Requirements Elicitation

**Change History**

| **Version** | **Date** | **Change Description / Reason** | **Author** |
| --- | --- | --- | --- |
| 1.0 | 2017-12-08 | Initial version based on Hella Process (State Avenue)  Conditions for conducting safety activities are added  References are modified | Hae-Min, Woo |
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**Table of Contents**

[1. Purpose Description 4](#_Toc500324033)

[1.1 Purpose 4](#_Toc500324034)

[1.2 Main Description 4](#_Toc500324035)

[1.3 Result of Process 4](#_Toc500324036)

[2. Major Roles Acting in this Process 4](#_Toc500324037)

[3. Process 4](#_Toc500324038)

[3.1 Process Input – Output Definition 4](#_Toc500324039)

[3.2 Introducing Aspects 5](#_Toc500324040)

[3.3 Process Flow Chart 6](#_Toc500324041)

[3.3.1 Task 1: Establish communication and collect Input documents 7](#_Toc500324042)

[3.3.2 Task 2: Prepare Customer Requirements for use at MHE 8](#_Toc500324043)

[3.3.3 Task 3: Evaluate Customer Requirements 8](#_Toc500324044)

[3.3.4 Decision 1: Is result of evaluation good enough to perform System Requirements Analysis? 9](#_Toc500324045)

[3.3.5 Task 4: Raise common understanding between customer and MHE of all customer requirements 9](#_Toc500324046)

[3.3.6 Decision 2: Is it necessary to refine Customer input to Functional Safety? 10](#_Toc500324047)

[3.3.7 Task 5: Define the item (Functional safety aspects) 10](#_Toc500324048)

[3.3.8 Task 6: Review Item Definition (Functional safety aspects) 11](#_Toc500324049)

[3.3.9 Decision 3: Is Item Definition (Functional safety aspects) correct and complete? 11](#_Toc500324050)

[3.3.10 Task 7: Hazard Analysis & Risk Assessment 11](#_Toc500324051)

[3.3.11 Task 8: Review Hazard Analysis & Risk Assessment 12](#_Toc500324052)

[3.3.12 Decision 4: Is Hazard Analysis & Risk Assessment sufficient and correct? 12](#_Toc500324053)

[3.3.13 Task 9: Functional Safety Concept 12](#_Toc500324054)

[3.3.14 Task 10: Verify Functional Safety Concept 13](#_Toc500324055)

[3.3.15 Decision 5: Is FSC sufficient and correct? 14](#_Toc500324056)

[3.3.16 Task 11: Create baseline of Customer Requirements 14](#_Toc500324057)

[3.3.17 Task 12: Inform the customer about the final version of baselined requirements 14](#_Toc500324058)

[4. Changes, References, Appendix, Terms 15](#_Toc500324059)

[4.1 References 15](#_Toc500324060)

[4.2 Template 15](#_Toc500324061)

# Purpose Description

## Purpose

The purpose of this procedure is to bring the customer requirements into the predefined format for MHE, evaluate and comment the customer requirements.

## Main Description

The System Analyst evaluates and comments the customer requirements regarding feasibility. The Safety Manager has to check if Functional Safety specific customer requirements are defined sufficiently.

## Result of Process

As a result of the successful implementation of this process:

* The customer requirements are prepared for the use at MHE
* The customer requirements are evaluated and commented.
* A check for safety relevant requirements is performed
* A baseline exists as a basis for change management

# Major Roles Acting in this Process

|  |  |
| --- | --- |
| **Role** | **Contribution and Responsibilities** |
| Project Manager | Establish communication to customer and collect Input documents, raise common understanding between customer and MHE of all customer requirements, inform the customer about final version of baselined requirements |
| System Analyst | Prepare Customer Requirements for use at MHE, evaluate customer requirements, trigger baselining of Customer Requirements |
| Safety Manager | Analyze Functional Safety Requirements from customer. Conduct Item Definition, Hazard & Risk Analysis and Functional Safety Concept in case customer has not specified according requirements sufficiently. |

# Process

## Process Input – Output Definition

The following process input is required:

|  |  |
| --- | --- |
| **Process input** | **From whom** |
| Documents received from Customer | Project Manager |

The following process output is produced:

|  |  |
| --- | --- |
| **Process output** | **To whom** |
| Evaluated Customer Requirements | Project Manager |

## Introducing Aspects

The following process can be performed iteratively.

## Process Flow Chart





### Task 1: Establish communication and collect Input documents

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Documents | | | | | |
| Output | | Customer Documents (received) | | | | | |
| D: |  | E: | Project Manager | S: | Quality Manager  Safety Manager (\*)  System Analyst | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

(\*) A “preliminary” Safety Manager should be named to evaluate safety relevance of certain functions and/or analyze and comment safety requirements given by customer.

**Objective**

The objective of this task is to install a communication with the stakeholders and receive all needed input documents.

Note: The Stakeholders are identified in Process “Project Management of Product-related Software and Hardware”, Task “Develop and maintain project management plan (sub-project manual)”

**Description**

The Project Manager shall

* plan and establish communication with stakeholders
* receive the input documents
* consult the QA Manager, System Analyst and Safety Manager to identify process requirements on tooling and format selection
* agree upon a process to steer\*\* the customer requirements documents with customer
* document the customer communication in a reproducible way
* request missing documents, e.g.
* Customer requirements specification
* Safety goals
* Customer FMEA

\*\* Tracking for quality and time is recommended

### Task 2: Prepare Customer Requirements for use at MHE

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Documents (received) | | | | | |
| Output | | Customer Requirements (prepared) | | | | | |
| D: |  | E: | System Analyst | S: |  | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

Documents from customer might be received in different formats. The System Analyst organizes the preparation of input document contents for use at MHE.

**Description**

The System Analyst

* checks the input documents for gaps (missing documents)
* decides which documents have to be converted into single requirements and which documents should be tracked as whole document
* convert the input requirement documents into a project compatible format

The used format must ensure that requirements

* are identifiable
* are of known status
* are able to carry information about risk
* are owned by a responsible person
* can be baselined
* are traceable

### Task 3: Evaluate Customer Requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements | | | | | |
| Output | | Customer Requirements (evaluated, commented) | | | | | |
| D: |  | E: | System Analyst | S: | Core Team  Safety Manager | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective of this task is to verify “Customer Requirements” for internal consistency and to evaluate the requirements in terms of acceptance, feasibility and according Functional Safety (if applicable). In this task the requirements from customer are processed. Internal requirements are in focus in procedure MHE-PE-22 “System Requirements Analysis”.

At the end of this task a report about missing, incomplete or not accepted requirements is created and resulting risks are described and the Customer Requirements are commented.

**Description**

The System Analyst shall

* review the available requirements for completeness of necessary information e.g. customer status
* organize the evaluation of Customer Requirements
* document remaining gaps and resulting risks for project

The Safety Manager shall

* review the results of “Item Definition”, “H&R” and “FSC” – activities, done by the customer, in terms of common understanding, completeness and feasibility (e. g. ASIL classification given by Customer shall be agreed on!) with the help of checklists (Review Checklist Item Definition, Review Checklist H&R, Review Checklist FSC) Link to Guideline (Check Customer Input to Functional Safety)
* document remaining gaps and resulting risks for project regarding Functional Safety aspects

### Decision 1: Is result of evaluation good enough to perform System Requirements Analysis?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | |  | | | | | |
| Output | |  | | | | | |
| D: | Project Manager | E: |  | S: | System Analyst  Safety Manager  Quality Manager | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

It must be decided, if the evaluation status of customer requirements is sufficient to start the System Requirements Analysis. If not, updates of the documents are needed and verification starts again.

### Task 4: Raise common understanding between customer and MHE of all customer requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements (evaluated) | | | | | |
| Output | | Customer Requirements (updated) | | | | | |
| D: |  | E: | Project Manager | S: | System Analyst  Safety Manager  Quality Manager | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objectives are to discuss unclear requirements, to find an agreement for rejected requirements and confirmation of MHE comments (e. g. results of MHE H&R / FSC)

**Description**

The Project Manager shall

* contact the customer to review the requirements which are not accepted
* perform the negotiations about content of requirements
* inform the system analyst about updates of requirements
* inform the safety manager in case of safety relevant updates (if the safety relevance of an update is unknown he has to contact the Safety Manager for clarification)

### Decision 2: Is it necessary to refine Customer input to Functional Safety?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | |  | | | | | |
| Output | |  | | | | | |
| D: | Safety Manager | E: |  | S: | System Analyst | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

It must be decided, related on the work in task 3 if all necessary information concerning “Item Definition”, “H&R” and “Functional Safety Concept” was provided by the customer. If there is no information from customer and the product is not safety related, then Decision 2, Task 5, Task 6, Decision 3, Task 7, Task 8, Decision 4 Task 9, Task 10 and Decision 5 can be skipped. If there is no information for safety related product from customer, then safety manager shall create “Item Definition”, “H&R” and “Functional Safety Concept” by assumption.

### Task 5: Define the item (Functional safety aspects)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements Specification | | | | | |
| Output | | Customer Requirements Specification (evaluated, commented, including Item Definition)  Item Definition | | | | | |
| D: |  | E: | Safety Manager | S: | System Analyst | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The first objective is to define and describe the item, its dependencies on, and interaction with, the environment and other items.

The second objective is to support an adequate understanding of the item so that the activities in subsequent phases can be performed.

**Description**

The Safety Manager shall:

- Identify functional and non-functional requirements of the item as well as the dependencies between the item and its environment.

- Define the boundary of the item, its interfaces, and the assumptions concerning its interaction with other items and elements.

### Task 6: Review Item Definition (Functional safety aspects)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements Specification (evaluated, commented, including Item Definition)  Item Definition | | | | | |
| Output | | Review Checklist – Item Definition | | | | | |
| D: |  | E: | Safety Manager  (Reviewer) | S: | Safety Manager | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

Another Safety Expert shall verify the results of the Item Definition using review checklist.

**Description**

The Item Definition, especially the completeness of the evaluation is to be reviewed.

### Decision 3: Is Item Definition (Functional safety aspects) correct and complete?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | |  | | | | | |
| Output | |  | | | | | |
| D: | Safety Manger (Reviewer) | E: |  | S: | Safety Manager | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

It must be decided, if the Item Definition is correct and sufficiently complete as regards the MHE scope. If not, updates of the documents are needed and verification starts again.

### Task 7: Hazard Analysis & Risk Assessment

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements Specification (Item Definition) | | | | | |
| Output | | Customer Requirements Specification (evaluated, commented, including H&R results)  Hazard Analysis and Risk Assessment Document | | | | | |
| D: |  | E: | Safety Manager | S: | System Analyst other Experts on demand | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective of this activity is to analyze the functions of the system to be developed according to their potential of creating hazardous situations which could lead to harm. The risk of those hazards and the necessary risk reduction in order to achieve an acceptable residual risk must be evaluated.

**Description**

The Safety Manager and evaluation team shall:

* Identify potentially hazardous functions & sub-functions
* Describe malfunctions, situations, hazards & consequences
* Estimate risk for each hazard
* Evaluate necessary risk reduction (ASIL)
* Determine safety goals

### Task 8: Review Hazard Analysis & Risk Assessment

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Hazard Analysis and Risk Assessment Document | | | | | |
| Output | | Review Checklist - Hazard Analysis and Risk Assessment | | | | | |
| D: |  | E: | Safety Manager  (Reviewer) | S: | Safety Manager | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

Another Safety Expert shall verify the results of the H&R using review checklist.

**Description**

The result of the Hazard analysis and risk assessment, especially the completeness of the evaluation and the classification of hazards is to be reviewed. At this stage it might be helpful to take H & R’s of other/former projects into account, to ensure an adequate classification of ASIL.

### Decision 4: Is Hazard Analysis & Risk Assessment sufficient and correct?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | |  | | | | | |
| Output | |  | | | | | |
| D: | Safety Manger (Reviewer) | E: |  | S: | Safety Manager | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

It must be decided, if the H&R is sufficient and correct. If not, updates of the documents are needed and verification starts again.

### Task 9: Functional Safety Concept

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements Specification (evaluated, commented, including H&R results)  H&R | | | | | |
| Output | | Customer Requirements Specification (evaluated, commented, including H&R results, including FSC results)  FSC | | | | | |
| D: |  | E: | Safety Manager | S: | System Analyst  System Architect | I: |  |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective of this phase is to derive Functional Safety requirements for each identified hazard in order to ensure the required functional safety, and to allocate them to the preliminary architectural elements of the item, or to external measures. The Functional Safety Concept specifies the mechanisms and measures, by which the safety goals shall be fulfilled, in the form of Functional Safety requirements, which are then taken over to the system requirements specification

**Description**

The Safety Manager shall:

* Determine Functional Safety requirements
* Allocate Requirements to systems and system elements of the item or other elements
* Evaluate acceptance criteria for safety validation (on vehicle level)

### Task 10: Verify Functional Safety Concept

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements Specification (evaluated, commented, including H&R results, including FSC results)  FSC | | | | | |
| Output | | Review Checklist – Functional Safety Concept  Additional work products if required | | | | | |
| D: |  | E: | Safety Manager  (Reviewer) | S: | Safety Manager  Core Team | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

**Objective**

The objective is to verify the Functional Safety Concept concerning the capability of reducing the risk to a tolerable level.

**Description**

The result of the FSC, especially the Safety Goals and related attributes, must be reviewed. Additional analysis, simulation, tests, trials or expert judgments may be necessary.

### Decision 5: Is FSC sufficient and correct?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | |  | | | | | |
| Output | |  | | | | | |
| D: | Safety Manger (Reviewer) | E: |  | S: | Safety Manager  Core Team | I: | Project Manager |
| D = Decision | | E = Execution | | S = Support | | I = Information | |

It must be decided, if the Functional Safety Concept is sufficient. If not, updates of the documents are needed and verification starts again.

### Task 11: Create baseline of Customer Requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Customer Requirements (evaluated) | | | | | |
| Output | | Baselined Version of: Customer Requirements (evaluated) | | | | | |
| 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 customer requirements baseline communicated to all stakeholders.

**Description**

The System Analyst creates a baseline of the customer requirements supported by Configuration Manager. The System Analyst communicates the new baseline number to all stakeholders.

### Task 12: Inform the customer about the final version of baselined requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input | | Baselined Version of: Customer Requirements (evaluated) | | | | | |
| Output | | Documents for Customer: Baselined Version of Customer Requirements (evaluated) | | | | | |
| 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 requirements the projects starts with.

**Description**

The Project Manager shall

* distribute the baselined customer requirements to the customer

# Changes, References, Appendix, Terms

## References

|  |  |  |
| --- | --- | --- |
| **Category** | **Document Name** | **Document Number** |
| Process | Requirements Elicitation | AD-PE1-1-21 |

## Template

|  |  |  |
| --- | --- | --- |
| **Category** | **Document Name** | **Document Number** |
| Template | Hazard Analysis and Risk Assessment Document | 8480 |
| Template | FSC | 8484 |
| Template | Item Definition | 8794 |
| Template | Functional Safety Impact Analysis | 8790 |
| Template | Review Checklist - Hazard Analysis and Risk Assessment | 8481 |
| Template | Review Checklist – Functional Safety Concept | 8485 |
| Template | Review Checklist – Item Definition | 8795 |