System Requirements Analysis

**Change History**

| **Version** | **Date** | **Change Description / Reason** | **Author** |
| --- | --- | --- | --- |
| 1.0 | 2017-12-08 | Initial version based on Hella Process (State Avenue)  Decision 1(Sys. Req. Spec. accepted?) and  Task 5(Raise common understanding) are merged with Task 4(Review Sys. Req. Spec.). | Hae-Min, Woo |
|  |  |  |  |
|  |  |  |  |

**Table of Contents**

[1. Purpose Description 4](#_Toc500323956)

[1.1 Purpose 4](#_Toc500323957)

[1.2 Main Description 4](#_Toc500323958)

[1.3 Result of Process 4](#_Toc500323959)

[2. Major Roles Acting in this Process 4](#_Toc500323960)

[3. Process 5](#_Toc500323961)

[3.1 Process Input – Output Definition 5](#_Toc500323962)

[3.2 Introducing Aspects 5](#_Toc500323963)

[3.3 Process Flow Chart 5](#_Toc500323964)

[3.3.1 Task 1: Identify all internal requirements 6](#_Toc500323965)

[3.3.2 Task 2: Create/update System Requirements Specification 7](#_Toc500323966)

[3.3.3 Task 3: Refine functional safety requirements 8](#_Toc500323967)

[3.3.4 Task 4: Review System Requirements Specification and depending documents 9](#_Toc500323968)

[3.3.5 Task 5: Create baseline of System Requirements Specification 10](#_Toc500323969)

[3.3.6 Task 6: Inform the customer about the last version of baselined requirements 10](#_Toc500323970)

[4. Changes, References, Appendix, Terms 11](#_Toc500323971)

[4.1 References 11](#_Toc500323972)

[4.2 Template 11](#_Toc500323973)

# Purpose Description

## Purpose

The purpose of the System requirements analysis process is to perform a system analysis on the defined customer requirements in order to create a set of desired system requirements that are the basis for the design of the system.

## Main Description

Within this process the System Analyst assures the availability and completeness of system relevant requirements (customer requirements, requirements from other stakeholders defined in Project Plan and cross-project requirements like law, standards, norms, regulations, etc.). On the requirements a system analysis will be performed. They will be refined, clarified and categorized to create a system requirement specification. In case of deviations to customer requirements these deviations are analyzed and reported to the project manager. In case of safety relevant projects, the process involves the safety manager to identify safety relevant system requirements.

## Result of Process

As a result of the successful implementation of this process:

* The customer and internal requirements are identified, analyzed and documented as system requirements.
* The system requirements are categorized and analyzed for correctness and testability.
* A system analysis is performed
* The impact of the system requirements on the operating environment is evaluated.
* A prioritization for implementing the system requirements is defined.
* The system requirements are accepted by the project / stakeholders.
* The system requirements are traceable to the customer and MHE internal requirements.
* Changes to the customer’s requirements baseline are evaluated for cost, schedule and technical impact.
* The system requirements are baselined and communicated to all affected parties.
* A Requirements Engineering Plan where the procedure of Requirements handling in the project is documented.

The identification of customer requirements is not aim of this procedure; this will be handled in the Requirements Elicitation (MHE-PE-21) procedure.

# Major Roles Acting in this Process

|  |  |
| --- | --- |
| **Role** | **Contribution and Responsibilities** |
| Project Manager | Raise common understanding between customer and MHE of all system requirements, Inform the customer about baselined system requirements |
| System Analyst | Identify all internal requirements, Create/update System Requirements Specification, Review System Requirements Specification, Trigger Baseline Creation |
| Safety Manager | Identify safety relevant system requirements, |

# Process

## Process Input – Output Definition

The following process input is required:

|  |  |
| --- | --- |
| **Process input** | **From supplier** |
| Customer Requirements Specification\* | Project Manager |

\* only accepted requirements are supposed to be processed

The following process output is produced:

|  |  |
| --- | --- |
| **Process output** | **To customer** |
| System Requirements Specification | System Architect, Software Analyst, Hardware Analyst, Test Manager |
| Communication Record | Project Manager |
| Review protocols | Project Manager |

All process outputs are subject to configuration and change management (MHE-PE-09, MHE-PE-10)

## Introducing Aspects

The following process can be performed iteratively.

## Process Flow Chart

This Process starts after end of Process “Requirements Elicitation” MHE-PE-21, using the documents “Customer Requirements Specification” and “Project Plan”.



### Task 1: Identify all internal requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements Specification | | | | | |
| Output | | MHE internal Requirements (collection of different documents containing requirements) | | | | | |
| D: |  | E: | System Analyst | S: | Core Team | I: | Project Manager  Safety Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective of this task is to get an overview about all requirements from all defined sources needed to create a system requirements specification. (Sources of internal requirements are the core team and additional stakeholders. To identify all requirements the identification of all stakeholders is necessary. If new stakeholders are identified, the System Analyst has to ensure that the list of stakeholders is updated in the project Plan.) It assures the transformation of all requirements into a format suitable to support the creation of System Requirements Specification. In addition the time to perform the analysis is estimated with respect to missing and incomplete input.

Note: The Stakeholders are identified in Process MHE-PE-05 “Project Management of Product-related Software and Hardware”, Task 2

**Description**

The System Analyst

* setup the Requirements Engineering Plan
* identifies all sources of requirements and document this list of sources in Project Plan.
* collects, understands and consolidates all input requirements which have to be satisfied by System Requirements
* requests additional requirements from all stakeholders named in Project Plan
* close gaps in available requirements and reports remaining gaps

### Task 2: Create/update System Requirements Specification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements Specification (baselined)  MHE internal requirements | | | | | |
| Output | | System Requirements Specification (including system interfaces) | | | | | |
| D: |  | E: | System Analyst | S: | System Architect  System Tester  Hardware Analyst  Software Analyst  Safety Manager  Construction(\*) | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

(\*) This is no role in this procedure. Nevertheless the experience of a member of this system development phase is needed.

**Objective**

The objective of this task is to develop a System Requirements Specification.

For this purpose the only accepted customer requirements will be structured, analyzed and transformed into system requirements regarding

* Categorization  
  - Functional requirements / Non-functional requirements with effect on product/ Non-functional requirements without effect on product  
  - Application parameter  
  - Testability depending on verification criterion for each requirement  
  - Interface relevance  
  - Internal / external  
  - Functional architecture  
  - Priority of requirements  
   √ according to development cycle (A-Sample, B-Sample, C-Sample, Final Release)  
   √ functional importance  
  - other categories as defined in project Plan
* Classification  
  - Risk  
  - Technical feasibility  
  - Safety level (in case of ASIL classified Systems)  
  - other classifications as defined in project Plan
* Traceability to and from Customer Requirements Specification
* Deviations from Customer Requirements Specification
* Impact on operation environment
* Alignment to Release Plan

**Description**

The System Analyst

* develops work product “System Requirements Specification” using the corresponding template and following the tailoring decisions made in Project Plan
* develops the work products “Communication record”\*, “Application parameter”\*, “Traceability record”\*
* defines system interfaces
* carries out the system analysis
* completes the transformation of customer requirements into system technical requirements
* reports any customer Requirements which can not be fulfilled
* closes gaps in System Requirements Specification and reports remaining gaps
* defines and document in “System Requirements Specification” whether on board programming is required or not.

(\*) Some of this may be performed automatically by the used tools.

### Task 3: Refine functional safety requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements Specification (baselined)  System Requirements Specification | | | | | |
| Output | | System Requirements Specification (updated with functional safety requirements) | | | | | |
| D: |  | E: | Safety Manager | S: | System Analyst | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective of the task is to analyze and detail the functional safety requirements given in the Customer Requirements Specification.

Remark:

It might be necessary to create a MHE internal functional safety concept in case a functional decomposition is required. (i. e. MHEs order is to deliver a complete subsystem)

Only with a complete overview about safety aspects the project planning can be validated.

**Description**

Complete view of safety goals (and functional safety requirements derived from MHE internal safety concept) and related attributes shall be available in the System Requirements Specification.

Safety relevant requirements will be marked in System Requirements Specification.

The Safety Manager is responsible for marking safety relevant requirements (only the Safety Manager should be able to). The Safety Manager is responsible for the traceability from the safety relevant System Requirements to the safety relevant Customer Requirements. The Safety Manager is responsible for coordination of Functional Safety requirements with release planning.

### Task 4: Review System Requirements Specification and depending documents

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | System Requirements Specification (including system interfaces) | | | | | |
| Output | | Review protocol including Checklist for System Requirements Specification  Note: Review organization is detailed in Review Process (Development reviews of Product-related software and hardware). | | | | | |
| D: |  | E: | System Analyst | S: | Project Manager  System Architect  System Tester  Hardware Analyst  Software Analyst  Safety Manager  Quality Manager | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective of this task is to verify “System Requirements Specification” and all depending documents for completeness, external and internal consistency and traceability.

At the end of this verification task the report about missing, incomplete or not accepted requirements is updated.

**Description**

The System Analyst organizes reviews with all necessary stakeholders. Especially the coordination with Safety Manager has to be kept in mind. The verification covers the review of requirement updates out of Task 2 and Task 3.

All results are communicated to the corresponding roles.

The Project Manager has to be informed about effects in schedule, cost, priority and risk.

The Quality Manager has to be informed about effects in schedule, risk and quality.

The System Tester has to be informed about effects in technical feasibility, testability, priority.

At the end of this task the report about missing, incomplete or not accepted requirements and depending risks is updated.

### Task 5: Create baseline of System Requirements Specification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | System Requirements Specification (including system interfaces)  Functional Safety Concept (In case of Non - ASIL Projects this Work Product can be skipped)  Review Protocol including Checklist for System Requirements Specification | | | | | |
| Output | | Communication Record (Examples are E-Mail, Topic in Core Team Meeting, Meeting Minutes …)  Baselined Versions of all input documents | | | | | |
| D: |  | E: | System Analyst | S: | Configuration Manager | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective of the task is to get a new requirements baseline communicated to all stakeholders.

**Description**

The System Analyst contacts the Configuration Manager and supports him with the created documents. The Configuration Manager creates a baseline from it and communicates the baseline to System Analyst.

The System Analyst communicates the new baseline to all stakeholders including Test Manager and System Architect.

### Task 6: Inform the customer about the last version of baselined requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Baselined Version of:  System Requirements Specification (including System Interfaces) | | | | | |
| Output | | Documents for Customer:  Baselined Version of System Requirements Specification (including System Interfaces) | | | | | |
| D: |  | E: | Project Manager | S: | System Analyst  Safety Manager  Quality Manager | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective of the task is to inform of the customer about the state of system requirements.

**Description**

The Project Manager shall

* distribute the baselined system requirements to the customer

# Changes, References, Appendix, Terms

## References

|  |  |  |
| --- | --- | --- |
| **Category** | **Document Name** | **Document Number** |
| Process | System Requirements Analysis | AD-PE1-1-22 |

## Template

|  |  |  |
| --- | --- | --- |
| **Category** | **Document Name** | **Document Number** |
| Template | Functional safety concept | 8484 |
| Template | System Requirements Specification | 4300 |
| Template | System Interface Requirements Specification | 8382 |
| Template | Requirements Engineering Plan | 8848 |
| Template | Review-Checklist System Requirements | 8331 |
| Template | Review-Checklist System Interfaces | 8333 |
| Template | Review Checklist Functional safety concept | 8485 |