Deployment Package
Software Security Requirements Analysis
Basic Profile + Security

Notes:

The processes described in this Deployment Package are not intended to preclude or discourage the use of additional processes that Very Small Enterprises may find useful.

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Abbreviations/Acronyms

Abre./Acro.	Definition
DP	Deployment Package - a set of artefacts developed to facilitate the implementation of a set of practices, of the selected framework, in a Very Small Entity.
VSE	Very Small Entity – an enterprise, organization, department or project having up to 25 people.
VSEs	Very Small Entities.
CETIC - ETS	Centre d'Excellence en Technologies de l'information et de la Communication – École de Technologie Supérieure.

Table of Contents

1. Technical Description

Purpose of this document

This Deployment Package (DP) supports the Basic Profile as defined in ISO/IEC TR 29110-5-1-2: 2011 Management and Engineering Guide[1]. The Basic Profile is one profile of the Generic profile group. The Generic Profile Group is a collection of four profiles (Entry, Basic Intermediate, Advanced), providing a progressive approach to satisfying a vast majority of VSEs. The Generic profile group is applicable to VSEs that do not develop critical software, commercial off the shelf software products. The Generic profile group does not imply any specific application domain.

A DP is a set of artefacts developed to facilitate the implementation of a set of practices in a Very Small Entity (VSE). A DP is not a process reference model (i.e. it is not prescriptive). The elements of a typical DP are: description of processes, activities, tasks, roles and products, template, checklist, example, reference to standards and models, and tools.

The content of this document is entirely *informative*.

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Why Requirements Management is Important?

Several studies clearly underlined the importance of requirement management in software engineering. Figure 1 illustrates that close to 50% of the software defects are produced during the requirements phase (Selby 2007)[2].

[1] Available at no cost at:
http://standards.iso.org/ittf/PubliclyAvailableStandards/c051153_ISO_IEC_TR_29110-5-1_2011.zip

[2] Selby, P., Selby, R.W., Measurement-Driven Systems Engineering Using Six Sigma Techniques to Improve Software Defect Detection, Proceedings of 17th International Symposium, INCOSE, June 2007, San Diego.

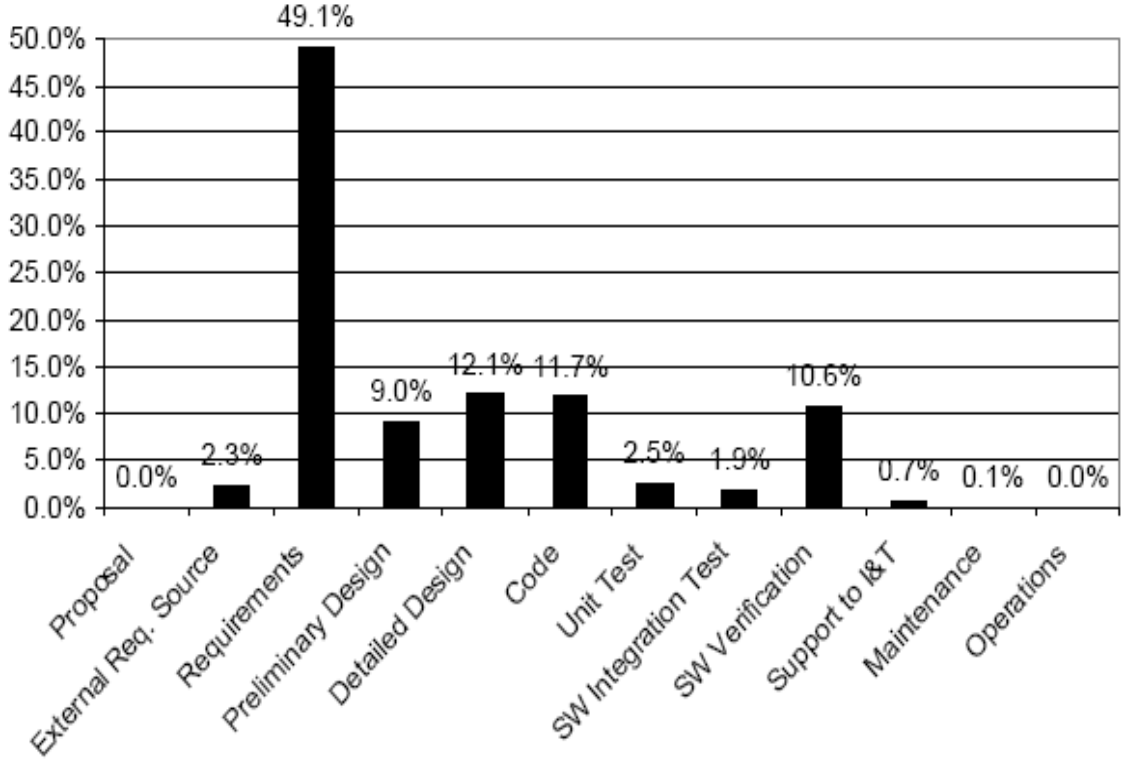


Figure 1 Origins of software defects (Selby 2007)

In IT projects, it is critical to define as unambiguously as possible the customer requirements to ensure a common comprehension of requirements between the stakeholders, and to guarantee that requirements evolution is handled as part of the project.

Requirement's analysis process includes the production and the maintenance of Software Requirements Specifications on the basis of customer demands and changes in these demands. Software Requirements Specifications will then constitute the basis for cost estimate, planning, implementation and tracking of activities throughout the project.

Requirements Management is one of the principal parameters for process stabilization and successful repeatability.

Why Security Requirements are Important?

The Security Requirement help in the identification of the security functionalities of a Software Project. Standard security criteria allow developers to reuse the specification of security controls and best practices rather than building a custom approach to security for each application.

2. Definitions

In this section, the reader will find two sets of definitions. The first set defines the terms used in all Deployment Packages, i.e. generic terms. The second set of terms used in this Deployment package, i.e. specific terms.

Generic Terms

Process: set of interrelated or interacting activities which transform inputs into outputs [ISO/IEC 12207].

Activity: a set of cohesive tasks of a process [ISO/IEC 12207].

Task: required, recommended, or permissible action, intended to contribute to the achievement of one or more outcomes of a process [ISO/IEC 12207].

Sub-Task: When a task is complex, it is divided into sub-tasks.

Step: In a deployment package, a task is decomposed in a sequence of steps.

Role: a defined function to be performed by a project team member, such as testing, filing, inspecting, coding. [ISO/IEC 24765]

Product: piece of information or deliverable that can be produced (not mandatory) by one or several tasks. *(e. g. design document, source code)*.

Artefact: information, which is not listed in ISO/IEC 29110 Part 5, but can help a VSE during the execution of a project.

Specific Terms

Requirement: *1.* a statement that identifies what a product or process must accomplish to produce required behaviour and/or results. *IEEE 1220-2005 IEEE Standard for the Application and Management of the Systems Engineering Process*. 3.1.16. *2.* a system or software requirement that specifies a function that a system/software system or system/software component must be capable of performing. *ISO/IEC 24765, Systems and Software Engineering Vocabulary. 3.* a requirement that specifies a function that a system or system component must be able to perform. [ISO/IEC24765]

Requirements analysis: The process of studying user needs to arrive at a definition of system, hardware, or software requirements. [ISO/IEC 24765]

Requirements document: a document containing any combination of recommendations, requirements or regulations to be met by a software package. [ISO/IEC 24765]

Requirements phase: the period of time in the software life cycle during which the requirements for a software product are defined and documented. [ISO/IEC 24765]

Software Requirements Specifications: The SRS is a specification for a particular software product, program, or set of programs that performs certain functions in a specific environment. The SRS may be written by one or more representatives of the supplier, one or more representatives of the customer, or by both. [IEEE830-98]

The SRS document contains both functional and non functional requirements.

The SRS can be materialized in a word document but it can also be managed in a database or in an Excel file.

Non Functional Requirement: a software requirement that describes not what the software will do but how the software will do it. ISO/IEC 24765, Systems and Software Engineering Vocabulary. Syn. design constraints, non-functional requirement. See also: functional requirement. NOTE for example, software performance requirements, software external interface requirements, software design constraints, and software quality attributes. Non functional requirements are sometimes difficult to test, so they are usually evaluated subjectively. [ISO/IEC24765]

Security Requirement: a security requirement cover functional security and emergent characteristics that ensure that one of many different security properties of software is being satisfied. As OWASP Top Ten Proactive Controls 2018 states that for an application, security requirements offer a foundation of approved security functionality. Standard security criteria allow developers to reuse the specification of security controls and best practices rather than building a custom approach to security for each application. Security issues that have happened in the past can be solved using the same established security requirements. Requirements exist to prevent security failures in the future. [OWASP Top Ten Proactive Controls 2018]

Prototype: ***1.***an experimental model, either functional or non functional, of the system or part of the system. *IEEE 1233, 1998 Edition (R2002) IEEE Guide for Developing System Requirements Specifications.* 3.12. ***2.*** a preliminary type, form, or instance of a system that serves as a model for later stages or for the final, complete version of the system. *ISO/IEC 24765, Systems and Software Engineering Vocabulary.* ***3.*** model or preliminary implementation of a piece of software suitable for the evaluation of system design, performance or production potential, or for the better understanding of the software requirements. *ISO/IEC 15910:1999 Information technology -- Software user documentation process.* 4.41. [ISO/IEC24765]

Traceable*:* having components whose origin can be determined. [ISO/IEC24765]

Traceability matrix: a matrix that records the relationship between two or more products of the development process. [ISO/IEC24765]

3. Relationships with ISO/IEC 29110

This deployment package covers the activities related to requirements analysis of ISO/IEC TR 29110 Part 5-1-2:2011 for Very Small Entities (VSEs) – Generic Profile Group: Basic Profile [ISO/IEC 29110].

In this section, the reader will find a list of applicable Project Management (PM) and Software Implementation (SI) process, activities, tasks and roles from Part 5 are directly related to this topic. This topic is described in details in the next section.

- **Process:**
  - **Project Management**
- **Activities:**
  - **PM.1 Project Planning**
- **Tasks and Roles:**

Tasks	Roles
PM.1.3 Identify the specific Tasks to be performed in order to produce the Deliverables and their Software Components identified in the Statement of Work. Include Tasks in the SI process along with verification, validation and reviews with Customer and Work Team Tasks to assure the quality of work products. Identify the Tasks to perform the Delivery Instructions. Document the Tasks.	PM, TL

- **Process:**
  - **Software Implementation**
- **Activities:**
  - **SI.2 Software requirements analysis**
- **Tasks and Roles:**

Tasks	Roles
SI.2.2 Document or update the *Requirements Specification.* Identify and consult information sources (customer, users, previous systems, documents, etc.) in order to get new requirements. Analyse the identified requirements to determinate the scope and feasibility. Generate or update the *Requirements Specification.*	AN, CUS
SI.2.3 Verification and obtaining approval of the *Requirements Specification.* Verify the correctness and testability of the *Requirements Specification* and its consistency with the *Product Description*. Additionally, review that requirements are complete, unambiguous and not contradictory. The results found are	AN, TL

Tasks	Roles
documented in a *Verification Results* and corrections are made until the document is approved by AN. If significant changes were needed, initiate a *Change Request.*	

4. Description of Processes, Activities, Tasks, Steps, Roles and Products

Process: Project Management

The purpose of the Software Implementation process is the systematic performance of the analysis, design, construction, integration and tests activities for new or modified software products according to the specified requirements.

The Software Requirements Analysis activity analyses the agreed customer's requirements *and establishes the validated project requirements.*

- **Process:**
  - **Project Management**
- **Activities:**
  - **PM.1 Project Planning**
- **Tasks and Roles:**

Tasks	Roles
PM.1.3 Identify the specific Tasks to be performed in order to produce the Deliverables and their Software Components identified in the Statement of Work. Include Tasks in the SI process along with verification, validation and reviews with Customer and Work Team Tasks to assure the quality of work products. Identify the Tasks to perform the Delivery Instructions. Document the Tasks.	PM, TL

Create Quality Gates/Bug Bars

Objectives:	Quality gates and bug bars are used to establish minimum acceptable levels of security and privacy quality.
Rationale:	Defining these criteria at the start of a project improves the understanding of risks associated with security issues and enables teams to identify and fix security bugs during development.
Roles:	PM – Customer
	TL – Technical Leader
	SA – Security Advisor
Artefacts:	Quality Gates/Bug Bars
Steps:	1. Define quality gates for each development phase
	2. Negotiate which quality gates must be integrated and which not
	3. Approve the quality gates negotiated

Step Description:	***Step 1. Define quality gates for each development phase***: A Project team must define quality gates to each development phase of the project (for example, all compiler warnings must be triaged and fixed prior to code check-in). ***Step 2. Negotiate which quality gates must be integrated and which not*** A project team must negotiate quality gates (for example, all compiler warnings must be triaged and fixed prior to code check-in) for each development phase. ***Step 3. Approve the quality gates negotiated*** Have the quality gates approved by the security advisor, who may add project-specific clarifications and more stringent security requirements as appropriate.

Process: Software Implementation

The purpose of the Software Implementation process is the systematic performance of the analysis, design, construction, integration and tests activities for new or modified software products according to the specified requirements.

The Software Requirements Analysis activity analyses the agreed customer's requirements *and establishes the validated project requirements.*

- **Process:**
  - **Software Implementation**
- **Activities:**
  - **SI.2 Software requirements analysis**
- **Tasks and Roles:**

Tasks	Roles
SI.2.2 Document or update the *Requirements Specification.* Identify and consult information sources (customer, users, previous systems, documents, etc.) in order to get new requirements. Analyse the identified requirements to determinate the scope and feasibility. Generate or update the *Requirements Specification.*	AN, CUS
SI.2.3 Verification and obtaining approval of the *Requirements Specification.* Verify the correctness and testability of the *Requirements Specification* and its consistency with the *Product Description*. Additionally, review that requirements are complete, unambiguous and not contradictory. The results found are	AN, TL

Tasks	Roles
documented in a *Verification Results* and corrections are made until the document is approved by AN. If significant changes were needed, initiate a *Change Request.*	

- **Tasks and Roles:**
  - **Security Requirements identification**
  - **Requirements identification**

Requirements identification

Objectives:	The objective of this activity is to clearly define the scope of the project and identify the key requirements of the system.
Rationale:	It is important to clearly define the project scope (boundaries) and to identify key functionalities of the future system with the customer to avoid problems like forgotten key functionalities or requirements creep.
Roles:	CUS – Customer
	AN – Analyst
	TL – Technical Leader
Artefacts:	Use Cases – scenarios
	Requirements Document
Steps:	1. Collect information about the application domain (e.g. finance, medical)
	2. Identify project's scope
	3. Identify and capture requirements
	4. Structure and prioritize requirements
Step Description:	***Step 1. Collect information about the domain***: During this Step, analyst captures the key concepts of the business domain of the customer. The customer assists the analyst by giving him all the information (existing documentation or explanation) that will facilitate this understanding. Key concepts are listed in a glossary section in the *Software Requirements Specification Document outline* document. ***Step 2. Identify project's scope*** Software analyst, helped by the person in charge of the contractual aspects of the project (sales manager) clearly identifies main functionalities that are included in the project scope. *Tips*: Identifying functionalities that are OUT of scope is also very valuable to clarify differences of understanding with your customers.

	Step 3. Identify and capture requirements Having in mind key concepts related to the customer business domain, analyst can start requirements identification. None of the situations in IT projects are identical. In some cases, most of the requirements are already identified in a document (call for tender in case of fixed priced projects). However, in most of the cases, key requirements are just (orally) mentioned by the customer. Analyst must identify and list the key requirements of the system to be built. During this Step, analyst should not start detailing identified requirements. The main goal is to gain a comprehensive view of the system requirements. ***Step 4. Structure and prioritize requirements***: Using requirements identified in the previous Step, the analyst has to organise and structure identified requirements accordingly (e.g. by business processes or by system functions). A priority must be identified by the customer for system key functionalities. Priorities can be stated like • '*High*' – a functionality that *shall be* implemented • 'Medium' - a functionality that *should be* implemented • 'Low' - a functionality that *could be* implemented The output of this Step is a list of requirements that are organized in the *Requirements Document.*

Security Requirements identification

Objectives:	The objective of this activity is to clearly define the scope of the project and identify the key requirements of the system.
Rationale:	It is important to clearly define the project scope (boundaries) and to identify key functionalities of the future system with the customer to avoid problems like forgotten key functionalities or requirements creep.
Roles:	CUS – Customer
	AN – Analyst
	TL – Technical Leader
	SA – Security Advisor
Artefacts:	Use Cases – scenarios
	Abuse/Misuse Cases – scenarios
	Requirements Document
Steps:	5. Collect information about the application domain (e.g. finance, medical)
	6. Identify project's scope

	7. Identify and capture requirements
	8. Structure and prioritize requirements
Step Description:	***Step 1. Collect information about the domain***: During this Step, analyst captures the key concepts of the business domain of the customer. The customer assists the analyst by giving him all the information (existing documentation or explanation) that will facilitate this understanding. Key concepts are listed in a glossary section in the *Software Requirements Specification Document outline* document. ***Step 2. Identify project's scope*** Software analyst, helped by the person in charge of the contractual aspects of the project (sales manager) clearly identifies main functionalities that are included in the project scope. With the help of a Security Advisor, the Software analyst must identify the security requirements (classified as non-functional requirements in some cases) taking in consideration the assets list to protect. *Tips*: Identifying functionalities that are OUT of scope is also very valuable to clarify differences of understanding with your customers. ***Step 3. Identify and capture requirements*** Having in mind key concepts related to the customer business domain, analyst can start requirements identification. None of the situations in IT projects are identical. In some cases, most of the requirements are already identified in a document (call for tender in case of fixed priced projects). However, in most of the cases, key requirements are just (orally) mentioned by the customer. Analyst must identify and list the key requirements of the system to be built. During this Step, analyst should not start detailing identified requirements. The main goal is to gain a comprehensive view of the system requirements. ***Step 4. Structure and prioritize requirements***: Using requirements identified in the previous Step, the analyst has to organise and structure identified requirements accordingly (e.g. by business processes or by system functions). A priority must be identified by the customer for system key functionalities. Priorities can be stated like • '*High*' – a functionality that *shall be* implemented • 'Medium' - a functionality that *should be* implemented • 'Low' - a functionality that *could be* implemented The output of this Step is a list of requirements that are organized in the *Requirements Document.*

Requirements refinement and analysis

Objectives:	The objective of this Step is to detail and analyse all the requirements identified.
Rationale:	It is important to go through identified requirements in order to detect requirements that seem easy to implement but hiding a business complexity that will cause problems in the project.
Roles:	AN – Analyst
	CUS - Customer
	PR - Programmer
Artefacts:	Use Cases – scenarios
	Abuse/Misuse Cases – scenarios
	Requirements Document
	Software prototype
Steps:	1. Detail requirements
	2. Produce a prototype
Step Description:	***Step 1. Detail requirements:*** The analyst goes through a set of identified requirements and performs a more detailed analysis. Business complexity can be implicit for some requirements. This must be clarified at this point before any implementation. The analyst will interact with customer representatives in order to clarify ergonomic question, if relevant (e.g. if a Graphical User Interface must be developed). This Steps results in a new version of the *Software Requirements Specification Document.* ***Step 2. Produce a prototype*** Producing a prototype can facilitate requirement understanding from all project participants (i.e. customer side and development team side). A prototype may only implement some of the functionalities.

Requirements verification & validation

Objectives:	Verify requirements and obtain validation from the customer or his representative.
Rationale:	In order to avoid constant fundamental changes in the requirements, it is important to ask for the requirement validation from the customer.
Roles:	AN – Analyst
	CUS – Customer

	PM - Project Manager
	PR - Programmer
Artefacts:	Requirements Document
	Software prototype
Steps:	1. Clarify fuzzy requirements (verification)
	2. Review software requirements specification
	3. Validate requirements
Description:	***Step 1. Clarify fuzzy requirements:*** Review requirements in order to detect requirements that are not clear enough (customer or software developer could understand it differently). Theses criteria can be used to perform this review: • Clear (avoid ambiguous requirements) • Unique (i.e. avoid two requirements stating the same thing) • Feasible (according project allocated resources) • Testable ***Step 2. Review software requirements specification:*** During this Step requirements are roughly reviewed with the customer in order to be sure that requirements are: • Complete • Correct *Tips*: This Step can be iteratively done by reviewing a given subset of requirements. Software engineers must be involved in order to identify technical dependencies between requirements (i.e. Requirement A must be implemented before requirement B due to implementation reason.) ***Step 3. Validate requirements:*** Obtain from your customer an approval of the requirements (or of a given subset if you are using an iterative lifecycle).

Requirements change management

Objectives:	To manage requirements change according with a process agreed upon with the customer.
Rationale:	Requirements change is a permanent feature of most of the IT projects. Change management must be planned and agreed upon with the customer on the project.
Roles:	AN – Analyst

	PM - Project Manager
	CUS - Customer
Artefacts:	Requirements Document
Steps:	1. Track changes to requirements
	2. Analyse impact of changes
	3. Identify changes that are out of the project scope
	4. Prioritize changes
Description:	***Step 1. Track changes to requirements*** This Step aims to collect and manage in a central repository (can be an excel sheet or any other database) any changes that are formulated against requirements. This encompasses changes to existing requirements but also new or deleted requirements. ***Step 2. Analyse impact of changes*** Identify the impact on the project schedule and cost of each of the requested changes. ***Step 3. Identify changes that are out of the project scope*** Analyst helped by the person in charge of the contractual aspects of the project (sales manager) identifies changes that are out of the project scope. Changes that could impact the project budget should be discussed with the customer. ***Step 4. Prioritize changes*** During this Step, the project manager must obtain from the customer a prioritization of the identified changes in order to adapt the project planning.

Role Description

This is an alphabetical list of the roles, abbreviations and list of competencies as defined in Part 5.

	Role	Abbreviation	Competency
1.	Analyst	AN	Knowledge and experience eliciting, specifying and analyzing the requirements. Knowledge in designing user interfaces and ergonomic criteria. Knowledge of the revision techniques and experience on the software development and maintenance. Knowledge of the editing techniques and experience on the software development and maintenance.
2.	Customer	CUS	Knowledge of the Customer processes, ability to explain the Customer requirements and experience in the application domain. The Customer (representative) must have the authority to approve the requirements and their changes. The Customer includes user representatives in order to ensure that the operational environment is addressed.
3.	Programmer	PR	Knowledge and/or experience in programming, integration and unit tests. Knowledge of the revision techniques and experience on the software development and maintenance. Knowledge of the editing techniques and experience on the software development and maintenance
4.	Project Manager	PM	Leadership capability with experience making decisions, planning, personnel management, delegation and supervision, finances and software development.
5.	Security Advisor	SA	Knowledge to advise the businesses to identify potential security weaknesses, create security policies, and reduce risks to their IT systems.
6.	Technical Leader	TL	Knowledge and experience in the software process domain.
7.	Work Team	WT	Knowledge and experience according to their roles on the project: TL, AN, DES, and/or PR. Knowledge on the standards used by the Client and/or by the VSE.

Product Description

This is an alphabetical list of the input, output and internal process products, its descriptions, possible states and the source of the product.

	Name	Description	Source
1.	Change Request	It may has the following characteristics: Identifies purpose of change Identifies request status (new, accepted, rejected) Identifies requester contact information Impacted system(s) Impact to operations of existing system(s) defined Impact to associated documentation defined Criticality of the request, date needed by The applicable statuses are: initiated, evaluated and accepted.	Software Implementation Customer Project Management

2.	Project Plan	It Includes the following elements which may have the characteristics as follows:
		- Product Description
		  ○ Purpose
		  ○ General Customer requirements
		- Scope description of what is included and what is not
		- Objectives of the project
		- Deliverables - list of products to be delivered to Customer
		- Tasks, including verification, validation and reviews with Customer and Work Team, to assure the quality of work products. Tasks may be represented as a Work Breakdown Structure (WBS). The task also includes the identification of security requirements, list of assets, threats, information security risk and incidents.
		- *Relationship and Dependence of the Tasks*
		- *Estimated Duration* of tasks
		- *Resources* o perform the project both in development and security (humans, materials, equipment and tools) including the required training, and the schedule when the resources are needed.
		- *Composition of Work Team*
		- *Competences pf personal Record*
		- *Role Matrix*
		- *Incidents Response of the project*
		- Schedule of the Project Tasks, the expected start and completion date, for each task.
			Project Management

		- Estimated Effort and Cost
		- Identification of Project Risks
		- Version Control Strategy
		  - Product repository tools or mechanism identified
		  - Location and access mechanisms for the repository specified
		  - Version identification and control defined
		  - Backup and recovery mechanisms defined
		  - Storage, handling and delivery (including archival and retrieval) mechanisms specified
		- Delivery Instructions
		  - Elements required for product release identified (i.e., hardware, software, documentation etc.)
		  - Delivery requirements
		  - Sequential ordering of tasks to be performed
		  - Applicable releases identified
		  - Identifies all delivered software components with version information
		  - Identifies any necessary backup and recovery procedures
		The applicable statuses are: verified, accepted, updated and reviewed.	

3.	Project Repository	It may have the following characteristics: - Stores project work products - Stores released deliverables products - Storage and retrieval capabilities - Ability to browse content - Listing of contents with description of attributes - Sharing and transfer of work products between affected groups - Effective controls over access - Maintain work products descriptions - Recovery of archive versions of work products - Ability to report work products status - Changes to work products are tracked to Change Requests The applicable statuses are: recovered and updated.	Project Management
4.	Requirements Specification	It may have the following characteristics: - Introduction –general description of software and its use within the scope of the	Software Implementation

		customer business;
		
		- Requirements description:
		  - Functionality – established needs to be satisfied by the software when it is used in specific conditions. Functionality must be adequate, accurate and safe.
		
		  - User interface – definition of those user interface characteristics that allow to understand and learn the software easily so the user be able to perform his/her tasks efficiently including the interface exemplar description;
		
		  - External interfaces – definition of interfaces with other software or hardware;
		
		  - Security – specification of the software executionlevel concerning the level of security implemented
		
		  - Reliability – specification of the software execution level concerning the maturity, fault tolerance and recovery;
		
		  - Efficiency – specification of the software execution level concerning the time and use of the resources;
		
		  - Maintenance – description of the elements facilitating the understanding and execution of the future software modifications;
		
		  - Portability – description of the software characteristics that allow its transfer from one place to other;
		
		  - Design and construction limitations/constraints – needs imposed by the customer;
		
		  - Interoperability – capability for two or more systems or software components be able to change information each other and use it.
		
		  - Reusability – feature of any product/sub-product, or a part of it, so that it can be used by several users as	

		an end product, in the own software development, or in the execution of other software products. - Legal and regulative – needs imposed by laws, regulations, etc. Each requirement is identified, unique and it is verifiable or can be assessed. The applicable statuses are: verified, validated and baselined.	
5.	Software User Documentation	It may have the following characteristics: - User procedures for performing specified tasks using the Software - Installation and de-installation procedures - Brief description of the intended use of the Software (the concept of operations) - The supplied and required resources - Needed operational environment - Availability of problem reporting and assistance - Procedures to access and exit the Software - Lists and explains software commands and system-provided messages to the user - As appropriate for the identified risk, it includes warnings, cautions, and notes, with corrections - It includes troubleshooting and error correction procedures. It is written in terms understandable by users. The applicable statuses are: preliminary, verified and baselined.	Software Implementation
6.	Verification Results	It may include the record of: - Participants - Date - Place - Duration - Verification check-list - Passed items of verification - Failed items of verification - Pending items of verification - Defects identified during verification	Project Management Software Implementation
7.	Validation Results	Documents the validation execution, It may include the record of: - Participants - Date - Place - Duration - Validation check-list	Software Implementation

		- Passed items of validation - Failed items of validation - Pending items of validation - Defects identified during validation	

Artefacts Description

This is an alphabetical list of the artifacts that could be produced to facilitate the documentation of a project. The artifacts are not required by Part 5, they are optional.

	Name	Description
1.	Abuse/Misuse Cases - scenarios	Describe the system's behaviour under attack; building abuse cases requires explicit coverage of what should be protected, from whom, and for how long.
2.	Requirements Document	Document in which all identified requirements are centralized. See Software Requirements Specification definition in section 0.
3.	Software prototype	Working piece of software produced during the early phases in order to demonstrate/validate a functionality of a system.
4.	Use Cases – scenarios	Description of a sequence of interactions between the user and the future systems. Uses cases can be written as prescribed by UML but can also be text scenarios.

5. Template

The templates provided with this deployment package should be customized for your project.

SRS Template Table of Content –Basic List of Requirements

To be used in an Excel sheet structured, for example, as:

ID	*Requirement*	*Description*	*Priority*

SRS Template Table of Content –Adapted from IEEE 830

1. Introduction

1.1 Purpose

1.2 Document conventions

1.3 Intended audience

1.4 Additional information

1.5 Contact information/SRS team members

1.6 References

2. Overall Description

2.1 Product perspective

2.2 Product functions

2.3 User classes and characteristics

2.4 Operating environment

2.5 User environment

2.6 Design/implementation constraints

2.7 Assumptions and dependencies

3. External Interface Requirements

3.1 User interfaces

3.2 Hardware interfaces

3.3 Software interfaces

3.4 Communication protocols and interfaces

4. System Features

4.1 System feature A

4.1.1 Description and priority

4.1.2 Action/result

4.1.3 Functional requirements

4.2 System feature B

5. Other Non functional Requirements

5.1 Performance requirements

5.2 Safety requirements

5.3 Security requirements

5.4 Software quality attributes

5.5 Project documentation

5.6 User documentation

6. Other Requirements

Appendix A: Terminology/Glossary/Definitions list

Appendix B: To be determined

SRS Template Table of Content -Construx[3]

[3] www.construx.com

SRS Template Table of Content – Volere[4]

Contents

[4] http://atlsysguild.com/GuildSite/Robs/Template.html

SRS Template Table of Content – Volere Requirement Shell

6. Example of Lifecycle

This section provides some graphical representation of example of requirement practices lifecycle. These examples are provided to help the reader to implement his own requirement lifecycle fitting his IT project's context and constraints.

Example 1 of Requirement Practices Lifecycle

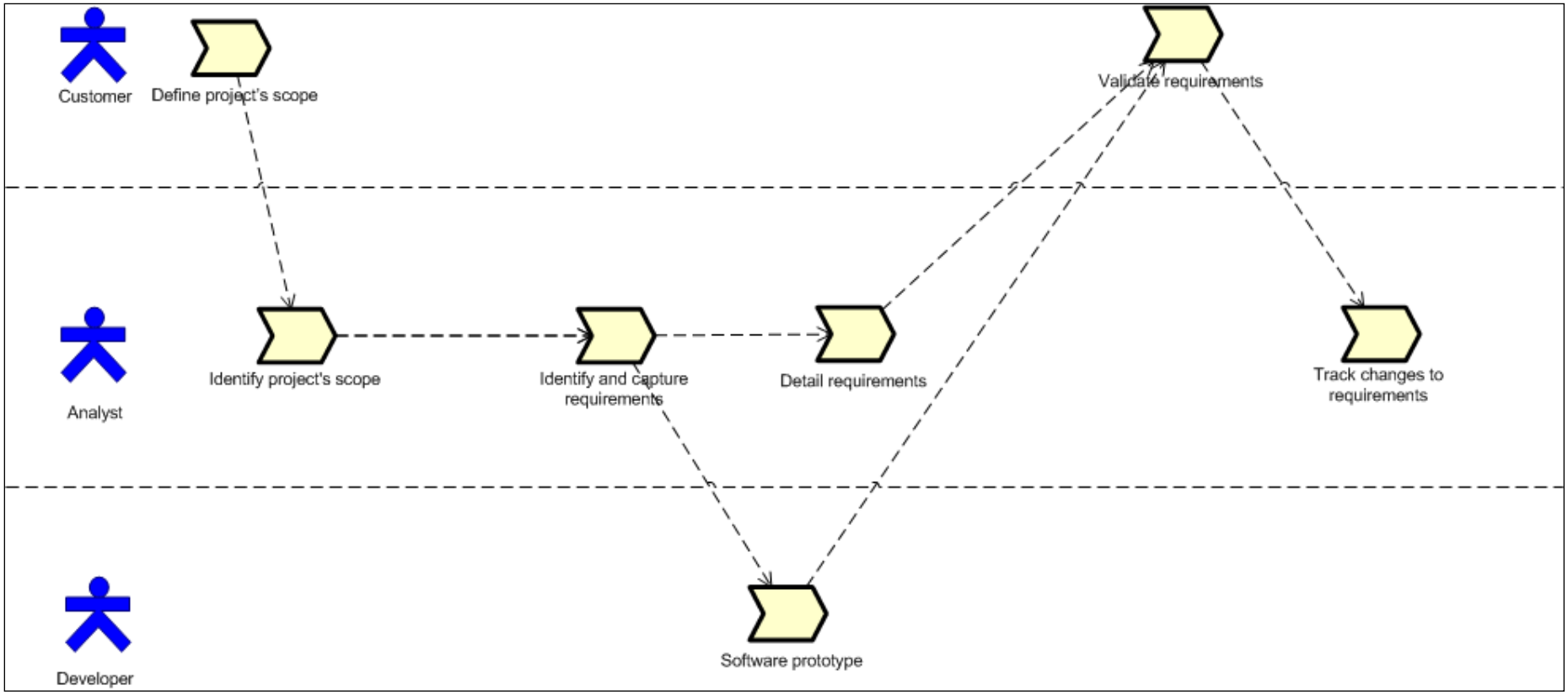


Figure 2 Example 1 of Requirement Practices Lifecycle

Example 2 of Requirement Practices Lifecycle

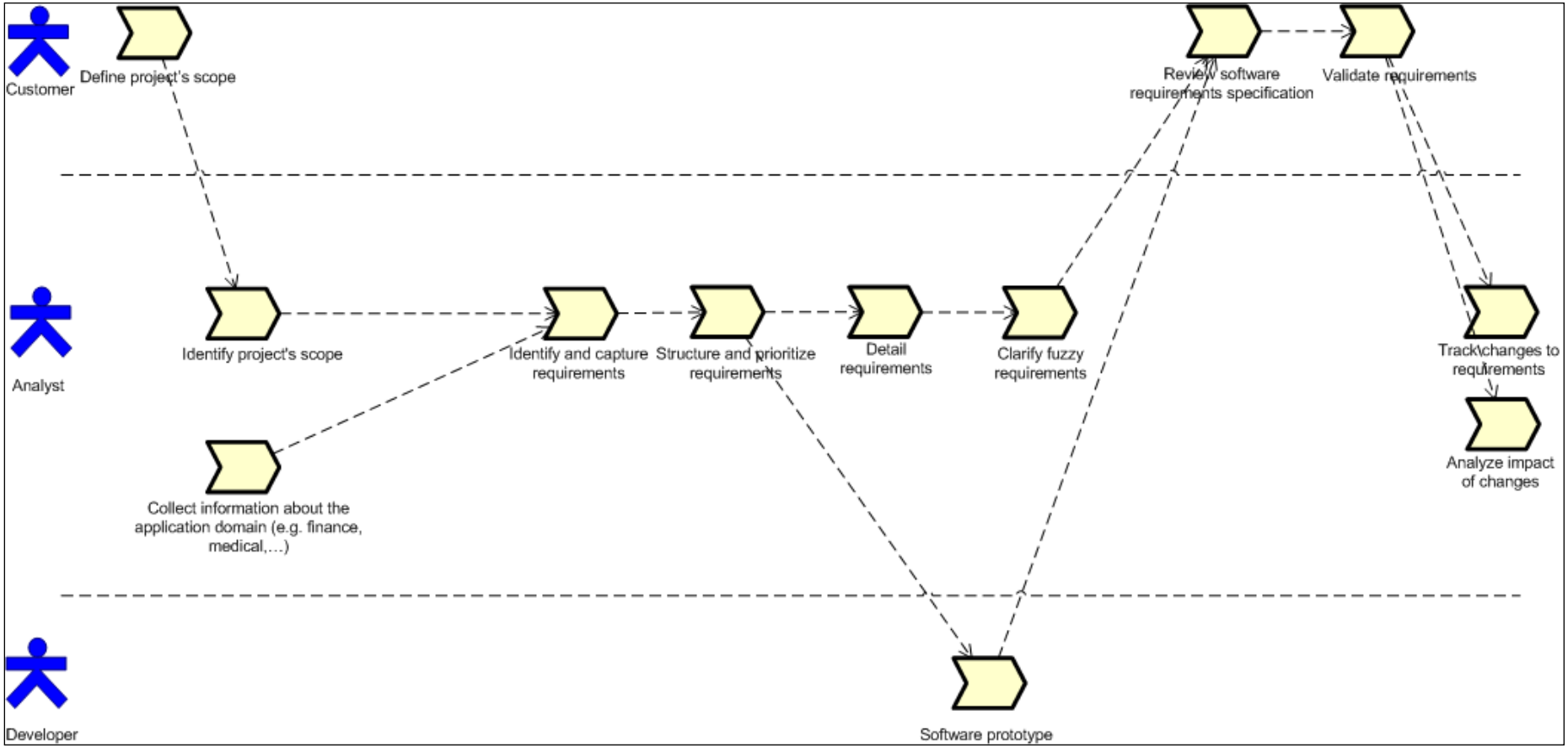
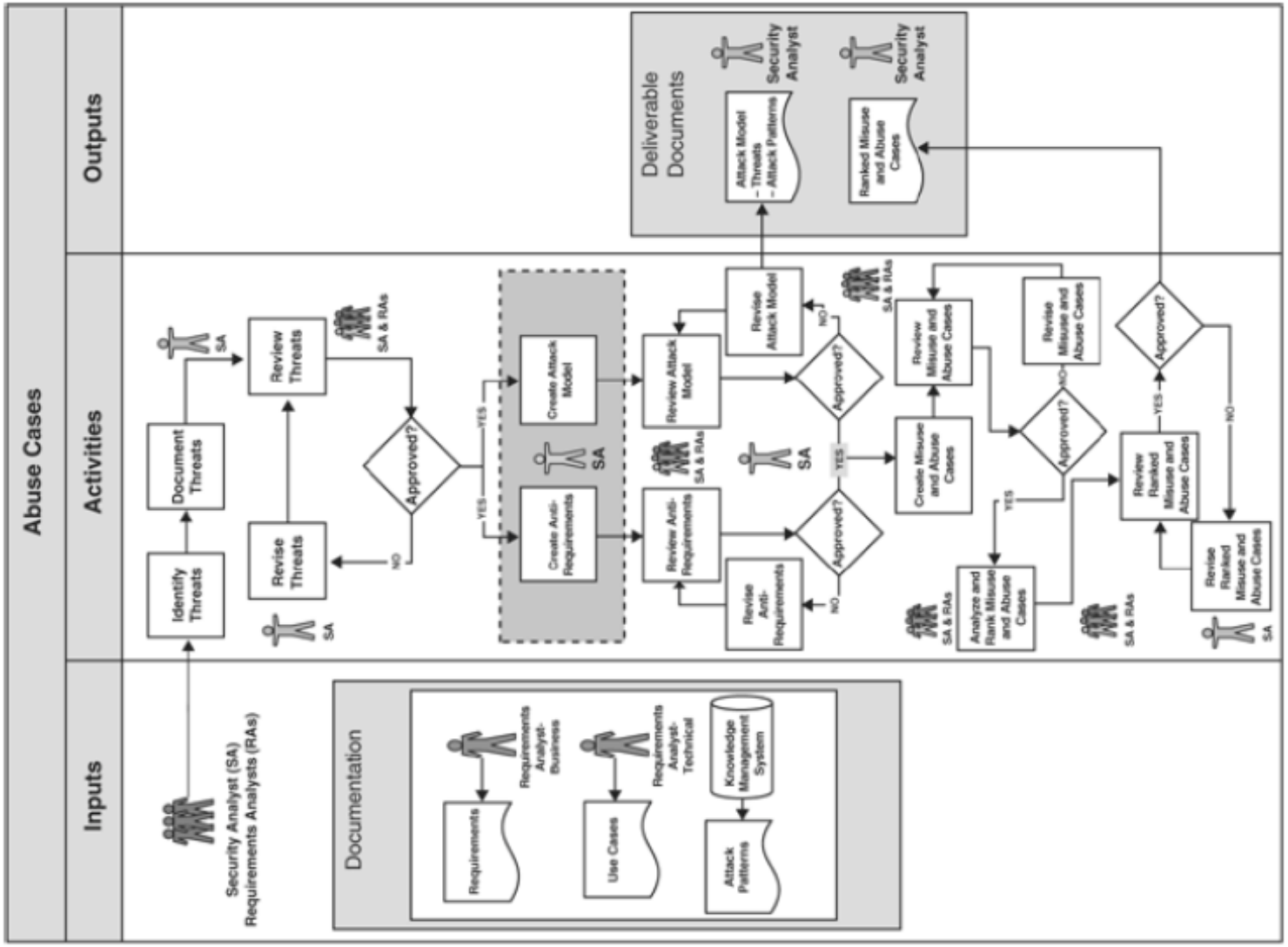


Figure 3 Example 2 of Requirement Practices Lifecycle

Example 1 of Abuse/Misuse Cases



7. Checklist

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Requirement checklist

This Requirement checklist is based on [Constr07]

RS 1 Testable	All requirements are verifiable (objectively)
RS 2 Complete	Are the requirements complete?
RS 3 Traceable	All requirements must be traceable to a systems specification, contractual/proposal clause.
RS 4 Correct	Requirements must be correct (i.e. reflect exactly customer's requirements)
RS 5 Unique	Requirements must be stated only once
RS 6 Elementary	Requirements must be broken into their most elementary form
RS 8 High Level	Requirement must be stated in terms of final need, not perceived means (solutions)
RS 9 Quality	Quality attributes have been defined.
RS 10 Unambiguous	
RS 11 Hardware	Hardware environment is completely defined.
RS 12 Solid	Requirements are a solid base for design

8. Tool

Traceability Tool

- Objectives:
  - To maintain the linkage from the source of each requirement through its decomposition to implementation and test (verification).
  - To ensure that all requirements are addressed and that only what is required is developed.
  - Useful when conducting impact assessments of requirements, design or other configured item changes.

Traceability Matrix

Date (yy-mm-dd): _____

Title of project:_____

	Name (Print)	**Signature**	**Date (yy-mm-dd)**
Verified by:	_____	_____	_____
Approved by:	_____	_____	_____

Identification Number	Text of the need	Text of the requirement	Verification method	Title or ID of Use Case	Title or ID of Code Module	Title or ID of test Procedure	Verification Date	Name of person who performed the verification	Result of verification

Instructions	
The above table should be created in a spreadsheet or database such that it may be easily sorted by each column to achieve bi-directional traceability between columns. The unique identifiers for items should be assigned in a hierarchical outline form such that the lower level (i.e. more detailed) items can be traced to higher items.	
Unique Requirement Identification (ID)	The Unique Requirement ID / System Requirement Statement where the requirement is referenced, and/or the unique identification (ID) for decomposed requirements
Requirement Description	Enter the description of the requirement (e.g., Change Request description).
Design Reference	Enter the paragraph number where the CR is referenced in the design documentation
Module / Configured Item Reference	Enter the unique identifier of the software module or configured item where the design is realized.
Release Reference	Enter the release/build version number where the requirement is fulfilled
Test Script Name/Step Number Reference	Enter the test script name/step number where the requirement is referenced (e.g., Step 1)

Guideline

Requirements traceability should:

- Ensure traceability for each level of decomposition performed on the project. In particular:
  - Ensure that every lower level requirement can be traced to a higher level requirement or original source
  - Ensure that every design, implementation, and test element can be traced to a requirement
  - Ensure that every requirement is represented in design and implementation
  - Ensure that every requirement is represented in testing/verification
- Ensure that traceability is used in conducting impact assessments of requirements changes on project plans, activities and work products
- Be maintained and updated as changes occur.
- Be consulted during the preparation of Impact Assessments for every proposed change to the project
- Be planned for, since maintaining the links/references is a labor intensive process that should be tracked/monitored and should be assigned to a project team member
- Be maintained as an electronic document

9. References to Other Standards and Models

This section provides references of this deployment package to to selected ISO and ISO/IEC Standards and to the Capability Maturity Model Integration[SM] version 1.3 of the Software Engineering Institute, CMMI®[5][CMMI 2010].

Notes:

- This section is provided for information purpose only.
- Only tasks covered by this Deployment Package are listed in each table.
- The tables use the following convention:
  - Full Coverage = F
  - Partial Coverage = P
  - No Coverage = N

Note: Coverage matrices are not completed, they are provided as an example to illustrate how to complete them.

ISO 9001 Reference Matrix

Title of the Task and Step	Coverage F/P/N	Clause of ISO 9001	Comments
Requirements identification Step 1- Collect information about the application domain	P	7.2.1 Determination of requirements related to the product a) requirements specified by the customer, including the requirements for delivery and post-delivery activities	
Requirements identification Step 2 - Identify project's scope	N		
Requirements identification Step 3 -Identify and capture requirements	P	7.2.1 Determination of requirements related to the product b) requirements not stated by the customer but necessary for specified or intended use, where known,	
Requirements identification Step 4-Structure and prioritize requirements	N		

[SM] CMM Integration is a service mark of Carnegie Mellon University.

® Capability Maturity Model, CMMI are registered in the U.S. Patent and Trademark Office by Carnegie Mellon University.

Requirements refinement and analysis Step 1 - Detail requirements	N		
Requirements refinement and analysis Step 2 - Produce a prototype	N		
Requirements verification & validation Step 1 - Clarify fuzzy requirements (verification)	N		
Requirements verification & validation Step 2 - Review software requirements specification	P	7.2.2 Review of requirements related to the product a) product requirements are defined, b) contract or order requirements differing from those previously expressed are resolved, and	
Requirements verification & validation Step 3 - Validate requirements	N		
Requirements change management Step 1 - Track changes to requirements	N		
Requirements change management Step 2 : Analyze impact of changes	N		
Requirements change management Step 3 : Identify changes that are out of the project scope	N		
Requirements change management Step 4 - Prioritize changes	N		

ISO/IEC 12207 Reference Matrix

Title of the Task and Step	Coverage F/P/N	Clause of ISO/IEC 12207	Comments
Requirements identification Step 1 - Collect information about the application domain	F	7.1.2 Software Requirements Analysis Process a) the requirements allocated to the software elements of the system and their interfaces are defined; 6.4.1 Stakeholder Requirements Definition Process 6.4.1.2 Outcomes a) the required characteristics and context of use of services are specified;	
Requirements identification Step 2 - Identify project's scope	F	7.1.2 Software Requirements Analysis Process a) the requirements allocated to the software elements of the system and their interfaces are defined; 6.4.1 Stakeholder Requirements Definition Process 6.4.1.2 Outcomes a) the required characteristics and context of use of services are specified;	
Requirements identification Step 3 -Identify and capture requirements	F	7.1.2 Software Requirements Analysis Process a) the requirements allocated to the software elements of the system and their interfaces are defined; 6.4.1 Stakeholder Requirements Definition Process 6.4.1.2 Outcomes a) the required characteristics and context of use of services are specified;	
Requirements identification Step 4-Structure and prioritize requirements	F	7.1.2 Software Requirements Analysis Process 7.1.2.2 Outcomes e) prioritization for implementing the software requirements is defined;	

Requirements refinement and analysis Step 1 - Detail requirements	F	7.1.2 Software Requirements Analysis Process 7.1.2.2 Outcomes a) the requirements allocated to the software elements of the system and their interfaces are defined;	
Requirements refinement and analysis Step 2 - Produce a prototype	F	6.1.2.3.4.13 j) User involvement; by such means as requirements setting exercises, prototype demonstrations and evaluations.	
Requirements verification & validation Step 1 - Clarify fuzzy requirements (verification)	F	7.2.4.3.2 Verification 7.2.4.3.2.1 Requirements verification. c) The software requirements are consistent, feasible, testable, and accurately reflect system requirements.	
Requirements verification & validation Step 2 - Review software requirements specification	P	7.2.4.3.2 Verification a) The system requirements are consistent, feasible, and testable.	
Requirements verification & validation Step 3 - Validate requirements	F	7.1.2 Software Requirements Analysis Process f) the software requirements are approved and updated as needed; 7.2.5 Software Validation Process The purpose of the Software Validation Process is to confirm that the requirements for a specific intended use of the software work product are fulfilled. e) evidence is provided that the software work products as developed are suitable for their intended use; and 7.2.5.3.2.4 Validate that the software product satisfies its intended use	
Requirements change management Step 1 - Track changes to requirements	P	7.2.4 Software Verification Process d) defects are identified and recorded; and 7.2.5 Software Validation Process d) problems are identified and recorded;	

Requirements change management Step 2 : Analyze impact of changes	F	7.1.2 Software Requirements Analysis Process 7.1.2.2 Outcomes c) the impact of software requirements on the operating environment are understood; g) changes to the software requirements are evaluated for cost, schedule and technical impact; and	
Requirements change management Step 3 : Identify changes that are out of the project scope	N		
Requirements change management Step 4 - Prioritize changes	N		

CMMI for Development V 1.3 Reference Matrix

Title of the Task and Step	**Coverage F/P/N**	**Objective/ Practice of CMMI V1.2**	**Comments**
Requirements identification Step 1 - Collect information about the application domain	F	SG1.Developing customer requirements SP 1.1 Obtaining and expressed needs	
Requirements identification Step 2 - Identify project's scope	F	SG1.Developing customer requirements SP 1.1 Obtaining and expressed needs	
Requirements identification Step 3 -Identify and capture requirements	F	SG1.Developing customer requirements SP 1.1 Obtaining and expressed needs	
Requirements identification Step 4-Structure and prioritize requirements	N		
Requirements refinement and analysis Step 1 - Detail requirements	P	SP 1.2 Develop Customer Requirements SP 3.3 Analysis Requirements	

Requirements refinement and analysis Step 2 - Produce a prototype	F	SP 3.4 Analyzing the requirements for securing the balance Make use of proven models, simulations and prototypes to analyze the balance of needs and constraints of stakeholders.	
Requirements verification & validation Step 1 - Clarify fuzzy requirements (verification)	P	SP3.3 Analysis Requirements 3. Analyze requirements to ensure they are complete, feasible, feasible and verifiable.	
Requirements verification & validation Step 2 - Review software requirements specification	F	SP 3.5 Submit Requirements 2. Check if the requirements are adequate and comprehensive development of Product representations (prototypes, simulations, models, scenarios and storyboards) and by collecting feedback from stakeholders concerned.	
Requirements verification & validation Step 3 - Validate requirements	F	SP 3.5 Submit Requirements	
Requirements change management Step 1 - Track changes to requirements	F	SP 1.3 Managing The Changes To Requirements	
Requirements change management Step 2 : Analyze impact of changes	F	SP 1.3 Managing The Changes To Requirements 3. Assess the impact of modification requirements in terms of stakeholders.	
Requirements change management Step 3 : Identify changes that are out of the project scope	N		
Requirements change management Step 4 - Prioritize changes	N		

10. References

Key	Reference
[ISO/IEC 29110]	ISO/IEC TR 29110-5-1-2:2011, Software Engineering — Lifecycle Profiles for Very Small Entities (VSEs) — Part 5-1-2: Management and Engineering Guide: Generic Profile group: Basic Profile. International Organization for Standardization/International Electrotechnical Commission: Geneva, Switzerland. Available at no cost at: http://standards.iso.org/ittf/PubliclyAvailableStandards/c051153_ISO_IEC_TR_29110-5-1_2011.zip
[OWPL-EN]	Renault A., Habra N., Alexandre S., Deprez J.-C., OWPL. Software Process Improvement for VSE, SME and low maturity enterprises. Version 1.2.2, FUNDP-CETIC, 2000. (http://www.cetic.be/internal393.html)
[CMMI 2010]	CMMI® for Development, Version 1.3, CMU/SEI-2010-TR-033, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA, 2010.
[IEEE830-98]	IEEE Std 830-1998, IEEE Recommended Practice for Software Requirements Specifications, IEEE, 1998.
[ISO/IEC12119]	ISO/IEC 12119:1994 Information technology – Software packages -- Quality requirements and testing. International Organization for Standardization/International Electrotechnical Commission: Geneva, Switzerland.
[ISO/IEC12207]	ISO/IEC 12207:2008 Systems and software engineering - Software life cycle processes. International Organization for Standardization/International Electrotechnical Commission: Geneva, Switzerland.
[ISO/IEC24765]	ISO/IEC 24765:2010, Systems and Software Engineering Vocabulary. International Organization for Standardization/International Electrotechnical Commission: Geneva, Switzerland.
[ConstSoft02]	Construx Software – Checklist for Software Requirements Specifications, 2002.
[SELB07]	Selby, P., Selby, R.W., Measurement-Driven Systems Engineering Using Six Sigma Techniques to Improve Software Defect Detection, Proceedings of 17th International Symposium, INCOSE, June 2007, San Diego.
[STAN02]	Standish Group – Chaos report 2002.
[SPEM05]	Software Process Engineering Metamodel Specification, OMG, 2005.
[VOLE07]	Volere, Requirements Resources - http://www.volere.co.uk
[OWASP Top Ten Proactive Controls 2018]	OWASP Top Ten Proactive Controls 2018, https://owasp.org/www-project-proactive-controls/v3/en/c1-security-requirements

11. Evaluation Form

Deployment Package – Software Requirements Analysis – Version 1.3 Your feedback will allow us to improve this package, your comments and suggestions are welcomed
1. How satisfied are you with the CONTENT of this deployment package? ☐ *Very Satisfied* ☐ *Satisfied* ☐ *Neither Satisfied nor Dissatisfied* ☐ *Dissatisfied* ☐ *Very Dissatisfied*
2. The sequence in which the topics are discussed, are logical and easy to follow? ☐ *Very Satisfied* ☐ *Satisfied* ☐ *Neither Satisfied nor Dissatisfied* ☐ *Dissatisfied* ☐ *Very Dissatisfied*
3. How satisfied were you with the APPEARANCE/FORMAT of this deployment package? ☐ *Very Satisfied* ☐ *Satisfied* ☐ *Neither Satisfied nor Dissatisfied* ☐ *Dissatisfied* ☐ *Very Dissatisfied*
4. Have any unnecessary topics been included? (please describe)
5. What missing topic would you like to see in this package? (please describe)
6. Any error in this deployment package?
7. **Other feedback or comments:**
8. Would you recommend this Deployment package to a colleague from another VSE? ☐ *Definitely* ☐ *Probably* ☐ *Not Sure* ☐ *Probably Not* ☐ *Definitely Not*

Optional

- Name: _____
- e-mail address : _____

Email this form to : simon.alexandre@cetic.be or: claude.y.laporte@etsmtl.ca or Avumex2003@yahoo.com.mx