



Simo 2003 Gestión Integrada de Requisitos

Antonio Rodríguez Perales



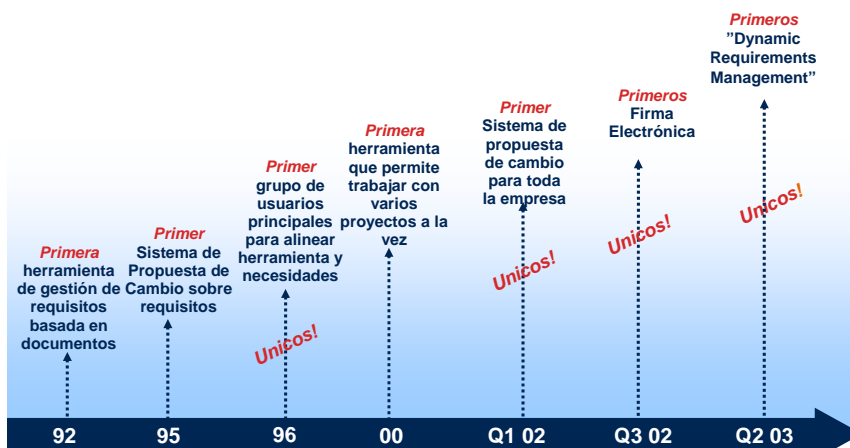
Telelogic - ¿Quiénes somos?



- Misión: Ayudar a nuestros clientes a hacerlo bien a la primera vez, de la forma más eficiente y al menor coste proporcionándole una tecnología que le permita soportar sus desarrollos de software y sistemas.
- Como nos vemos: Pioneros Tecnológicos
- Referencias: Clientes alrededor de todo el mundo en múltiples sectores desde Airbus a VW group.
- Nuestra estrategia de innovación y el proporcionar a nuestro clientes una tecnología puntera nos ha llevado a la vuelta a beneficios(Q3 – 2003) basado principalmente en la venta de nuevas licencias y la adquisición de la confianza de nuevos clientes, en contraste con nuestros principales competidores



Pioneros en la Gestión de Requisitos



Telelogic DOORS® ha sido galardonada por Yphise como la mejor herramienta de gestión de requisitos del mercado

3

6 años como herramienta lider en ventas

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Pioneros en las herramientas de desarrollo visual



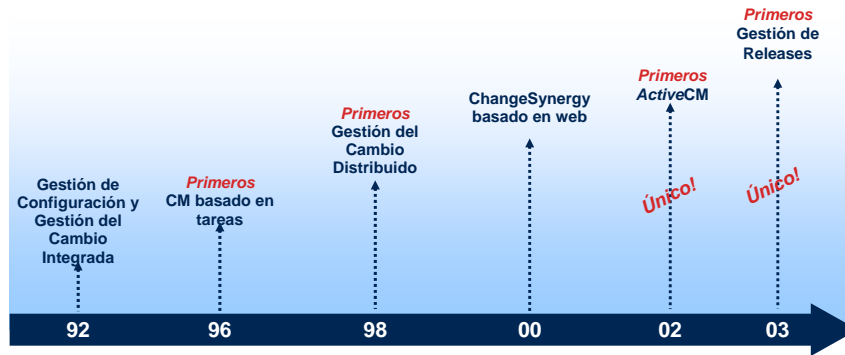
Telelogic TAU® es la primera herramienta que soporta UML2.0 para el desarrollo de sistemas y software

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Pioneros en la gestión de configuración y gestión del cambio



Telelogic SYNERGY™ ha sido galardonada por YPHISE y OVUM como la mejor herramienta de gestión de configuración del mercado

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Base global y local de clientes

Comunicaciones

Militar
Aeroespacial

Transportes

Finanzas
Seguros
Comercio



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El coste de los errores



Solo en los últimos 10 años, los defectos en software y sistemas han:

- Destruído el Ariane5 durante su lanzamiento
- Retrasado un año la apertura del aeropuerto de Denver, el más caro en la historia de EEUU
- Estrellado una sonda de la NASA contra la superficie de Marte
- Asesinado 4 militares americanos al estrellarse un helicóptero
- Inducido a una fragata de la marina americana a destruir un avión civil
- Parado el sistema de control de ambulancias de Londres, produciendo más de 30 muertos

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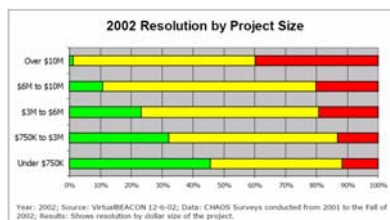
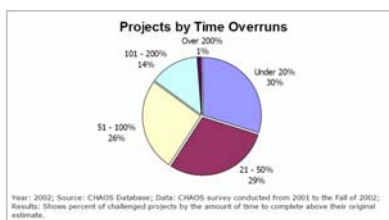
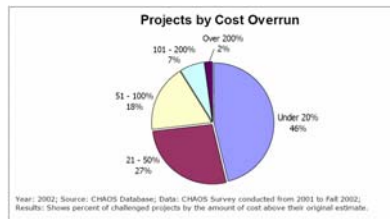
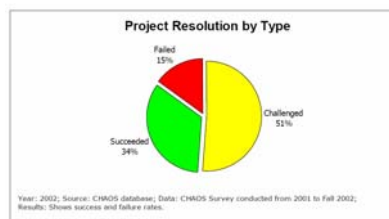
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Estado de la Industria Internacional

Fuente: Standish Group



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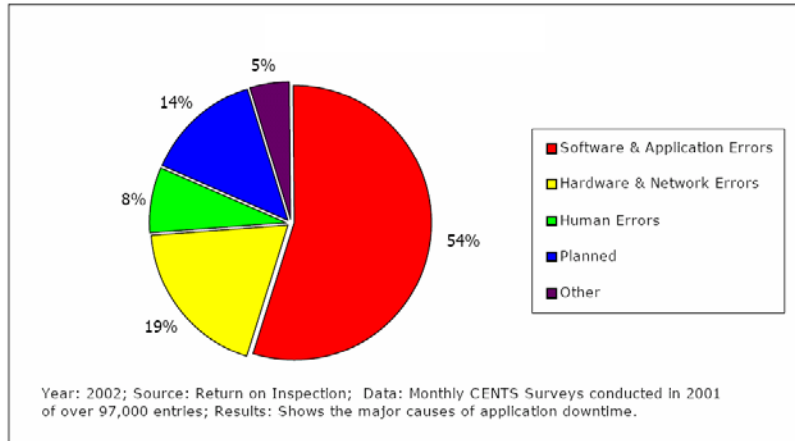
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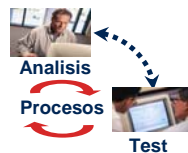


Origen de los Errores

Fuente: Standish Group



Gestión integrada de requisitos



Requisitos conducen Desarrollo

- Unir efectivamente la brecha entre requisitos y desarrollo
- Garantiza la organización y la prioridad de información crítica
- Asegura una solución basada en las necesidades

Requisitos conducen procesos de Validación

- Establecer trazabilidad entre requisitos y tests
- Sincronizar defectos con su resolución
- Mejora de comunicación
- Asegura que la solución cumple con todos los requisitos

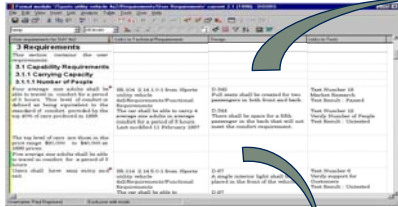
Gestión de Cambios

- Mecanismo flexible y escalable para cambios

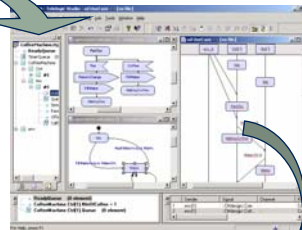
Requisitos conducen Desarrollo



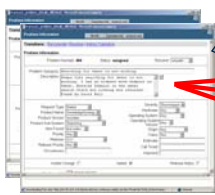
DOORS:
Gestión de Requisitos y Trazabilidad



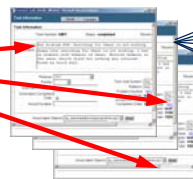
Tau/Architect:
Modelado de Procesos de Negocio y Arquitectura



ChangeSynergy:
Ordenes de Trabajo



CM Synergy:
Tareas



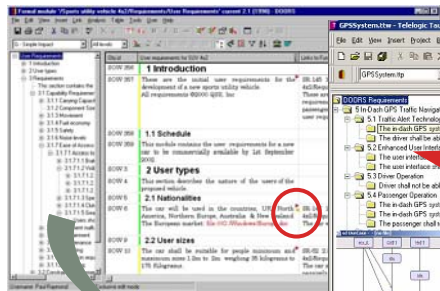
ActiveCM

Asegurar la trazabilidad desde requisitos! CONTROL

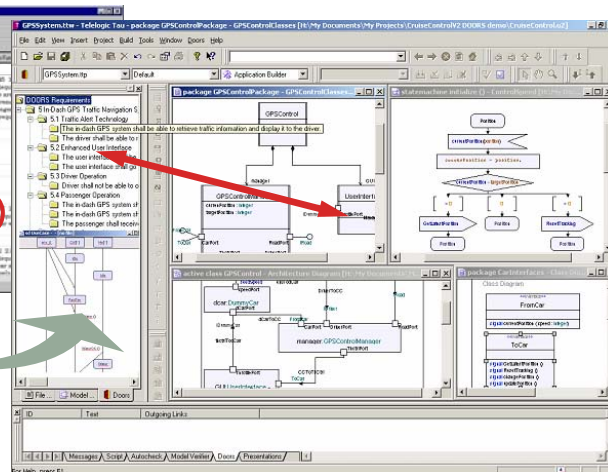
Requisitos conducen Desarrollo



DOORS:
Gestión de Requisitos y Trazabilidad



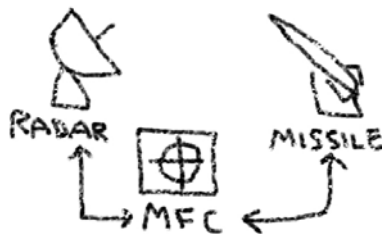
Tau/Architect:
Modelado de Procesos de Negocio y Arquitectura





Visualizar los requisitos

- ¿Creamos modelos mentales mediante imágenes de como el sistema debería trabajar?
- ¿Producimos escenarios gráficos cuando recogemos o definimos los requisitos?
- ¿Dibujamos para explicar mejor como debe ser entendido un requisito cuando nos comunicamos con otros miembros del equipo?



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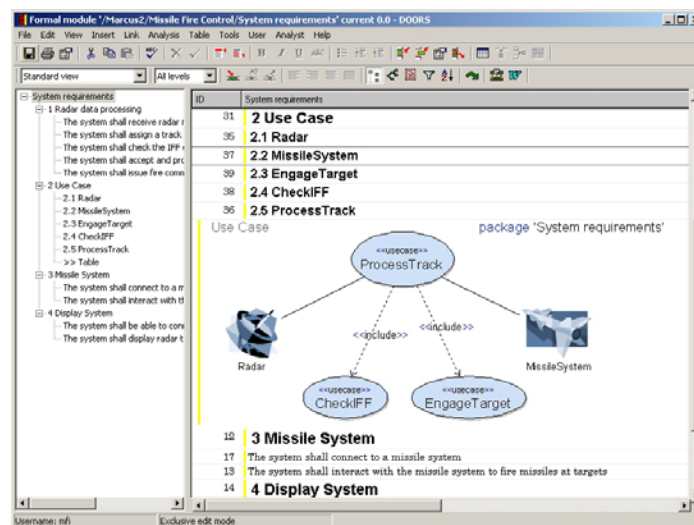
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DOORS/Analyst

Modelado visual UML dentro de la herramienta líder de Gestión de Requisitos



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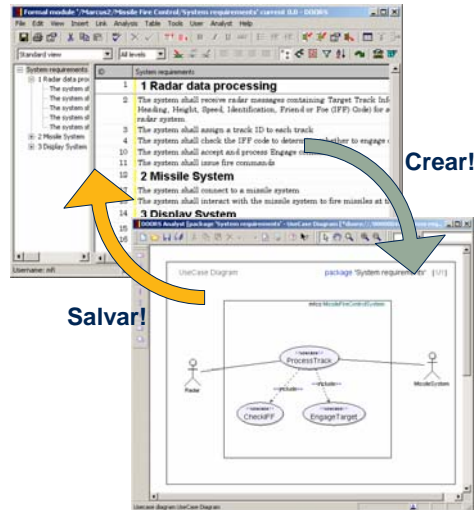
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DOORS/Analyst

- Definición de diagramas o modelos completos
- Crear diagramas a partir de requisitos textuales y mantenerlos sincronizados



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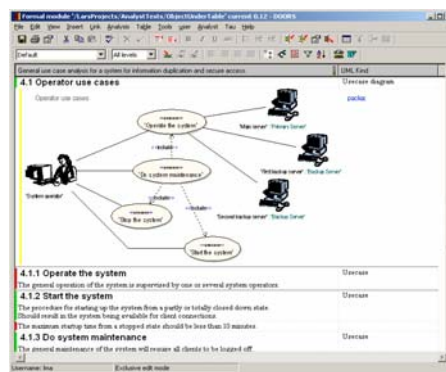
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Capacidades DOORS/Analyst

- Posibilidad de introducir símbolos descriptivos del sistema definidos por el usuario para un área específica
- Mantiene los niveles de seguridad, control de acceso y baselines de DOORS
- Enlaces de requisitos DOORS a modelo para una rápida navegación y trazabilidad

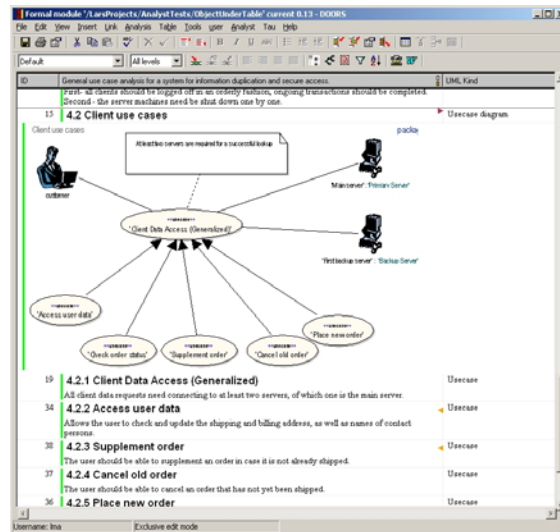


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Links DOORS desde objetos textuales a elementos del modelo

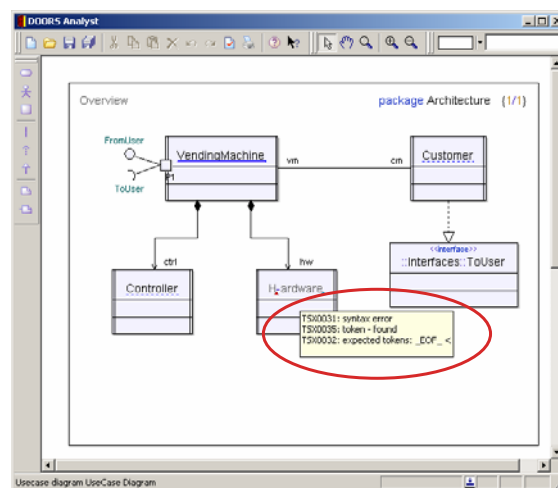


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Análisis semántico y sintáctico no intrusivo del modelo



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Beneficios de DOORS/Analyst

- **Disminuye la curva de aprendizaje y facilita empezar a usarlo**
 - No es necesario preocuparse de tener actualizadas las diferentes representaciones (textual y visual)
 - Basado en paradigmas de usabilidad familiares y diagramas estandarizados
- **Mejora en la captura de requisitos**
 - Mejora el input de los clientes
 - Requisitos menos ambiguos
 - Mas facil demostrar los requisitos a los usuarios finales
- **Asegurar la trazabilidad de los requisitos**
 - Rapidamente encontrar los elementos relevantes del modelo via enlaces bidireccionales desde los requisitos textuales



Beneficios de DOORS/Analyst (cont)

- **Mejora de feedback de todas las personas involucradas**
 - Captura un mejor feedback de las personas claves en la organización
 - Involucra tambien al personal no tecnico en el proceso de gestión de requisitos
- **Refuerza la colaboración con otros miembros del equipo**
 - Rapidamente enriquece los requisitos con conceptos gráficos
 - Asegura que los requisitos son completamente entendidos por los desarrolladores
 - Los simbolos y diagramas usados son conocidos por la mayoría de los desarrolladores de software y sistemas
- **Simplifica cooperación internacional**
 - Los modelos visuales proveen un "lenguaje común" para todos

Requisitos conducen procesos de VALIDACION

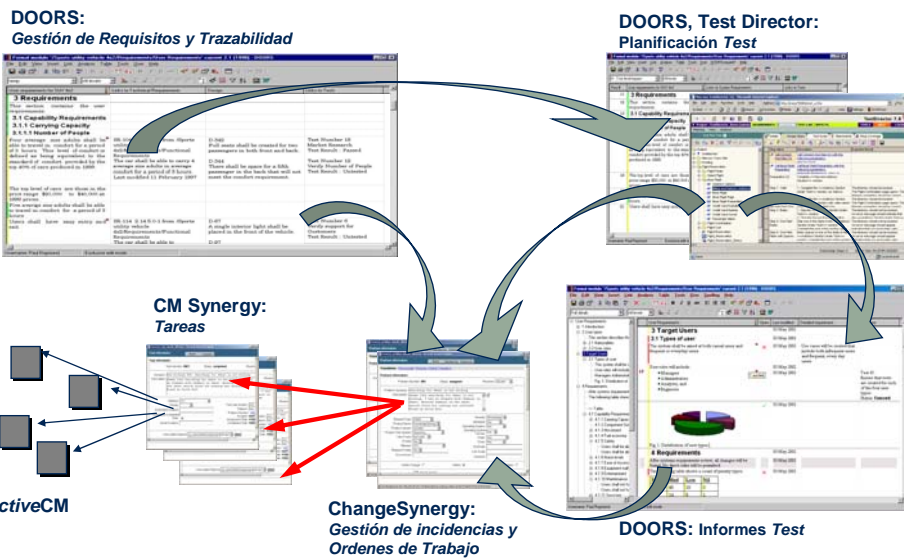


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Requisitos conducen procesos de Validación



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DOORS T3 (Test Tracking Tool)

- Especificación y gestión de test dentro de DOORS
- Gestión de la trazabilidad entre requisitos y tests
- Generar automáticamente planes de prueba
- Comparar los resultados de varias ejecuciones de las pruebas
- Asegurar la cobertura de los requisitos a través de la pruebas

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Casos de Prueba



The screenshot displays the DOORS T3 Test Tracking Tool interface. The main window shows a list of test cases under the heading "1 Equipment malfunction". The list includes test numbers, descriptions, and expected results. A detailed view of test case 390 is shown in a separate window, detailing the object test, expected test result, and actual test result.

Test Number	Must Test After	Expected Test Result	Actual Test Result 1	Test Engineer 1	Test Status 1
349		Ensure malfunction notification by using system code 182 to induce a failure.	Malfunction should be displayed.		
318	349	Check display for location indicator.	Display should indicate error in region W2.		
350	349	Time the response of malfunction notification by using system code 182 to induce a failure.	Malfunction should be displayed within 10 seconds. A 1 second tolerance will be permitted.		
356		Ensure malfunction notification by using system code 185 to induce a failure.	Malfunction should be displayed.		
320	356	Check display for location indicator.	Display should indicate error in region W6.		
357	356	Time the response of malfunction notification by using system code 185 to induce a serious failure.	Malfunction should be displayed within 5 seconds. A 1 second tolerance will be permitted.		
389		Ensure malfunction notification by using system code 202 to induce a failure.	Malfunction should be displayed.		
322	389	Check display for location indicator.	Display should indicate error in region W4.		
390	389	Users shall be able to be aware of any malfunction that affects the ability of the equipment to meet the statutory regulations within 1 second of that malfunction occurring.	Malfunction should be displayed within 1 second. A 1 second tolerance will be permitted.		

13 (0.3) Edit Test Case - DOORS

Test Number: 390

Object Test: Users shall be able to be aware of any malfunction that affects the ability of the equipment to meet the statutory regulations within 1 second of that malfunction occurring.

Expected Test Result: Malfunction should be displayed within 1 second. A 1 second tolerance will be permitted.

Actual Test Result 2: Display time was 3 seconds.

Test Engineer 2: PAM

Test Status 2: Pass Fail Undetermined Exempt

Object Identifier: 9

Apply | Prev | Next | Close

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Comparar resultados de las pruebas



Test Number	Must Test After	Expected Test Result	Actual Test Result 1/2	Test Engineer 1/2	Test Status 1/2
320	356	Check display for location indicator.	Display should indicate error in region W6.	W6 was displayed. But W5 displayed also. W6 was displayed only	FR EM Fail Pass
337	356	Time the response of malfunction notification by using system code 183 to induce a serious failure.	Malfunction should be displayed within 1 seconds. A 1 second tolerance will be permitted.	Display time was 4 seconds. Display time was 4 seconds.	FR EM Pass Pass
389		Ensure malfunction notification by using system code 202 to induce a failure.	Malfunction should be displayed.	Malfunction was displayed.	FR EM Pass Pass
322	389	Check display for location indicator.	Display should indicate error in region W4.	W4 was displayed. W4 was displayed.	FR EM Pass Pass
390	389	Users shall be able to be aware of any malfunction that affects the ability of the equipment to meet the statutory regulations within 1 second of that malfunction occurring	Malfunction should be displayed within 1 second. A 1 second tolerance will be permitted.	Display time was 4 seconds. Display time was 3 seconds.	FR EM Fail Fail

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Estatus de los requisitos respecto a su validación



Requirement	Test Status
4.1.8 Equipment malfunction	
Users shall be able to be aware of equipment malfunction within 10 second of the malfunction occurring.	Test Number: 350 Test Status 2: Pass Test Number: 249 Test Status 2: Pass
Users shall be able to be aware of any equipment malfunction that affects safety within 5 second of the malfunction occurring.	Test Number: 356 Test Status 2: Pass Test Number: 337 Test Status 2: Pass
Users shall be able to be aware of any malfunction that affects the ability of the equipment to meet the statutory regulations within 1 second of that malfunction occurring.	Test Number: 390 Test Status 2: Fail Test Number: 389 Test Status 2: Pass
Users shall be able to have maximum safety protection against any malfunction of equipment.	Test Number: 318 Test Status 2: Pass
Users shall be able to see where equipment malfunction has occurred.	Test Number: 320 Test Status 2: Pass Test Number: 322 Test Status 2: Pass

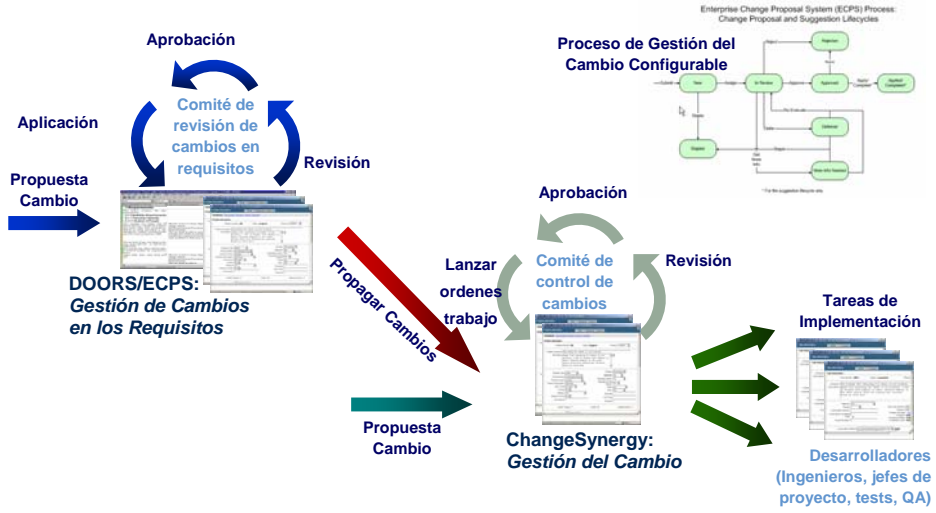
Filtrar que requisitos han sido validados y cuales no

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Gestión del Cambio a lo largo de todo el ciclo de vida



Conozca el impacto del cambio antes de que se produzca!

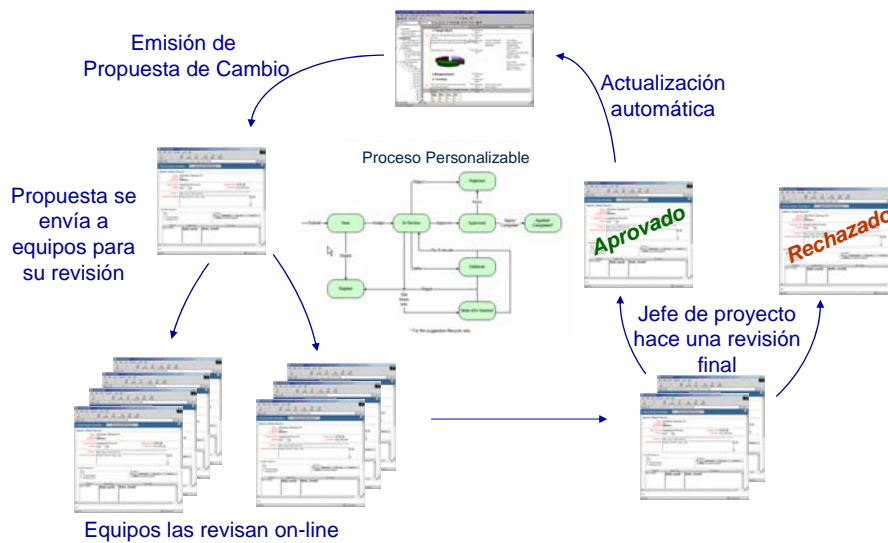
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Gestión de cambios de requisitos

Gestión de PCI



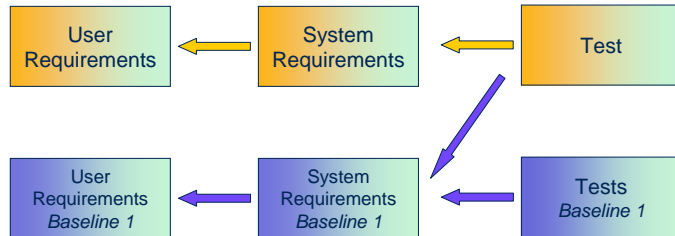
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Soporte al desarrollo iterativo



- Trazabilidad creada entre documentos actuales pero para algunos es necesario hacer baselines antes que otros.
- Entonces podemos hacer enlaces a la baseline para conformidad con esa fase
- Cuando hagamos la ultima baseline el histórico de trazabilidad se completa



Gestionar la trazabilidad resulta complejo en desarrollos iterativos

Documento 1

1. 820.300: Design and Development Planning

Each manufacturer shall establish and maintain plans that describe or reference the design and development activities and define responsibility for implementation.

The plans shall identify and describe the interfaces with different groups or activities that provide, or result in, input to the design and development process.

The plans shall be reviewed as design and development evolves.

The plans shall be updated as design and development evolves.

The plans shall be approved as design and development evolves.

2. 820.301: Design type

2.1. Each manufacturer shall establish procedures to ensure that the design requirements relating to a device are appropriate and address the intended use of the device, including the needs of the user and patient.

2.2. Each manufacturer shall maintain procedures to ensure that the design requirements relating to a device are appropriate and address the intended use of the device, including the needs of the user and patient.

2.3. The procedures shall include a mechanism for addressing incomplete requirements.

2.4. The procedures shall include a mechanism for addressing conflicting requirements.

2.5. The design input requirements shall be documented by a designated individual(s).

2.6. The design input requirements shall be reviewed by a designated individual(s).

2.7. The design input requirements shall be approved by a designated individual(s).

2.8. The design input requirements shall be approved by a designated individual(s) approving the requirements, shall be documented.

2.10: Questions

2.10.1. Summarize the manufacturer's written procedure(s) for identification and control of design type.

2.10.2. From what sources are design inputs sought?

2.10.3. Do design input procedures cover the relevant aspects, such as: (Mark all that apply and list additional aspects)

2.10.3.1. intended use

2.10.3.2. user/patient/clinical

2.10.3.3. performance characteristics

2.10.3.4. safety

2.10.3.5. limits and tolerances

2.10.3.6. risk analysis

2.10.3.7. toxicity and biocompatibility

2.10.3.8. electromagnetic compatibility (EMC)

2.10.3.9. compatibility with accessories/auxiliary devices

2.10.3.10. compatibility with the environment of intended use

2.10.3.11. human factors

2.10.3.12. physical/chemical characteristics

2.10.3.13. labeling/packaging

2.10.3.14. reliability

2.10.3.15. statutory and regulatory requirements

2.10.3.16. voluntary standards

2.10.3.17. manufacturing processes

2.10.3.18. sterility

2.10.3.19. MDR/complaints/failures and other historical data

2.10.3.20. design history files (DHF)

2.10.4. For the specific design covered, how were the design input requirements identified?

2.10.5. For the specific design covered, how were the design input requirements reviewed for adequacy?

Documento 2

Comply with FDA Design Control Guidance (GMP Regulation)

1. Capture design and related information

1.1. Input electronically formatted data

1.2. Reference external information sources

1.3. Reference external documentation

2. Store design and related information

2.1. Identify and tag design information as unique "design element"

2.2. Organize design elements

2.2.1. Organize by Design Control Guidance Element

2.2.2. Organize by interrelationships

2.3. Ensure all design elements are available

2.3.1. Store design elements by Design Control Guidance Element

2.3.2. Store design elements and their historical values

3. Manage all user needs

3.1. Identify the source of the user need

3.2. Identify all user types (groups)

3.3. Identify the customer(s)

3.4. Profile the expected patients

3.5. State the intended use of the product (family)

3.6. Capture the acceptance criteria for each user need

4. Manage design input requirements

4.1. Identify the source of the requirement

4.2. Identify the associated user need

4.3. Capture requirement description and attributes

4.4. Capture acceptance criteria

4.5. Assign responsibility for each requirement

4.6. Manage acceptance requirements

4.7. Manage ambiguous requirements

4.8. Manage conflicting requirements

4.9. Approve all requirements

5. Manage acceptance

5.1. Ensure the acceptance of every user need

5.2. Ensure the acceptance of every design input requirement

5.3. Document the results of every user need acceptance test

5.4. Document the results of every design input requirements test

5.5. Make acceptance results available

6. Manage change

6.1. Maintain history of design element changes

6.1.1. Make complete change history available

6.1.2. Maintain history within and across any organizational procedure

6.1.3. Maintain history within and across any project subelement

6.1.4. Maintain history within and across any Design Control Guidance Elements

6.2. Capture frequency and nature of design changes

6.2.1. Provide rationale for change

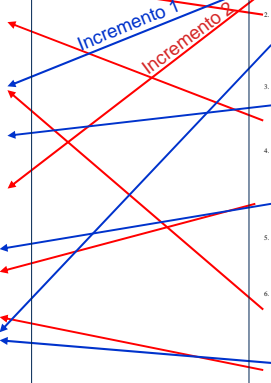
6.2.2. Identify approval authority for the change

6.2.3. Capture date, time, and signature of approving authority

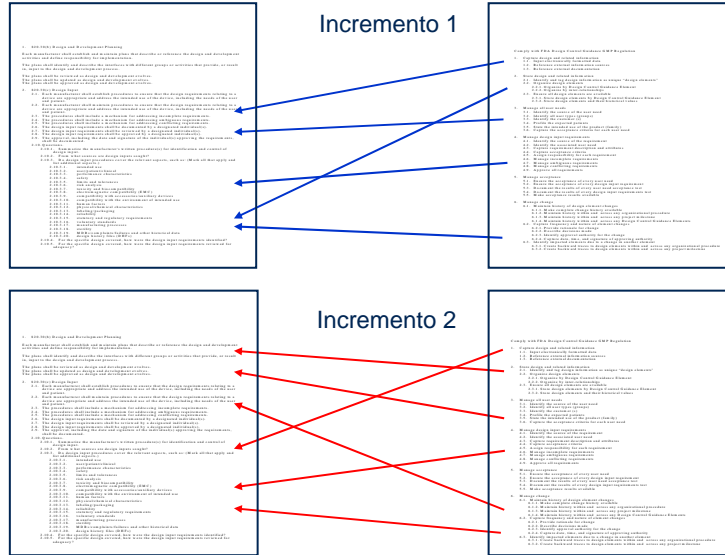
6.3. Identify impacted elements due to a change in another element

6.3.1. Create backward traces to design elements within and across any organizational procedure

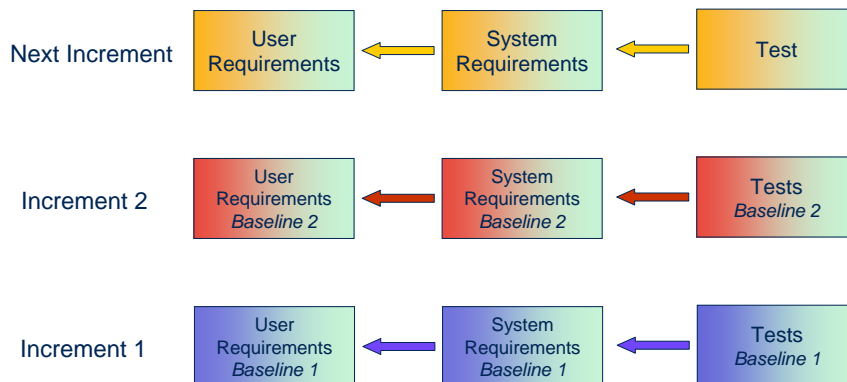
6.3.2. Create backward traces to design elements within and across any project subelement



Telelogic DOORS elimina la complejidad



Trazabilidad inteligente: Gestión de multiples grupos de trazabilidad





Más información

- Antonio Rodríguez Perales: antonio.rodriguez@telelogic.com
- Pagina web Telelogic: <http://www.telelogic.com>
- Pagina web específica de Telelogic DOORS:
<http://www.telelogic.com/doors>
http://www.telelogic.com/campaigns/2003/global/doors_analyst
- Libro "Requirements Engineering"
<http://www.telelogic.com/news/publications/reading/index.cfm>

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Telelogic DOORS

Antonio Rodríguez Perales



¿Quienes usan DOORS?

Proveedores, generan los requisitos

- Analistas de mercado, Jefes de Producto, Marketing, Cliente, Usuario Final,...



Revisores

- Jefes de proyecto, jefes de producto, Calidad, Usuario Final,...

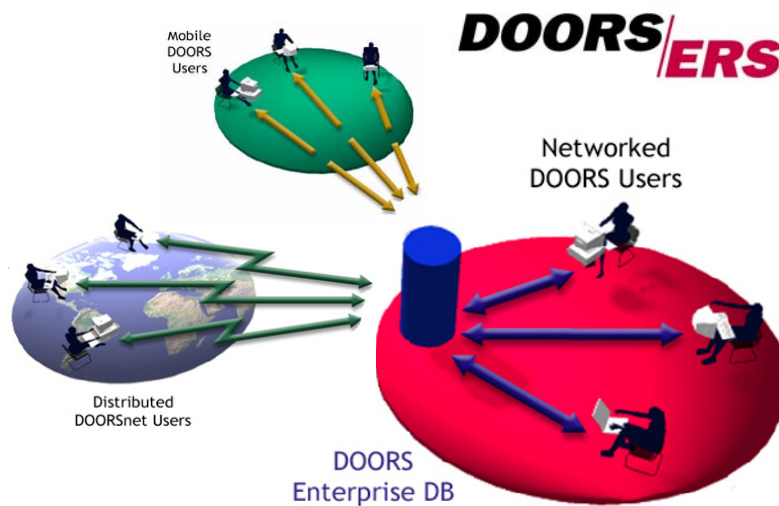


Gestores de Requisitos

- Ingenieros de Sistema, ingenieros de software, ingenieros de test, analistas,...



Solución Global Telelogic



Vista de base de datos DOORS



- Ninguna otra herramienta permite la edición de varios módulos de requisitos para su reutilización
- Organización jerárquica de proyectos y carpetas
- Control de acceso a nivel de base de datos, proyecto, modulo, requisito e incluso atributo de cada requisito

~~"No hay visibilidad de lo que otros proyectos hacen asi que muchas veces se duplica el esfuerzo"~~

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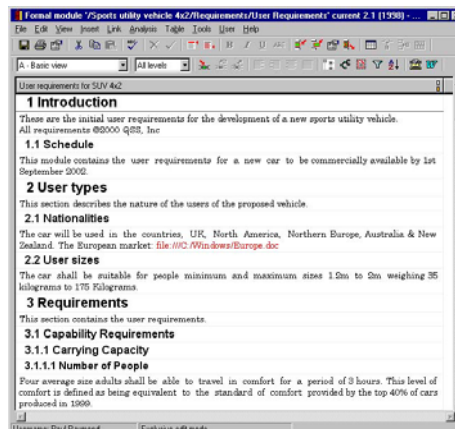
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Vistas DOORS



Simple vista de un documento de la base de datos



Muestra múltiples requisitos de forma lógica

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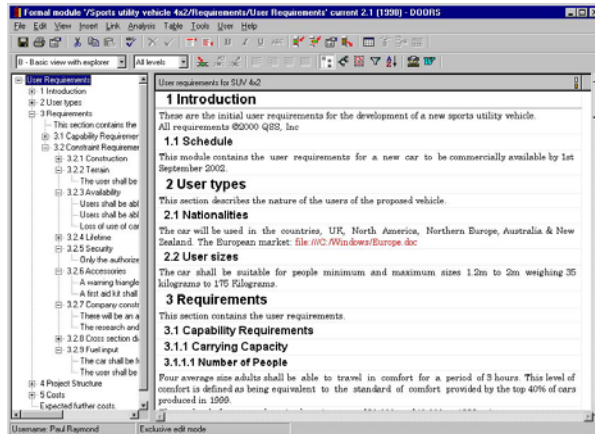
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Vistas DOORS



Explorer y documento al mismo tiempo

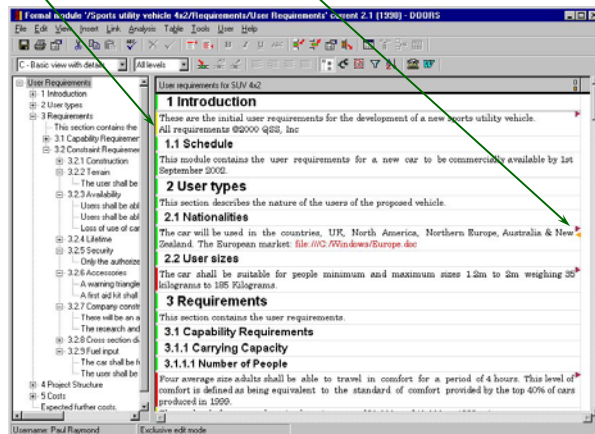


Navega por el documento rápida y eficientemente

Vistas DOORS



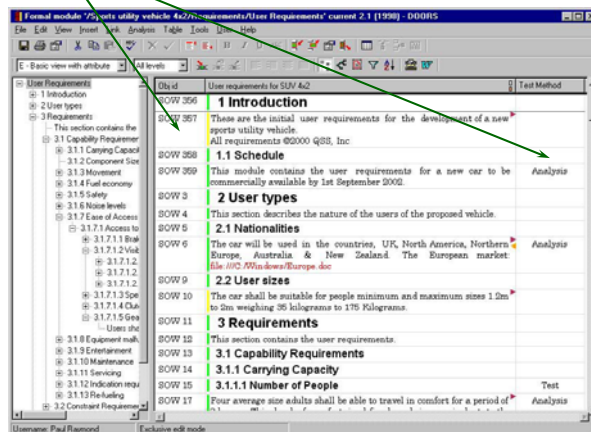
Barras de cambio e indicadores de links; trazabilidad instantánea
Vista estándar de DOORS



Vistas DOORS



Múltiples atributos en una vista tipo spreadsheet



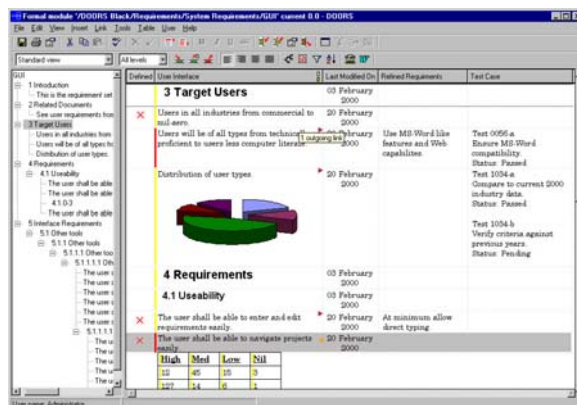
Información enriquecida en una sola vista, no es necesario navegar entre diferentes ventanas, pestañas,...

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Vistas "todo en una"



- Múltiples atributos en una sola vista
- Reorganización de la información en vistas
- Posibilidad de incluir tablas, figuras y todo tipo de objetos OLE

~~"Es difícil estimar el tiempo y los recursos necesarios para implementar con fiabilidad los cambios en los requisitos"~~

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Vistas "todo en una"

Ilimitado numero de atributos definidos por el usuario

texto, enumeraciones, enumeraciones multievaluadas, conteniendo operaciones,...

The screenshot shows the DOORSnet application window titled "Formal module 'Sports utility vehicle 4x2/Requirements/Use Requirements' current 2.1 (1998) - DOORS". It features a table with columns: ObjId, User requirements for SUV 4x2, Spent, Remaining, Verification Method, Risk, and Last Modified On. The table lists various requirements such as "3.1.4 Fuel economy" and "3.1.5 Safety". An "Object 45 properties - DOORS" dialog box is open, showing fields for "Created By", "Created On", "Created Thu", "Critical Issues", "Cyclically", "History count", "Integrated Product Team", "Last Modified By", "Last Modified On", "Milestone", "Object Heading", "Object Short Text", "Object Text", "ObjId", "OLE", "OLEIcon", and "OLEIconLink Count".

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Edición con DOORSnet

Acceso en tiempo real via Web a la base de datos DOORS con posibilidad de editar requisitos y atributos así como la posibilidad de hacer propuestas de cambio

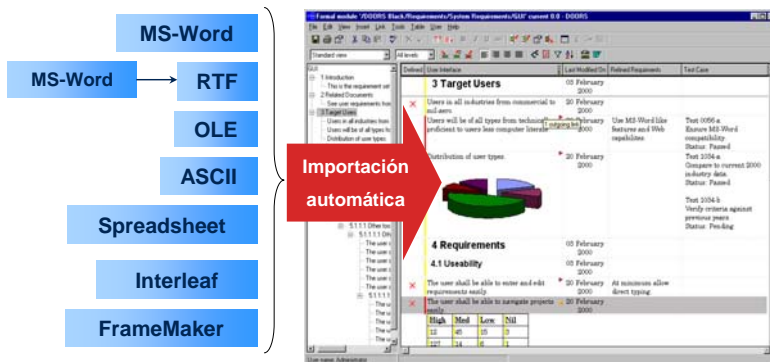
The screenshot shows the DOORSnet web interface accessed via Netscape. On the left is a tree view of the "DOORS database" with folders like "Another new project", "Folder one", "Folder two", "Folder three", "Deep module", "Standard view", "Level one", "Standard view", "Sub folder 1", "Formal one", "Formal two", "New Module", and "Top level module". The main content area displays a list of requirements (UR1 to UR12) under the heading "Module 1: Standard view (1 to 32 of 192)". A context menu is open over the list, showing options: "Edit this object", "Delete this object", "New object before this one", "New object after this one", and "New object below this one".

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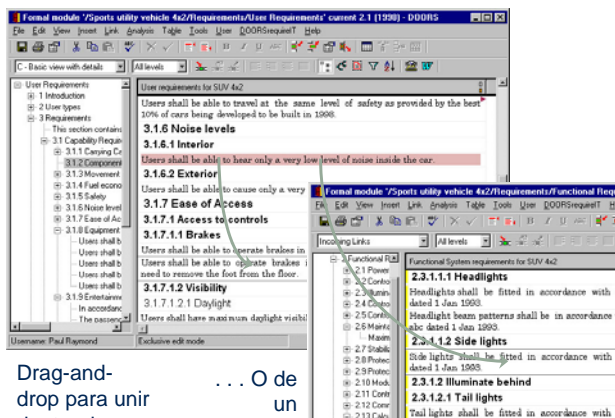
44

Fácil incorporación de información existente



La migración de proyectos existentes es fácil y rápida

Trazabilidad: drag-and-drop linking



Drag-and-drop para unir
dentro de un documento . . .
O de un documento a otro

~~“Características innecesarias o redundantes son muchas veces desarrolladas ya que no hay forma de asegurar una correcta evolución de los requisitos”~~

DOORS: metodos para la gestión de la trazabilidad



The screenshot shows the 'Object 6 properties - DOORS' window with tabs for General, Access, History, Attributes, and Links. The main area displays a table of requirements and their links to test cases. A 'Traceability Explorer' window is open, showing a tree view of the project structure. A specific requirement, '3 Target Users', is highlighted, showing its link to a test case 'Test Number 18 Market Research'.

In/Out	Module	Object Heading/Text
In	/Copy of DOORS Black/Requirements/System Require...	The user shall be able to ...
Out	/Copy of DOORS Black/Requirements/System Require...	Distribution of user types.
Out	/Copy of DOORS Black/Requirements/System Require...	The user shall be able to ...

Un Ejemplo...



Reqs. Usuario Reqs. Tecnicos Diseño Casos de Test

The screenshot shows a traceability matrix in DOORS. The columns are labeled 'Reqs. Usuario', 'Reqs. Tecnicos', 'Diseño', and 'Casos de Test'. The rows show requirements and their links to test cases. Arrows indicate the flow of traceability from user requirements through technical requirements and design to test cases.

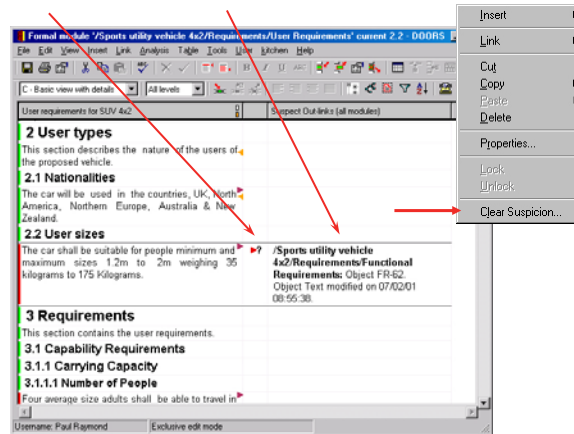
Reqs. Usuario	Reqs. Tecnicos	Diseño	Casos de Test
3.1.1.1 Number of People	SR 104 2.14.1.0.1 from 8ports utility vehicle	D-342 Pull seats shall be created for two passengers in both front and back.	Test Number 18 Market Research
Four average size adults shall be able to travel in comfort for a period of 3 hours. This level of comfort is defined as being equivalent to the standard of comfort provided by the top 40% of cars produced in 1999.	462Requirements/Functional Requirements The car shall be able to carry 4 average size adults in average comfort for a period of 3 hours. Last modified 11 February 1997	D-344 There shall be space for a fifth passenger in the back that will not meet the comfort requirement.	Test Number 12 Verify Number of People
SR 114 2.14.5.0.1 from 8ports utility vehicle	462Requirements/Functional Requirements The car shall be able to	D-67 A single interior light shall be placed in the front of the vehicle.	Test Number 6 Verify support for Customers

~~"Es difícil predecir el impacto de un cambio antes de que el trabajo se haya terminado"~~

Suspect links

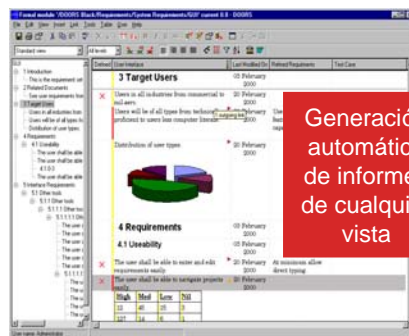


Suspect links son visibles en el contexto del documento y muestran información completa del cambio

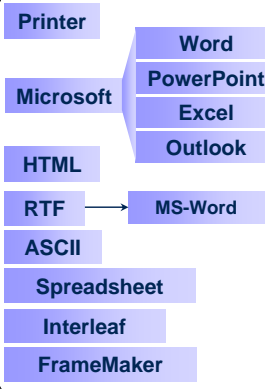


Nunca dejar sin aplicar un cambio

Generación de informes



Generación automática de informes de cualquier vista



Publicar informes fácilmente con el contenido y formato requerido

Histórico y baselines



Historio de cada requisito

Baseline previa

Versión actual

cualquier cambio

Firma Digital



– La posibilidad de utilizar firma digital en las “baselines”

- Formalizar procesos
- Auditoria
- Procesos de calidad
- Verificación
- Validación