

Requirements XML Edition

- RX9 -



User Guide – V1

BPA Delivery 7 for V5R19 (V5.7)

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1. Introduction

This document describes the user guide for the BPA Requirements XML Edition.

This document is divided into the following sections:

- Requirements XML Edition overview
- Requirements XML Edition Editing with InfoPath
- Requirements XML Edition Requirement management with Requirements XML Edition

1.1. *Scope and purpose*

Systems Lifecycle Management and Traceability (SLM&T) provides key services for end to end, cross discipline, full life cycle management and traceability from Requirements to Product. It Covers Life cycle management of all systems engineering objects, history and audit trail, change management, control and justification tools. By tracing in specific tables the history of all objects and by controlling the links, it is possible for the user to justify all his actions through decision objects, and recover traceability reports showing the exact links between all objects. Additional services allow to undo delete operations and to control requirement revisions and change.

SLM&T capabilities are essential for companies that need to insure complete traceability and answer regulations. It offers:

- **Compliance to Standards and Maturity Models**
 - Offers systematic tools to insure compliance to SE standards such as EIA 632, ISO 15288, ...
 - Change management, configuration management and traceability insures compliance with CMMI and other SE Maturity Models (EIA 731, SECAM)
- **A Controlled and Justified approach**
 - Traceability and Control eases the V&V and certification process.
 - Adding Justification information allows to explicit the Design Rationale and to trace not only requirements but why such requirements.
 - Impact analysis and change control allows efficient cost-effective design.

1.2. *Related Documentation*

There documents give complementary useful information for daily use of the BPA.

- Collaborative Systems Engineering – License Use Management (CSE_licenseUseManagement_R19D7.doc)
- Collaborative Systems Engineering – Data Model Documentation (CSE_DataModelDocumentation_R19D7.doc)
- Collaborative Systems Engineering – Requirement Management Implementation guide (RM9_ImplementationGuide_R19D7.doc)
- ENOVIA SmarTeam - Editor Installation Guide
- ENOVIA SmarTeam - Editor Administrator Guide
- ENOVIA SmarTeam - Editor User Guide
- ENOVIA SmarTeam - Foundation Installation Guide
- ENOVIA SmarTeam - Foundation Administrator Guide
- ENOVIA SmarTeam - Foundation User Guide

1.3. Definitions

1.3.1. Glossary

Acronym	Definition
BPA	Business Process Accelerator
PDIR	Program Directory
CSE	Collaborative System Engineering

Table 1 - Acronyms

1.3.2. Pictograms

Symbol	Usage
	Create primary requirement
	Creating primary requirements from MS Clipboard
	Decomposing requirements
	Derived Requirement
	Updating requirements
	View requirements change history
	Provide requirement history report
	Requirements Module
	Requirements Chapter
	Trace to original document
	Allocate requirement to test and validation plan
	Allocate requirement to function
	Allocate a requirement to a system
	Declare a requirement to requirement dependency
	Publishing a report matrix
	Publishing a requirements document into Word
	Reordering
	Capture Requirements
	Markup requirement for capture
	Automatic capture requirements
	Reset Globals
	Requirement Folder
	Unallocated objects
	Generate Traceability Matrix
	Requirement information
	IVVQ Module
	IVVQ Chapter
	IVVQ Folder
	IVVQ Result
	IVVQ Information
	IVVQ Matrix item
	IVVQ Sheet
	IVVQ Analysis

Table 2 - Pictograms

2. Requirements XML Edition overview

2.1. Functional overview

2.1.1. CSE Requirement Management Process

The Requirements Management activity is defined as a systematic approach to eliciting, organizing and documenting the requirements of the system, as well as a process that establishes and maintains agreement between the customer and the project team on the changing requirements of the system. Requirements Management is the ongoing process of identifying the needs of the end user, and balancing them against the time and budget of the project, resulting in a system satisfying the needs of the end user.

The objective of Requirements Management is to take the customer's/marketing specific, written requirements and proliferate them into a clear and unambiguous set of derived requirements to control the design, development, implementation and testing of the final system so that we deliver a product that meets customer/marketing expectations.

Requirements Management involves establishing and maintaining agreement between customer and developer on both technical and non-technical requirements. This agreement forms the basis for estimating, planning, performing, and tracking project activities throughout the project, and for maintaining and enhancing developed systems.

Key activities of Requirements Management include: **Needs Identification** phase, **Requirements Source Capture** and **Requirement Analysis and Decomposition**, **Requirement Allocation and Formalization**, **Requirement Verification** and final product **Acceptance**.

2.1.2. CSE IVVQ Process

The V&V activities are composed of 4 major steps:

- **Integration:** System is built step by step from the components. The purpose of the Integration process is to assemble a system that is consistent with the architectural design. This process combines system elements to form complete or partial system configurations in order to create a product specified in the system requirements.
- **Verification:** Do we meet the technical requirements? The purpose of the Verification Process is to confirm that the specified design requirements are fulfilled by the system. This process provides the information required to effect the remedial actions that correct non-conformances in the realized system or the processes that act on it.
- **Validation:** Do we meet the needs & expectations? The purpose of the Validation Process is to provide objective evidence that the services provided by a system when in use comply with stakeholders' requirements. This process performs a comparative assessment and confirms that the stakeholders' requirements are correctly defined. Where variances are identified, these are recorded and guide corrective actions. System validation is ratified by stakeholders.
- **Qualification:** Do we meet the global expectation (in the working environment) and can we start manufacturing activity?

IVVQ activities are pretty much closed to the system definition activities. As soon as a technical requirement is defined you need to define how to test it.

2.1.3. Requirements XML Edition Module

In the Requirements Management Process, there is a necessary phase of validating the requirements produced during the activity. Creating Documents allows grouping coherent sets of requirements in one global document that can be communicated, validated and released as a whole. This allows an easy way to identify and communicate a given baseline in the Requirement Process.

Requirements XML Edition allows considering requirements in their context, grouping sets of requirements in modules to build coherent **Documents**. When using CSE for capturing and analyzing requirements, System Engineers need to define requirements in a **document view**. In that way, a module becomes a coherent set of requirements that can be understood simply by reading the module document. As in a document, the user is able to insert structure, titles and subtitles and text that insure the readability of the document by giving introductions, conclusions and transitions between the different requirements. The user can also embed tables and pictures inside requirements.

Since SmarTeam does not offer such a view of Requirements but a tree view where each requirement is seen as an atomic object linked to others but not contextually imbedded, the need is to be able to switch from the SmarTeam tree view to a semantically equivalent Document View where all editing can be done and then to be able to go from one view to the other without any loss of information.

InfoPath is an XML authoring tool from Microsoft. With Requirements XML Edition, a requirement/IVVQ module is exported in XML and can then be edited inside InfoPath using a specific CSE form. The user can thus edit his module exactly as a document, inserting chapters, formatted text and pictures directly in the document in a WYSIWYG manner. When saving the document in InfoPath, the document is saved back inside CSE where the requirements/IVVQ objects can be used in further requirement management exactly as if they had been edited inside CSE.

2.1.4. Requirements/IVVQ XML Edition Scope

Since SmarTeam does not offer a document view of Requirements/IVVQ but a tree view where each requirement/IVVQ object is seen as an atomic object linked to others but not contextually imbedded, the need is to be able to switch from the SmarTeam tree view to a semantically equivalent Document View where all editing can be done and then to be able to go from one view to the other without any loss of information.





- **A document View of Requirements/IVVQ objects:** When using CSE for capturing and analyzing Requirements, System Engineers need to define Requirements in a document view. In that way, a module becomes a coherent set of Requirements that can be understood simply by reading the Module document. The same need appears for defining the IVVQ documents in order to validate the requirements.
- **Structure, rich text, images and tables:** As in a document, the user is able to insert structure, titles and subtitles and text that insure the readability of the document by giving introductions, conclusions and transitions between the different requirements/ IVVQ Objects. The user can also embed inside requirements/ IVVQ Objects tables and pictures. Finally the text can be richly formatted by changing fonts and format such as font size or style.

2.1.5. Requirements/IVVQ XML Edition Value






- **WYSIWYG** view of requirements/ IVVQ objects: The author can edit his requirements/IVVQ Objects as the reader will see them.
- **Formatting of requirement/IVVQ content:** enhancing important content helps getting to the point
- **Inserting Images:** a good drawing is sometimes better than a lot of text
- **Inserting Tables:** when requirements/IVVQ objects are structured and valued, a table is better than text.
- **Faster requirement/IVVQ edition:** the author can enter specifications simply by typing, without cumbersome life cycle operations in SmarTeam.

2.2. CSE_XML Entities

To insure Requirements XML Edition, one has to map a Requirement/IVVQ Module to a Document. New objects have been added to do this mapping. A Requirement Module is today composed of:


-  **Primary_Requirement:** The normal requirement of CSE.
-  **Derived_Requirement:** A requirement derived from a primary requirement.
-  **Requirements_Information:** A piece of text, or a document paragraph that allows filling between requirements so as to give the document a good readability. An information may be the documents introduction or summary, a transition between requirements, etc. An information requirement is not a requirement in itself. It cannot be used for traceability, cannot be derived, and cannot be used generally inside CSE as a requirement.
-  **Requirements_Chapter:** A requirement chapter is used to put titles and to organize the module into a document. It is therefore used to structure the requirements but it is not in itself a requirement.

An IVVQ module is composed of:

-  **IVVQ Information:** A piece of text, or a document paragraph that allows filling between IVVQ objects so as to give the document a good readability.
-  **IVVQ Sheet:** An IVVQ Sheet is used to define a test procedure.
-  **IVVQ Result:** An IVVQ Result allows defining a test result document.
-  **IVVQ Matrix Item:** An IVVQ Matrix Item is used to create traceability links between a test procedure (IVVQ Sheet) and a Requirement or between a test result (IVVQ Test Result) and a Requirement.
-  **IVVQ Chapter:** Like in a document, an IVVQ chapter allows structuring an IVVQ module. It can contain a set of tests called Run.


An IVVQ chapter is composed of same objects than an IVVQ Module and content also IVVQ Analysis:

-  **IVVQ Analysis:** An IVVQ Analysis is used to present the results after analysing the different tests of a Run during a tests campaign.

 In CSE, requirements can be organized by Modules. The Modules entities are providing the capability to define a specific view of the requirements and can be used to define the structure of final requirements documents. Requirements module object can be created to support the definition of the final requirement document structure and to group requirements per themes and categories. The module concept is usually used to put together the Safety Requirements, User requirements, Functional Requirements and Performance Requirements.

The composition rules define the structure of a CSE Module:

- In a Module you can add a Chapter or an information or a Requirement.
- In a Chapter you can add a Chapter or an information or a Requirement.
- In an information you can add nothing (it is always a leaf).
- In a Primary Requirement you can add nothing.
- In a Derived Requirement you can add nothing.

 Like for the requirements, IVVQ objects can be organized by module. The IVVQ module provides the capability to define a full test plan as you'd do within MS Word. Using the chapters and leaf elements you will be able to create a complete test plan.

The composition rules define the structure of an IVVQ module:


- In an IVVQ module you can add an IVVQ chapter or an IVVQ Information, IVVQ Sheet, IVVQ Result or IVVQ Matrix Item.

- In an IVVQ chapter you can add an IVVQ chapter or an IVVQ Information, IVVQ Sheet, IVVQ Result, IVVQ Matrix Item or an IVVQ Analysis.
- In any leaf object (IVVQ Information, IVVQ Result, IVVQ Sheet, IVVQ Matrix Item and IVVQ Analysis), you cannot add anything.

3. User Interface presentation

3.1. Launching InfoPath from CSE

Requirements XML Edition considers a Requirements/IVVQ Module as the root of a document. InfoPath therefore needs a Requirement/IVVQ Module to work with. You must first create a Requirement/IVVQ Module in your Requirement/IVVQ Tree inside SmarTeam. You can then launch Requirements XML Edition from SmarTeam:

1. Select The empty Module
2. Click the InfoPath button:  or
3. Use the User Defined Tool “Edit in InfoPath”

InfoPath opens with your Requirements/IVVQ Module as illustrated:

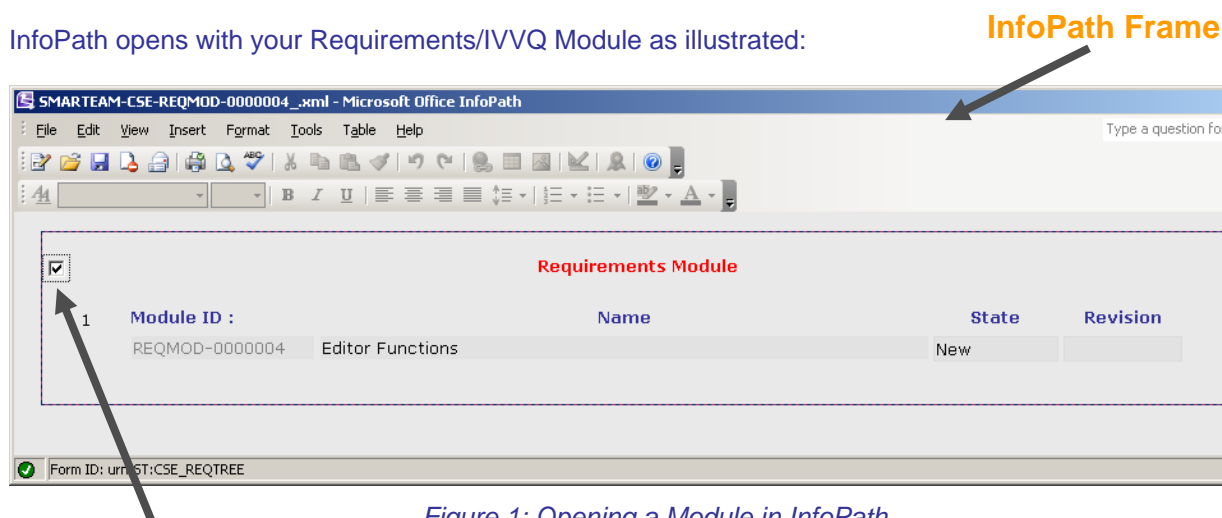


Figure 1: Opening a Module in InfoPath

Open button

The Open checkbox allows opening nodes in the Document Tree. To edit your module, first click on the Open checkbox. You can then select The Module (which is empty) and click right. A menu appears:

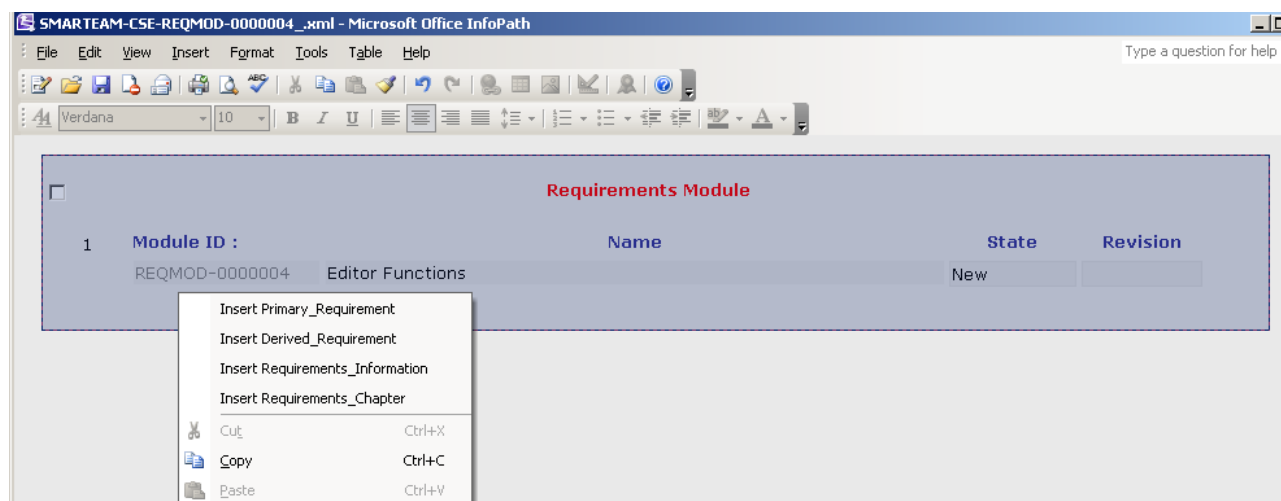

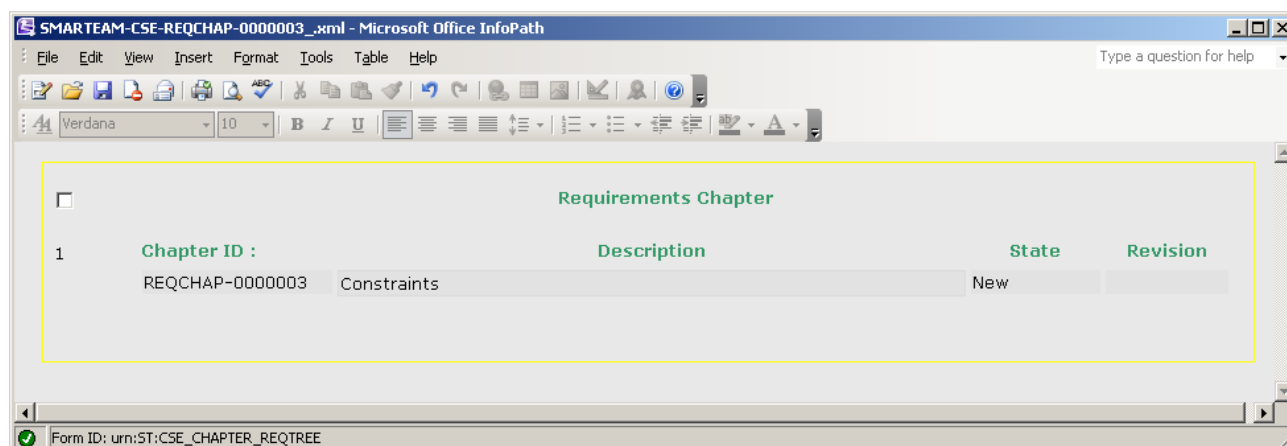


Figure 2: Inserting in a Module

As you can edit a module in InfoPath, you can also edit a chapter.

1. **Select a Chapter**
2. **Click the InfoPath button:**  **or**
3. **Use the User Defined Tool “Edit in InfoPath”**



4. Requirements XML Edition Editing with InfoPath

Once you have CSE installed with the Requirements XML Edition, you can edit your Requirements/IVVQ objects with InfoPath.

Permanent Restriction :

If more than one empty rows, tabs and extra spaces are inserted during InfoPath edition, only one will appear in the associated profile card and in generated composite documents. These specific characters are condensed to one.

4.1. *Editing a Module or a chapter*

4.1.1. *Function description*

4.1.1.1. Inserting new objects

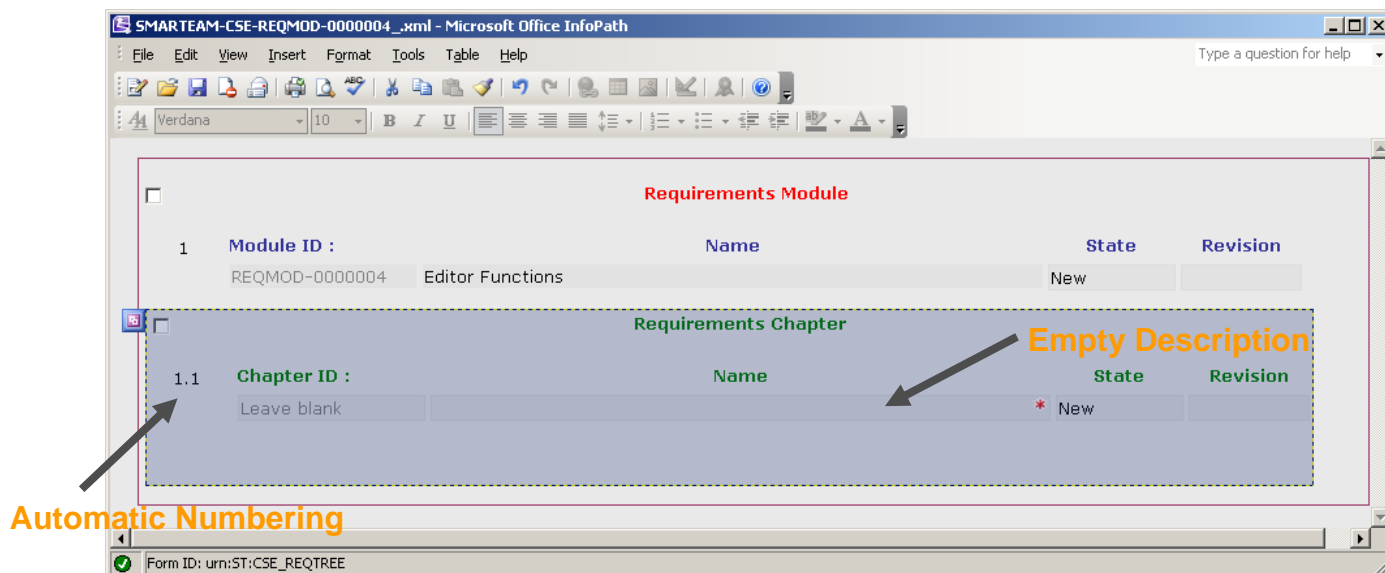
For the requirements tree, you can insert in your Module/Chapter four types of objects:

- **A Requirement Chapter:** It will help you structure your Document as a Title or Subtitle
- **A Requirement Information:** It is to add text to your document that is not a Requirement (Introductory text for instance)
- **A Primary Requirement:** Each Requirement created inside your Module will become a Requirement in CSE that you can manage by lifecycle or by linking it to other CSE objects.
- **A Derived Requirement**

For the IVVQ tree, you can insert in your Module/Chapter six types of objects:

- **An IVVQ chapter**
- **An IVVQ Information**
- **An IVVQ Result**
- **An IVVQ Sheet**
- **An IVVQ Matrix Item**
- **An IVVQ Analysis**

For Instance, adding a requirements chapter:



Requirements Module

Module ID :	Name	State	Revision
REQMOD-0000004	Editor Functions	New	

Requirements Chapter

Chapter ID :	Name	State	Revision
1.1	Leave blank	* New	

Automatic Numbering

Empty Description

Form ID: urn:ST:CSE_REQTREE

Figure 3: New Chapter

To help the user visually, a color pattern has been used:

- The Requirements/IVVQ Module is in Red.
- The Requirements/IVVQ Chapter is in Green.
- The Requirements/IVVQ Objects are in Blue.

This color pattern is also used by creating a frame around the object. This is useful to see up to where a chapter goes for instance.

Once the chapter created, you can enter its description which will actually be its Title. As you can see, InfoPath automatically computes the corresponding Number of your Chapter. "1" stands for the Module: The root of your document. "1.1" Stands for the first object in your Module.

In the same way, you can add a subchapter or a requirement/IVVQ object to your Chapter. When right clicking, you have the choice of adding things:

- **Above:** adding a chapter above your first chapter will create a brother chapter with numbering "1.1". The first chapter will have numbering "1.2".
- **Bellow:** adding a chapter below your first chapter will create a brother chapter with numbering "1.2". The first chapter will keep numbering "1.1".
- **Inserting:** simply inserting means inserting as a son. Inserting a chapter will create a subchapter numbered "1.1.1".

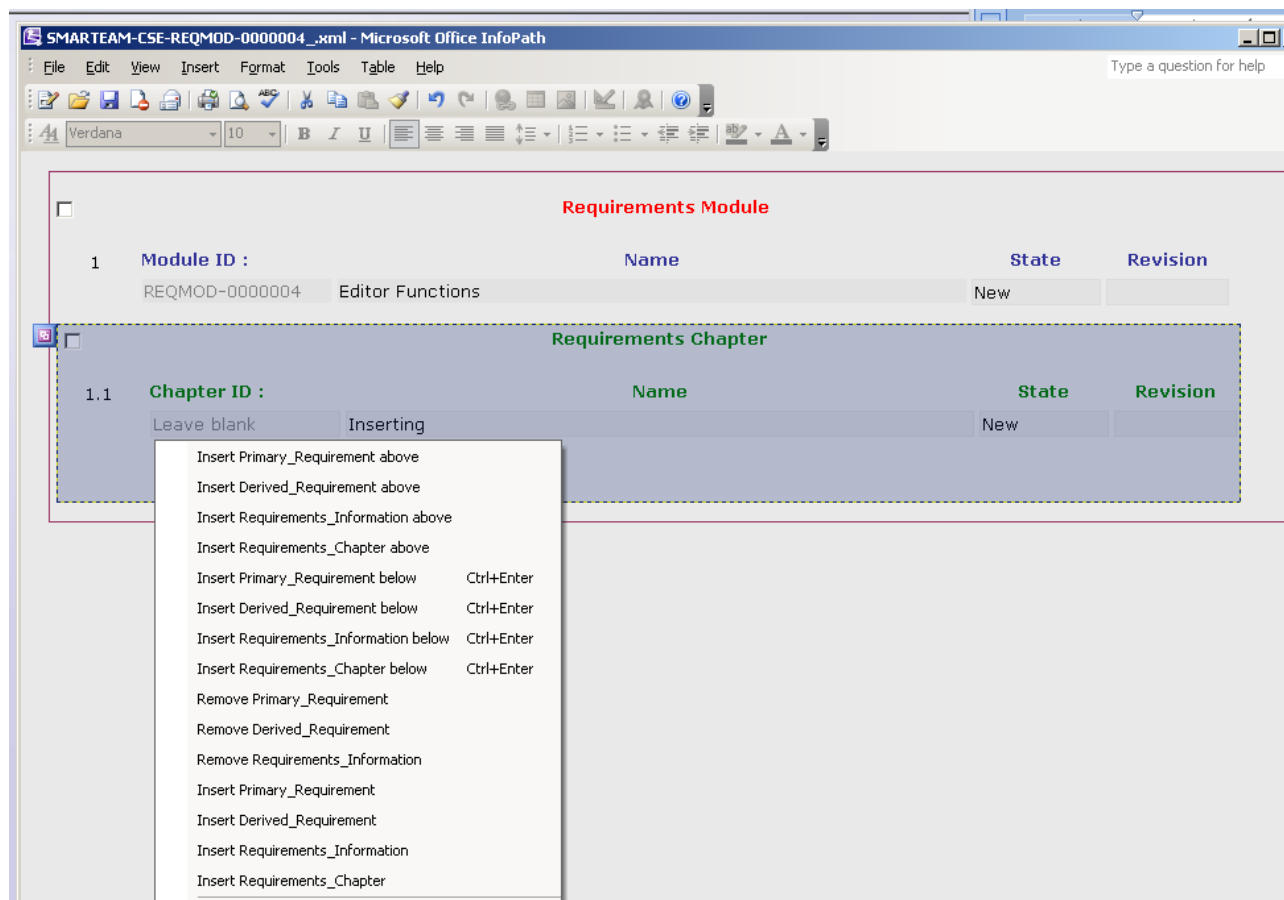


Figure 4: Inserting in a Chapter

Suppose you insert a Primary Requirement. It will have a content field, in addition to the Description which stands for the name of the requirement. The content field is **Rich Text**. This means that you can type any formatted text in that field. To format the text, you use the InfoPath Toolbar:



Figure 5: InfoPath Toolbar

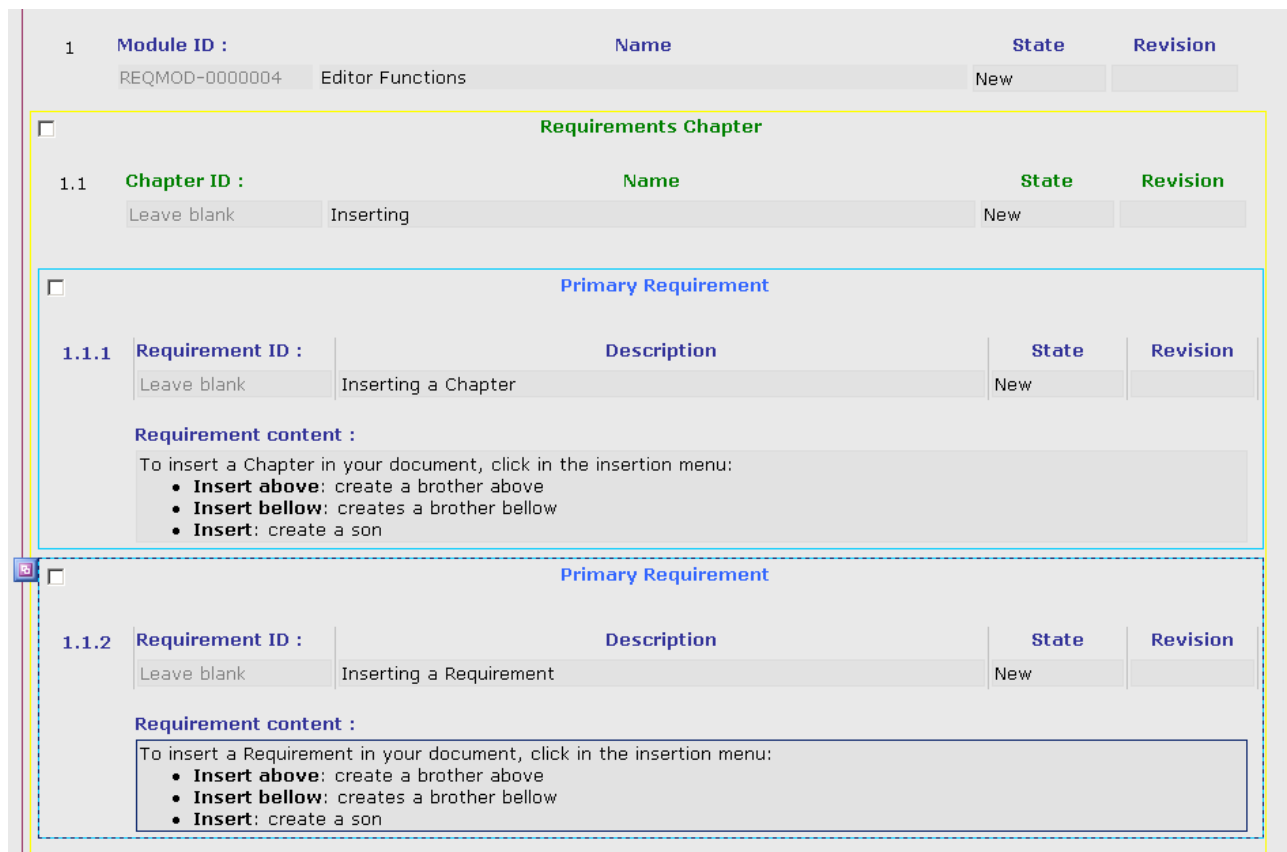
Formatting Toolbar

In the Requirement below, rich text has been inserted: The fonts color can be changed, its style also and you can insert Bullets or numbering.

Primary Requirement		Requirement name	
Requirement ID :	Description	State	Revision
1.1.1.1 Leave blank	Inserting a Chapter	New	
Requirement content : To insert a Chapter in your document, click in the insertion menu: <ul style="list-style-type: none"> • Insert above: create a brother above • Insert below: creates a brother bellow • Insert: create a son 			

Figure 6: New Requirement

From your new requirement, try “Insert requirement bellow”. You then create a brother requirement to “1.1.1” numbered “1.1.2”.



1	Module ID :	Name	State	Revision
	REQMOD-0000004	Editor Functions	New	

☐
Requirements Chapter

1.1	Chapter ID :	Name	State	Revision
	Leave blank	Inserting	New	

☐
Primary Requirement

1.1.1	Requirement ID :	Description	State	Revision
	Leave blank	Inserting a Chapter	New	

Requirement content :

To insert a Chapter in your document, click in the insertion menu:

- **Insert above:** create a brother above
- **Insert bellow:** creates a brother bellow
- **Insert:** create a son

☐
Primary Requirement

1.1.2	Requirement ID :	Description	State	Revision
	Leave blank	Inserting a Requirement	New	

Requirement content :

To insert a Requirement in your document, click in the insertion menu:

- **Insert above:** create a brother above
- **Insert bellow:** creates a brother bellow
- **Insert:** create a son

Figure 7: New brother Requirement

4.1.1.2. Cutting and Pasting

You can also use the contextual menu to move around Chapters and Requirements.

You can for example move a chapter in the following steps:

1. Create an empty chapter where you want your new chapter.
2. Go to the chapter to move.
3. Cut the chapter.
4. Paste it on the empty chapter.

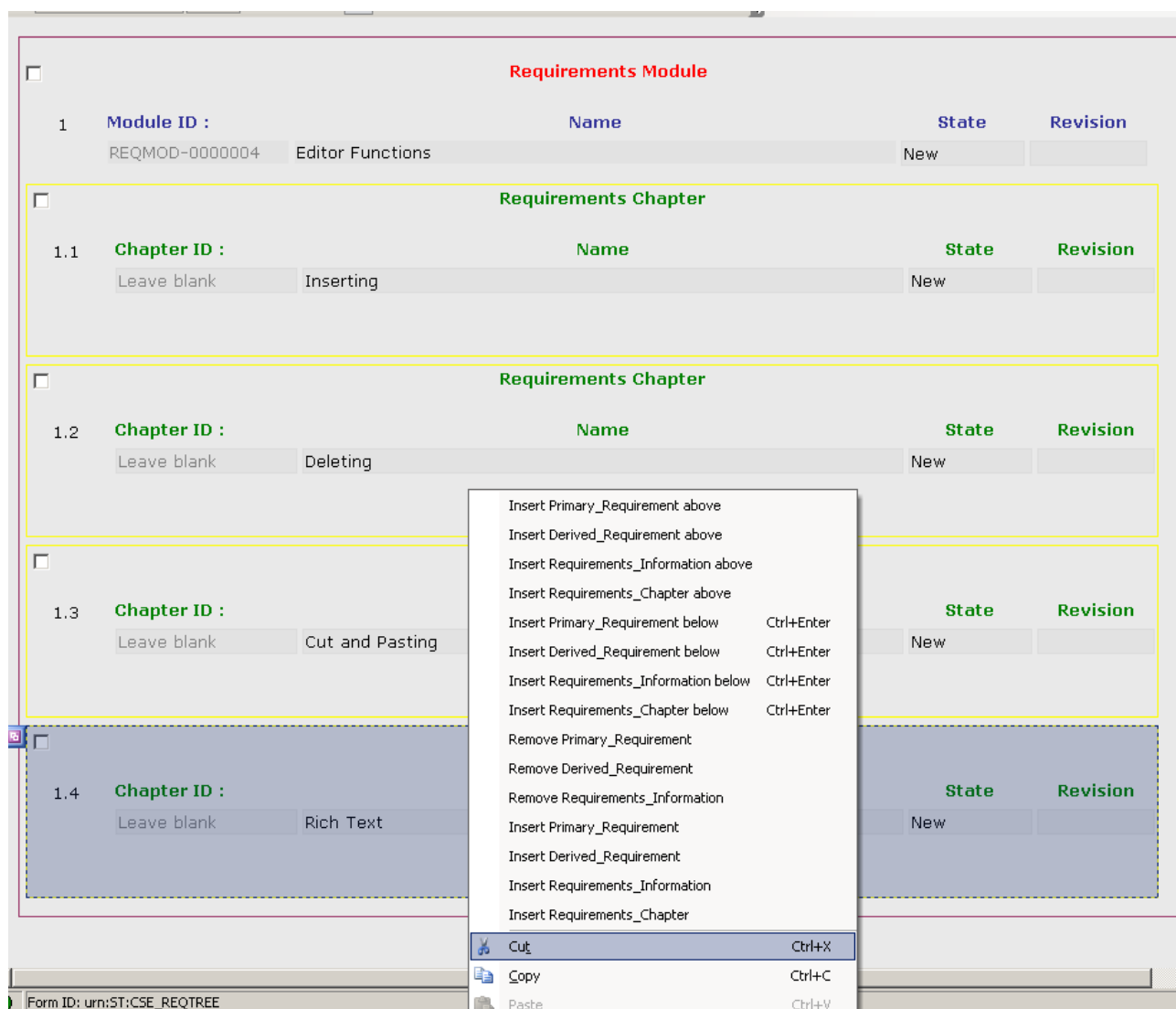


Figure 8: Cutting a Chapter

4.1.1.3. Inserting Pictures and Tables

To insert pictures and tables in the Requirement/IVVQ object content, you can use the InfoPath buttons.

To insert a picture:

1. Click in the Requirement content field where you want to insert your picture.
2. Click on the picture button.
3. Browse to the picture on your file system.

Add Picture button

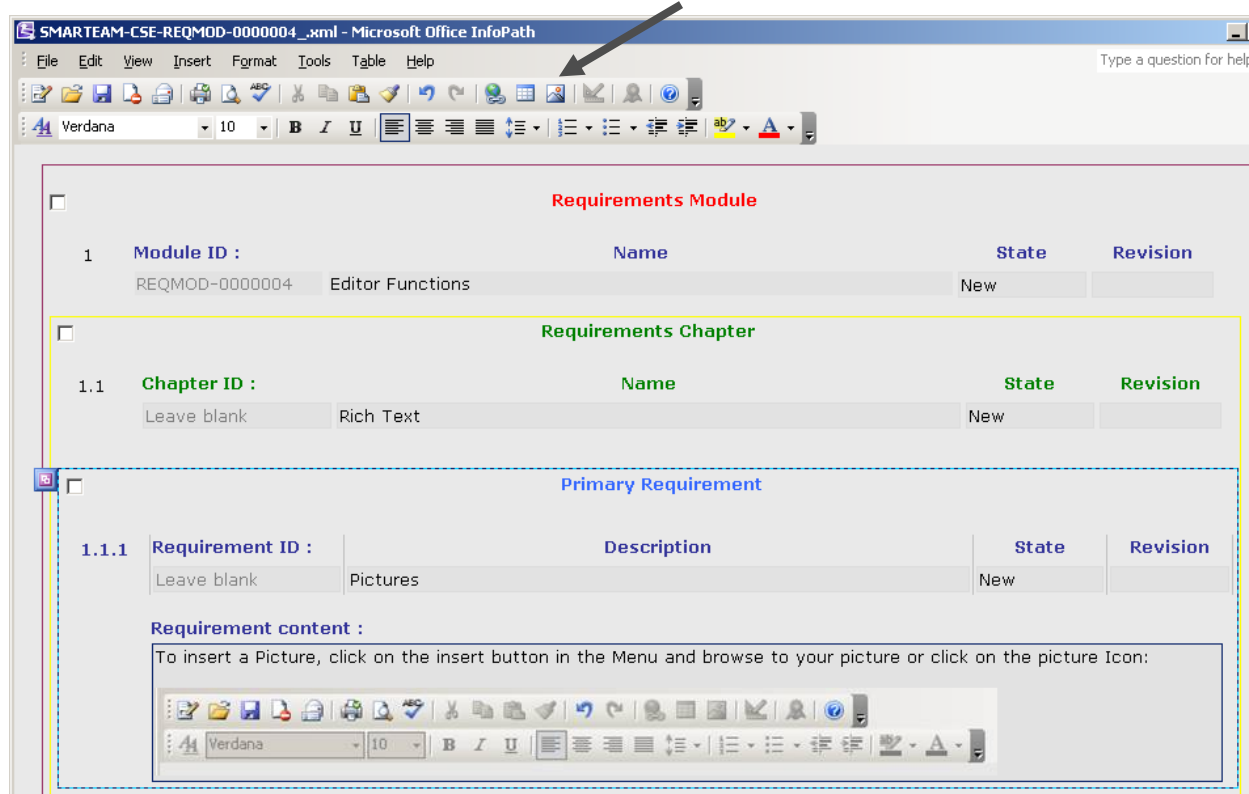


Figure 9: Adding a Picture

In the same way, you can add a Table using the Table button.

Add Table button

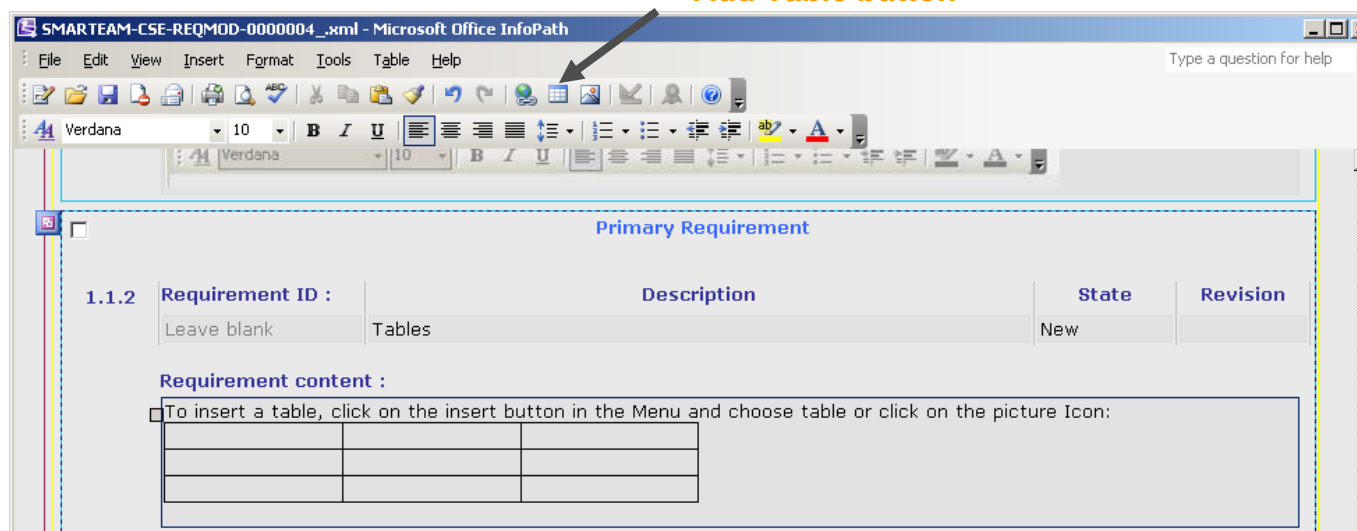
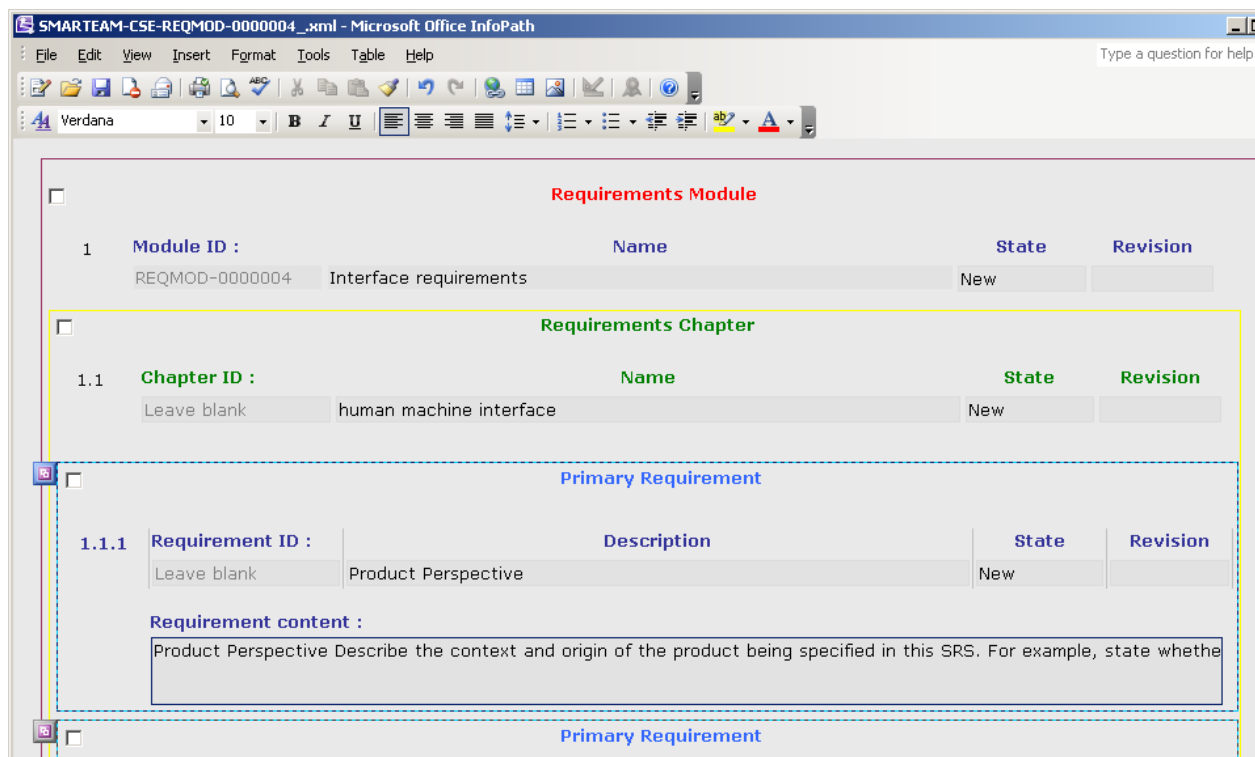


Figure 10: Adding a Table

4.1.1.4. Switch between different views

By default all the CSE forms for requirements tree (chapter and module forms) are composed of two views. A simple view is provided so as to navigate or browse a requirements document very quickly, with the most important attributes displayed, as shown below.



Requirements Module

Module ID :	Name	State	Revision
REQMOD-0000004	Interface requirements	New	

Requirements Chapter

Chapter ID :	Name	State	Revision
Leave blank	human machine interface	New	

Primary Requirement

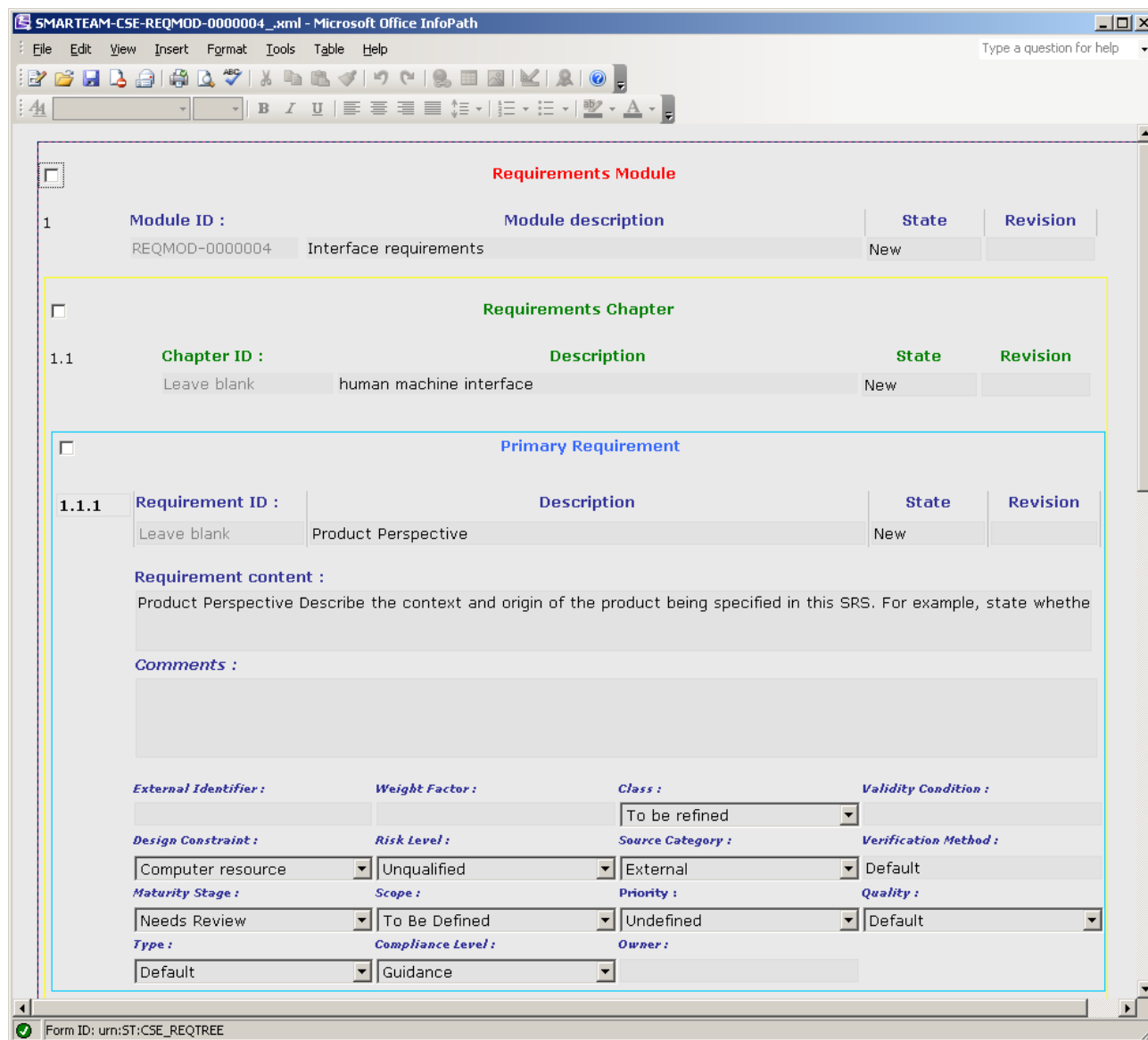
Requirement ID :	Description	State	Revision
Leave blank	Product Perspective	New	

Requirement content :

Product Perspective Describe the context and origin of the product being specified in this SRS. For example, state whether

Figure 11: Module simple view

A more complete view showing more attributes is also provided so as to allow end users engineering requirements within InfoPath.



Requirements Module

Module ID :	Module description	State	Revision
REQMOD-0000004	Interface requirements	New	

Requirements Chapter

Chapter ID :	Description	State	Revision
1.1	human machine interface	New	

Primary Requirement

Requirement ID :	Description	State	Revision
1.1.1	Product Perspective	New	

Requirement content :
Product Perspective Describe the context and origin of the product being specified in this SRS. For example, state whether

Comments :

External Identifier : **Weight Factor :** **Class :** To be refined **Validity Condition :**

Design Constraint : Computer resource **Risk Level :** Unqualified **Source Category :** External **Verification Method :** Default

Maturity Stage : Needs Review **Scope :** To Be Defined **Priority :** Undefined **Quality :** Default

Type : Default **Compliance Level :** Guidance **Owner :**

Figure 12: chapter full view

To switch from a view to the other, select the View menu and select it.

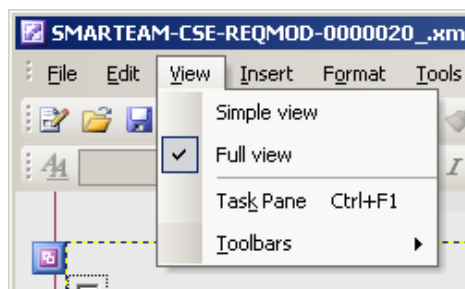


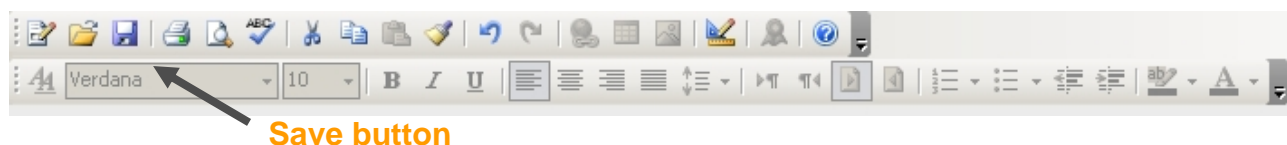
Figure 13: switch menu

The integration with IVVQ tree provides the end user with one full view only.

4.2. Saving in CSE

4.2.1. Function description

To Save your Module in CSE, click on the Save button in InfoPath:



The control will go back to SmarTeam and all your modifications will be saved inside CSE. From an empty module you may get this for example:

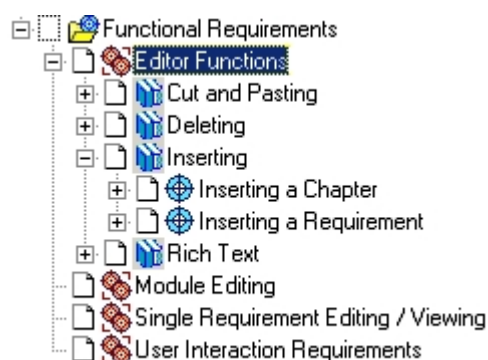


Figure 14: Saved Module in SmarTeam

Some objects (like chapters for example) may be modified or deleted in InfoPath while being Checked-In in SmarTeam. When saving back in CSE, the modification rights are verified by SmarTeam and only allowed modifications are taken into account. If some changes done inside InfoPath are not saved in SmarTeam, a warning will be given.

5. Requirements XML Edition

Requirement management with Requirements XML Edition

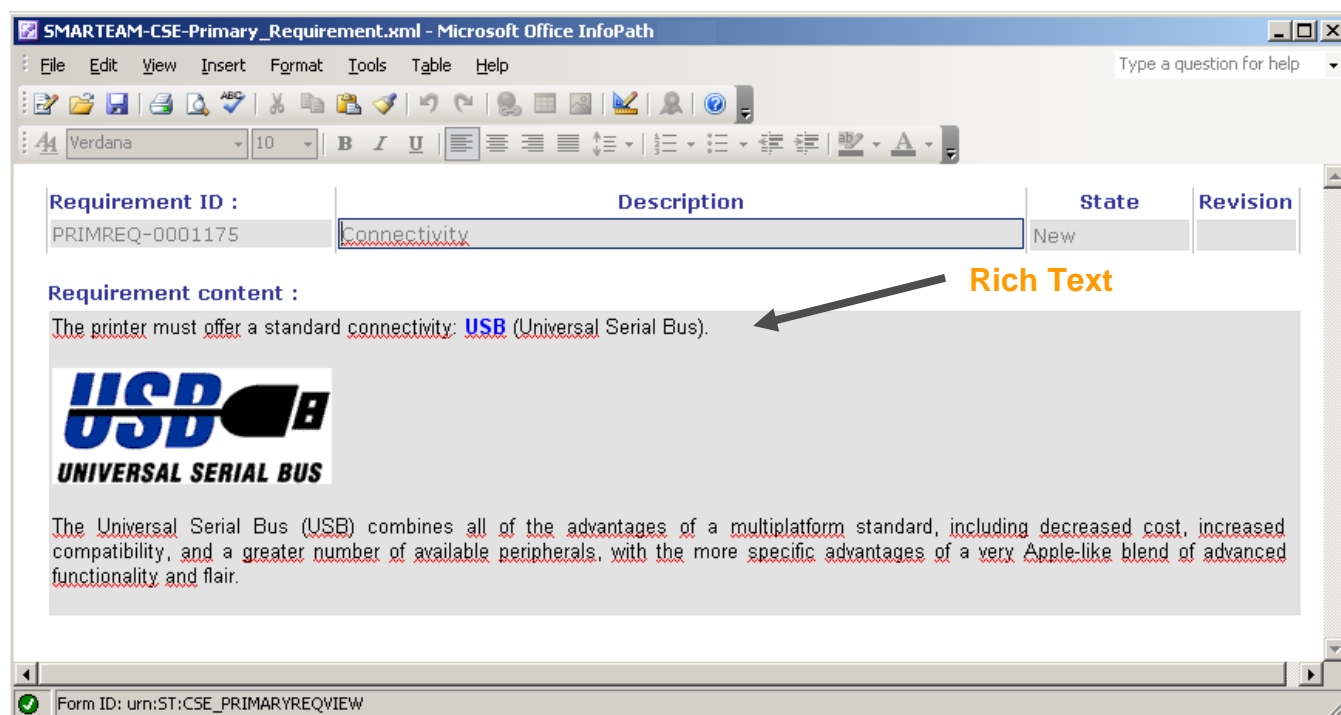
5.1. Rich-Text Requirements

5.1.1. Function description

5.1.1.1. Viewing Rich Text in SmarTeam CSE

A Rich-Text requirement can be totally seen inside SmarTeam.

If your requirement is defined as below in InfoPath




The screenshot shows the Microsoft Office InfoPath application window titled 'SMARTEAM-CSE-Primary_Requirement.xml - Microsoft Office InfoPath'. The window displays a requirement entry with the following details:

Requirement ID :	Description	State	Revision
PRIMREQ-0001175	Connectivity	New	

Below the table, the 'Requirement content :' section displays rich text. An arrow points to the word 'USB' in the text 'The printer must offer a standard connectivity: USB (Universal Serial Bus).', which is labeled 'Rich Text'. The content includes a USB logo and a detailed description of the Universal Serial Bus (USB) standard.

The USB logo is displayed as follows:



UNIVERSAL SERIAL BUS

The Universal Serial Bus (USB) combines all of the advantages of a multiplatform standard, including decreased cost, increased compatibility, and a greater number of available peripherals, with the more specific advantages of a very Apple-like blend of advanced functionality and flair.

The status bar at the bottom of the window shows 'Form ID: urn:ST:CSE_PRIMARYREQVIEW'.

Figure 15: Single Requirement in InfoPath

You will see the following profile card in SmarTeam.

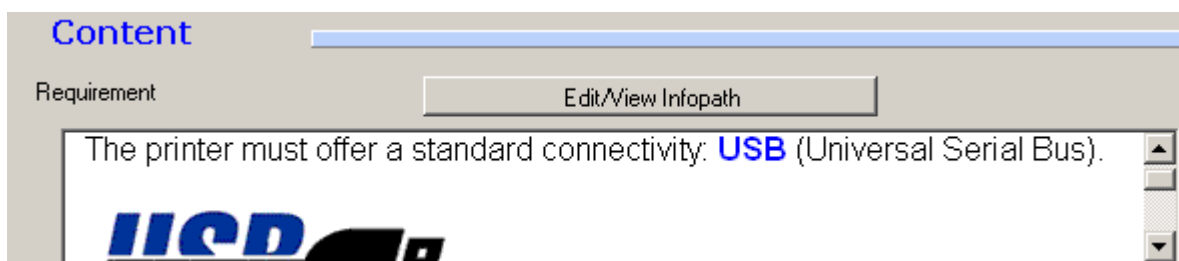


Figure 16: Requirement Content with Table or Picture

5.1.1.2. Editing Rich Text in SmarTeam CSE

You can also edit directly your Rich Text in SmarTeam CSE without sending a whole module or chapter to InfoPath. To be able to edit the requirement content inside the single requirement view, you must first update the requirement in the usual SmarTeam way.

To edit requirement content:

1. Create a new empty requirement or select an existing one.
2. Update the requirement.
3. Click on the “Edit / View” button that opens the single requirement InfoPath form.
4. Update your Rich Text in InfoPath.
5. Click on the save button.
6. Back in SmarTeam click on OK.

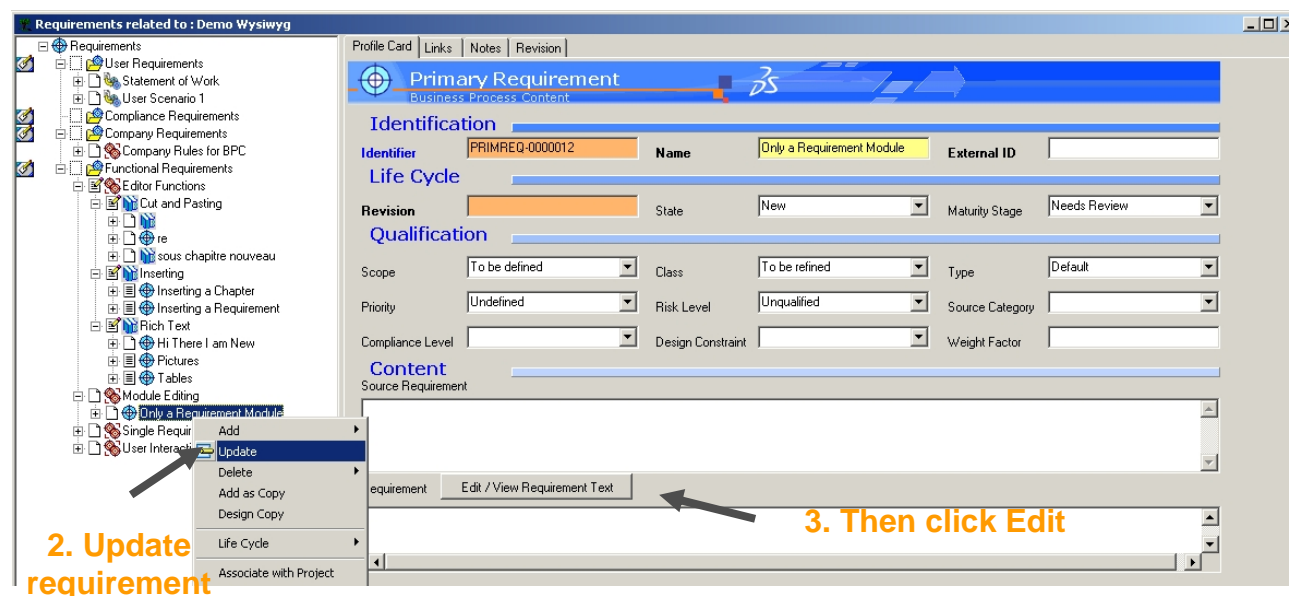


Figure 17: Updating Requirement content from SmarTeam

5. Save

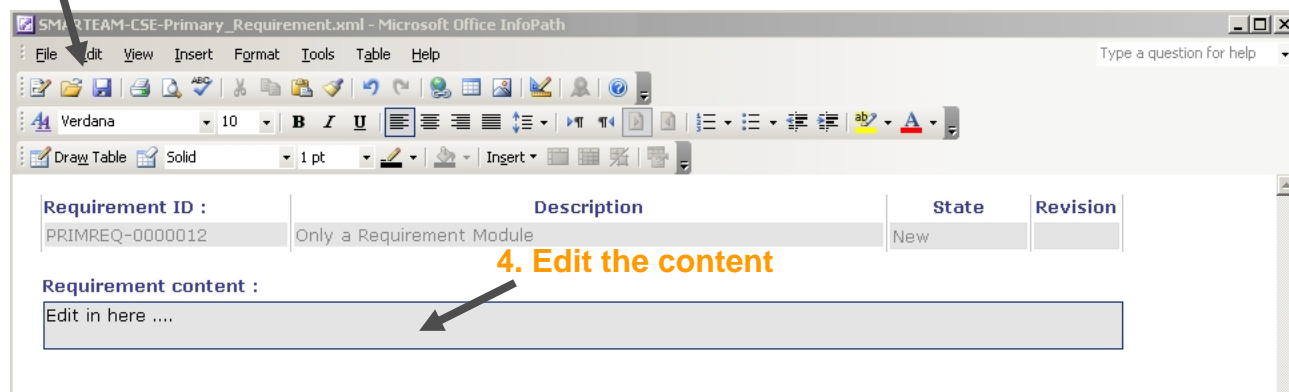


Figure 18: The Edit single requirement form

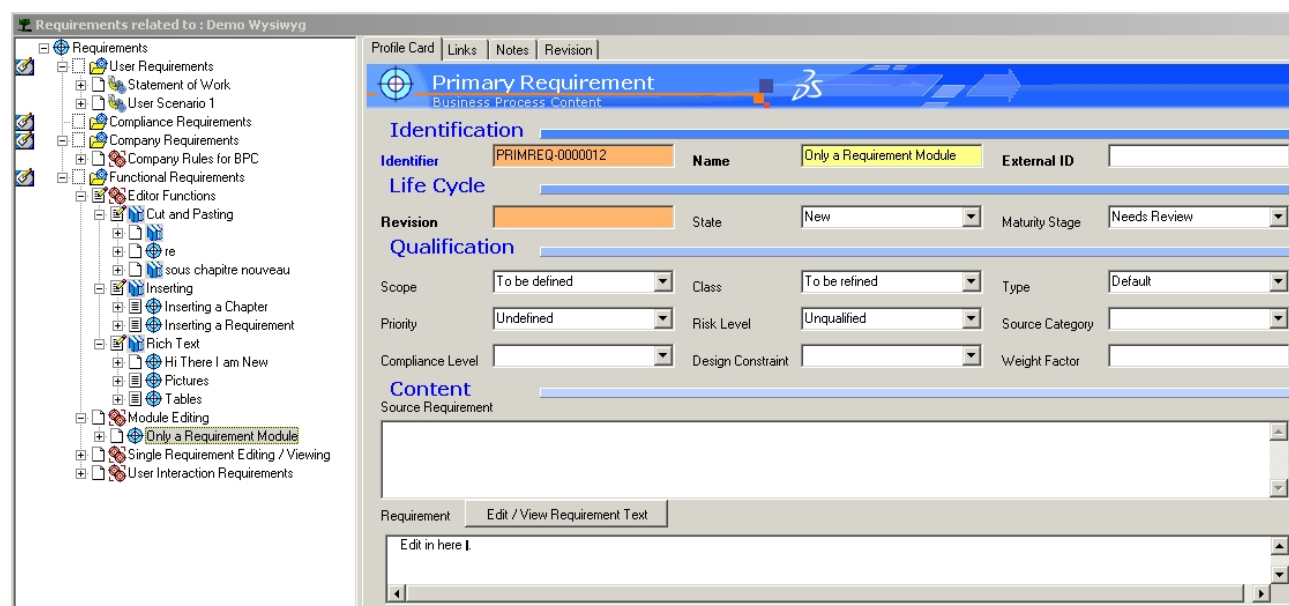


Figure 19: The requirement once edited

5.2. Requirement Life Cycle

5.2.1. Function description

5.2.1.1. Modifying in InfoPath with Module Life Cycle

As usual in CSE, you can check-in or release an object (a chapter, a module) only if its constituents are themselves released or checked-in. The easiest way to work, therefore, with CSE Requirements XML Edition, is to manage a module as a whole:

1. First, you create an empty module and fill it up by the author. You obtain a tree with chapters and requirements all in the new state. If some existing requirements should be used in the module, then they can be simply dragged inside the new module by the author, whatever their state. It is very easy to integrate released client requirements or organization requirements in this way.

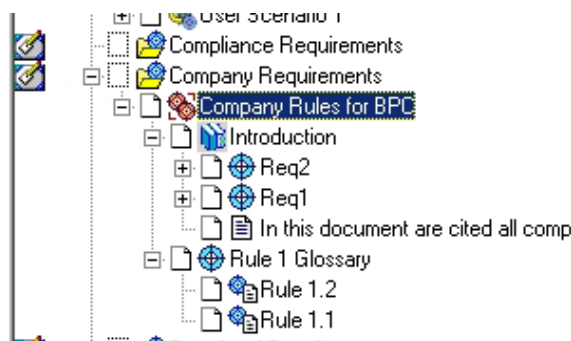


Figure20: New Module

2. When a first version of the module/document is ready to be shared, the author checks-in everything.

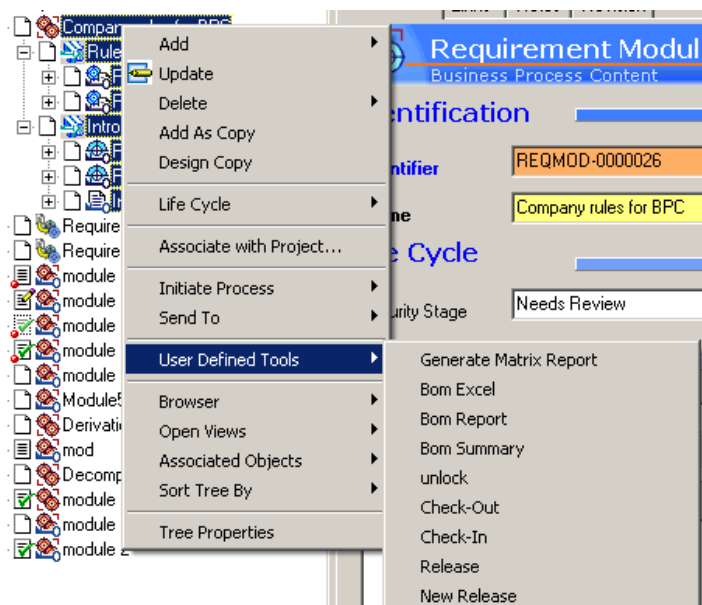


Figure 20: Check-in the Module

3. When the document/module must be re-worked, the whole module is checked-out by its author. When the module is checked-out, all the chapters are automatically checked-out. But the requirements are not checked-out by default. To modify any existing requirement, the author must select the requirements he wants to modify and check it out.

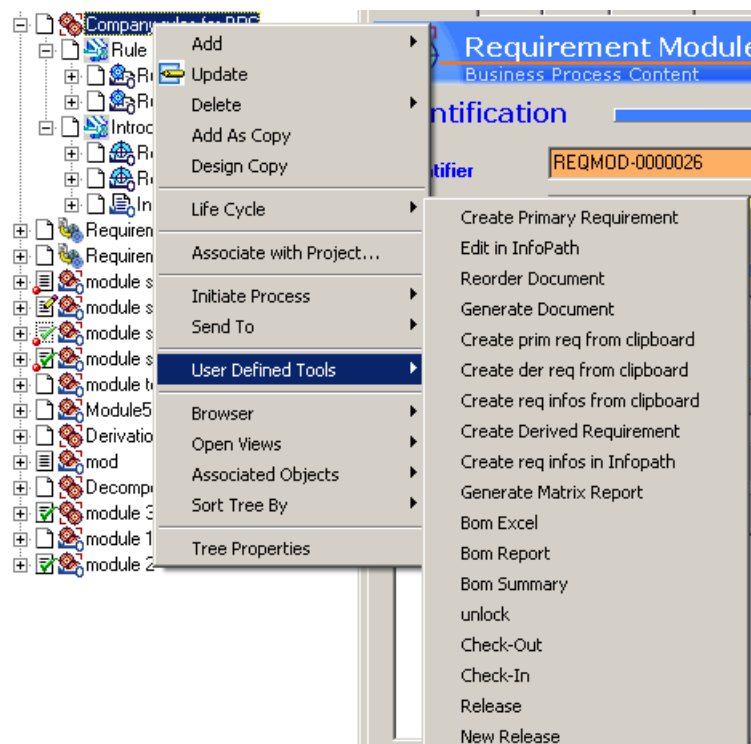


Figure 21: Check out of a module

The result of the check-out is a module where all chapters are checked-out.

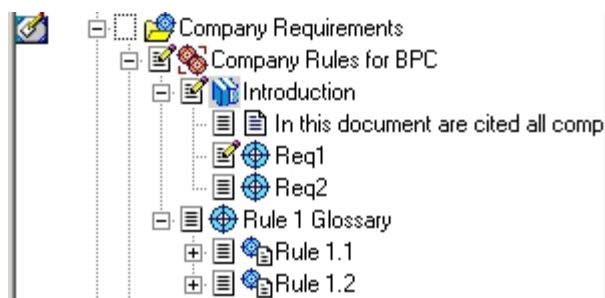
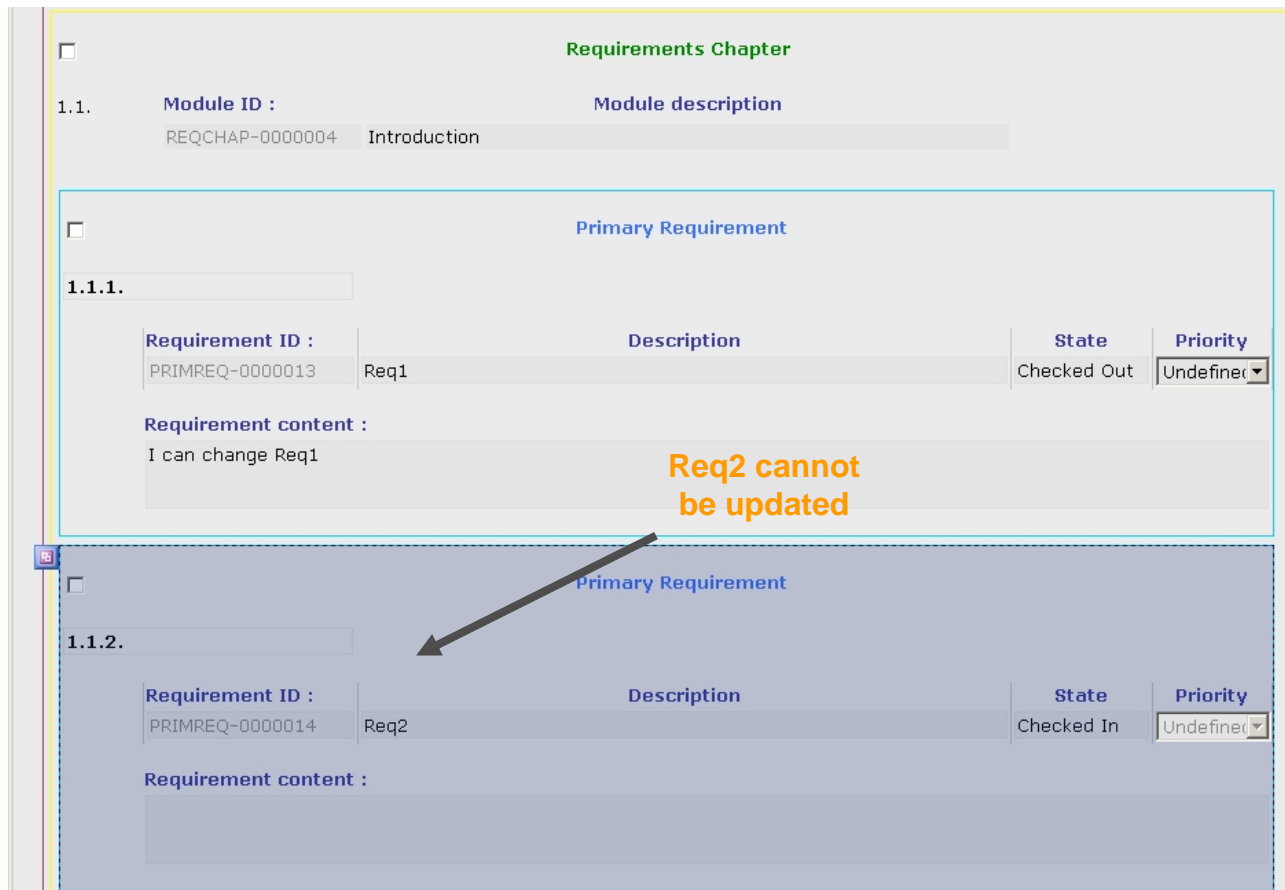


Figure 22: Checked-out Module

When you send the Module to InfoPath, only the checked-out objects are modifiable.



Requirements Chapter

1.1. **Module ID :** REQCHAP-0000004 **Module description:** Introduction

Primary Requirement

1.1.1.

Requirement ID :	Description	State	Priority
PRIMREQ-0000013	Req1	Checked Out	Undefined
Requirement content : I can change Req1			

Req2 cannot be updated

1.1.2.

Requirement ID :	Description	State	Priority
PRIMREQ-0000014	Req2	Checked In	Undefined
Requirement content :			

Figure 23: Edit rights in InfoPath

Requirements XML Edition takes the status of chapters and requirements into consideration. Only new and checked-out objects can be modified inside InfoPath.

- When all modifications in the Module are ready for publication, the author again checks-in (or releases) the whole.

5.2.1.2. Deleting in InfoPath

Deletion of an object is possible in InfoPath only if the object has just been created. Once an object has been saved in SmarTeam CSE, you cannot delete in InfoPath anymore. The author needs to go in SmarTeam and delete the object.