Certified Professional for Requirements Engineering

Requirements Modeling Specialist

Task definition for the written assignment

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IREB

Content

0 Introduction

The purpose of this written assignment is to prove that you:

- can select a combination of suitable diagram types for specific Requirements Engineering purposes and justify your selection.
- are able to adequately implement and explain the cross-references in content between the diagrams of the various diagram types.
- are able to use the diagram types covered in the syllabus and the associated modeling languages to specify requirements appropriately and correctly.
- are able to create high-quality requirement models in order to document complex facts in an understandable, precise, comprehensible and with a high degree of unambiguousness.

To demonstrate the above mentioned knowledge and skills, you have to present the application of requirements modeling in a real (or at least realistic) project of your choice. For this purpose, the solutions in the form of requirement diagrams for characteristic tasks of requirement modeling are to be presented and explained in extracts and you have to reflect on their use in the project. In addition, you have to describe the specific project context in which the requirement diagrams were created. You also have to explain why you thought the selected requirement diagram types and the requirement diagrams were appropriate in the project context. You also have to take a critical look at any weaknesses and drawbacks in requirements modeling and the use of specific types of requirements diagrams.

The written assignment has to consider a single project that you have worked on in your working environment. The requirement diagrams submitted must have been created independently by you.

0.1 Scope of work, structure and assessment

Regarding the scope of the written assignment and the minimum percentage to pass the examination see Specialist Examination Regulations (chapter 2).

The following table provides an overview of the sections structure of the written assignment, and shows the maximum number of points to be awarded for each section. Structure your written assignment according to this structure, if necessary, you can subdivide this structure.

Section	Contents	Achievable points
1	Project context	10 points
2.1	Overview of the diagram types used in the project and presented in the written assignment.	0 points
2.2 – 2.7	Presentation of the extracts from the diagrams including a textual explanation where necessary. Reflection of use in the project or reflection why certain diagram types were not used.	50 points
3	Explanation and discussion of your own modeling procedure.	20 points
	maximum possible total points	**80 points**

The achievable points should serve as a guideline for the extent of each section.

Details of the expected content and its evaluation criteria are described in the following chapters. Please note when formulating your written assignment, that the contents must be comprehensible for an examiner who is not necessarily an expert in your application context.

Scoring for sections 2.2 – 2.7:

The candidate has to comment on all diagram types presented in the syllabus. The use of at least two diagram types must be proven by means of example diagrams, meaning examples must be submitted for these two diagram types. The scoring for each diagram type is done according to the following three cases:

- **Case 1**: A diagram type was not used in the project. It has to be explained why it was not used in the project (reflection).
  Achievable points: 5 points per diagram type
- **Case 2**: A diagram type was used in the project, but it is not documented with an example diagram. The use in the project is reflected upon.
  Achievable points: 5 points per diagram type
- **Case 3**: A diagram type was used in the project and it is documented in the work with an example diagram. The use in the project is reflected upon.
  Points achievable: Between 8.3 and 15 points per diagram type depending on the number of diagram types documented with example diagrams

The following points are awarded for the six different diagram types, depending on the number of diagram types documented with example diagrams.

Number of different diagram types documented by example diagrams (Case 3)	Number of diagram types to be reflected (Case 1 and Case 2)	Maximum Points per Diagram Type for Case 1 and Case 2	Maximum Points per Diagram Type for Case 3	Maximum overall score for section 2
2	4	5	15	4*5 + 2*15=**50**
3	3	5	11.67	3*5 + 3*11.67=**50**
4	2	5	10	2*5 + 4*10=**50**
5	1	5	9	1*5 + 5*9=**50**
6	0	5	8.33	0*5 + 6*8.3=**50**

0.2 Anonymity and confidentiality of the contents

The contents of the completed work are to be made anonymous to a degree that the content cannot be related to real people and / or companies. Specific company or personal names should only be used if absolutely necessary for the understanding of the contents of the written assignment. Details on originality and confidentiality of the contents are set in the examination regulations.

0.3 Evaluation criteria

The written assignment will be evaluated by the following criteria:

- Has the candidate followed **all** instructions given for the respective chapter?
- Are the answers reasonable and the arguments for the answers plausible for an outsider?
- Is the text understandable?
- Does it become clear from the text, that the candidate has understood the syllabus and handbook content?
- Whenever the candidate is asked to "reflect" something:

  – Have they looked at the topic to be reflected from different angles?
  – Have they considered pro and con arguments?
  – Have they drawn a plausible conclusion?

1 Project context

Expected content of this section

Select a project or task (realistic project) from your work environment in which you were actively involved in modeling during the requirements specification. First describe some characteristic aspects of this project. Amongst others please include the following accompanying information:

- Which domain/field of expertise was addressed by the project?
- What was the goal of this project?
- What role did you take within the project?
- Which part of the project are you looking at? What is the subject of your requirements?
- What was the scope (duration and number of participants) of the project?
- How long did the modeling of the requirements take? What effort was required for the modeling?
- Which sources of requirements (e.g., models from previous projects) were available to you?
- How was the cooperation with the stakeholders and project participants?

Evaluation criteria for this section

The evaluation of this section of the written assignment is based on the following criteria:

K.1.1.	Can the project be assessed on the basis of the description with regard to the topic and scope?
K.1.2.	Are the constraints and initial situation clearly set out?
K.1.3.	Are the procedures and the scope of the modeling work in Requirements Engineering presented in a coherent and comprehensible way?
K.1.4.	Are time periods and efforts quantified?
K.1.5.	Does the description adequately reflect the role/responsibility of the candidate and indicate a significant involvement in the development of the relevant models?
K.1.6.	Is the cooperation with other project participants or the procedure described in a comprehensible way?

2 Excerpts from the model

2.1 Overview of the diagram types used

Expected content of this section

Describe which of the diagram types listed in the syllabus were used in your project. If you have used other notations, please name them and convert your model to the diagram types listed in the syllabus. Give an informal overview of the diagram types according to the following pattern:

Diagram type	**Diagram type used in project?** **– intense** **– medium** **– none**	**Diagrams in the written assignment?** **– yes** **– no**	**Section in the written assignment**
Class diagrams			2.2
Use case diagrams			2.3
Activity diagrams			2.4
Data flow diagrams			2.5
State machines			2.6
Sequence or communication diagrams			2.7

An informal specification such as "intensively used" (short: intense), "used to a medium extent" (short: medium), "not used" (short: none) is sufficient for the degree of use.

Evaluation criteria for this section

None. This section only motivates the selection and structuring of the following subsections. The evaluation shall be based on the following subsections.

Instructions for sections 2.2 to 2.7

It is necessary that you have used **at least two of the diagram types** in your project (e.g., class and activity diagrams) and that you submit sections of the requirement model. Omitting or not using other diagram types has no negative effect on your score, provided you give comprehensible and understandable reasons for this in the subchapter "Reflection" of the corresponding diagram type. In this case the subchapter "Example diagrams" remains empty.

Creating the subchapters "Example Diagrams"

- Insert one or more diagrams, as well as any relevant sections. Depending on the scope of your model, it may make sense to concentrate on **semantically meaningful sections** in your written assignment, i.e., on aspects of the domain where the diagrams have enabled you to achieve more comprehensible structures and significant knowledge gains, or where you have significantly improved communication with stakeholders. Make sure that your written assignment goes beyond the obvious textbook examples ("customer has account", "machine consists of parts") and shows the parts of your project that you have experienced as a challenge in modeling the requirements.
- If necessary, supplement the diagrams with textual explanations that explain the contents of the diagrams shown.
  – For information models, for example, some essential term definitions (of non-obvious or domain-specific subject classes and attributes, and in particular non-obvious relationship specifications)
  – For use cases exemplary excerpts or complete use case descriptions
  – For activity diagrams or data flow diagrams, for example, textual refinements or explanations of parts of the displayed activity diagrams
- Supplement the selected diagrams with explanations on the following points, if necessary.
  – Brief definition of the stereotypes used
  – Where did you deviate from the given syntax?
  – Have you used general or self-defined patterns?

Creating the "Reflection" subsection

Evaluate to what extent the use of the respective diagram type in your project has fulfilled expectations. In particular, discuss possible difficulties and possible reasons why the respective diagram type met or failed to meet expectations in the project situation described. Provide possible solutions and other improvements that you would apply if used in a next project. Explain the connection of the diagram type to other diagram types and further information (especially on natural language requirements).

For each diagram type that was not used in the project, explain why this diagram type was not included in the project. Also discuss how diagrams of this type could have been used in addition to the other diagram types and what would have been the advantages or benefits of additionally considering this type of diagram.

Evaluation criteria for Sections 2.2 to 2.7

The evaluation criteria that are valid for all diagram types are specified here. Further criteria may be specified in the relevant sections.

Syntax:

K.2.allg.1. Conformity to syntax:

The presented diagrams comply with the syntactic specifications of the modeling language used and the syntactic specifications and restrictions of the handbook.

K.2.allg.2. Reasonable deviations from the syntax:

Deviations from the syntactic specifications are declared and conclusively explained.

Semantics:

K.2.allg.3. Use of modeling constructs:

Appropriate use of the various (also advanced) modeling constructs of the corresponding modeling language

K.2.allg.4. Dealing with complicated issues:

Justification if complicated facts were not presented in the diagram and advanced modeling constructs were not used for this purpose

K.2.allg.5. Content errors:

Correctness of content, as far as this is comprehensible

K.2.allg.6. Relations between the diagrams:

Are relationships between diagrams within the view and with other views of requirements modeling recognizable and consistent?

K.2.allg.7. Correct reference point of the diagrams:

The contents of the diagrams refer to the actual subject matter of the specification

Reflection:

K.2.allg.8. References to other requirement descriptions:

Presentation of relationships from diagrams to textually described or otherwise specified requirements, indicated and adequately explained

K.2.allg.9. Relationship to other diagram types:

Connections to other diagram types, e.g., that a use case is refined by an activity diagram

K.2.allg.10.	Degree of formalization of the content relationships: Are the connections informally (via names) or formally (via IO pins, call behavior, ...) given?
K.2.allg.11.	Pragmatic quality of the diagram type: Reflection on the suitability for the intended purpose and its impact on stakeholders conclusively explained
K.2.allg.12.	Learning effect: Problems encountered, solution options, selected solution or lessons learned for a new use in a new project conclusively explained

Not in use:

K.2.allg.13.	Sufficient justification for not using the diagram type
K.2.allg.14.	Reflection on the consequences of non-use

2.2 Class diagrams

Evaluation criteria

Describe which of the diagram types listed in the syllabus were used in your project.

2.2.1 Example diagrams incl. explanation

2.2.2 Reflection

2.3 Use Case diagrams

Evaluation criteria

K.2.uc.1.	Consistent processes from a usage perspective on the system or internal processes triggered by a time trigger
K.2.uc.2.	Suitable granularity of the use cases (i.e., the use cases are "cut" reasonably)
K.2.uc.3.	Meaningful use case names that reflect the semantics of the complete process
K.2.uc.4.	If used: Useful use and correct modeling of include and extend relationships in use case diagrams and correct specification of extension points

2.3.1 Example diagrams incl. explanation

2.3.2 Reflection

2.4 Activity diagrams

Evaluation criteria

K.2.al.1.	Appropriate use of activity diagrams
K.2.al.2.	Adequate level of abstraction
K.2.al.3.	Reasonable coarsening / refinement
K.2.al.4.	Reasonable use of refining flow charts
K.2.al.5.	Consistency between superior and refined flow charts
K.2.al.6.	Correct and meaningful modeling of the control flow
K.2.al.7.	Reasonable use of the modeling of areas of responsibility (swim lanes) in flow charts
K.2.al.8.	Comprehensibleness of cross-references to other diagrams (also formal, if used)

2.4.1 Example diagrams incl. explanation

2.4.2 Reflection

2.5 Data flow diagrams

Evaluation criteria

K.2.df.1.	Appropriate granularity of functions
K.2.df.2.	Specification of meaningful names for functions and data flows
K.2.df.3.	Supplementary information on the processing systematics of selected functions
K.2.df.4.	Appropriate decomposition of functions
K.2.df.5.	Consistency between superior and refining data flow diagrams

K.2.df.6.	Comprehensibleness of cross-references to the information structure model
K.2.df.7.	Comprehensibleness of cross-references to scenarios

2.5.1 Example diagrams incl. explanation

2.5.2 Reflection

2.6 State machines

Evaluation criteria

K.2.st.1.	Sharp distinction between state and action/activity
K.2.st.2.	Indication of meaningful events and conditions for state transitions
K.2.st.3.	Appropriate use and meaningful modeling of hierarchization mechanisms in state machines
K.2.st.4.	Appropriate use of orthogonal state spaces (if necessary)
K.2.st.5.	Comprehensibleness of cross-references to other diagrams (also formal, if used)

2.6.1 Example diagrams incl. explanation

2.6.2 Reflection

2.7 Sequence or communication diagrams

Evaluation criteria

K.2.sc.1.	Reasonable selection of scenarios to illustrate exemplary event sequences
K.2.sc.2.	Comprehensibleness of the selection decision with respect to the selected diagram type (e.g., sequence diagram, communication diagram)
K.2.sc.3.	Standard-compliant use of the sequence or communication diagrams used
K.2.sc.4.	Correct and complete consideration of the actors involved in the interaction diagrams of a scenario

K.2.sc.5. Reasonable use of alternative and optional fragments in scenario modeling by sequence diagrams

K.2.sc.6. Comprehensibleness of cross-references to other diagrams (also formal, if used)

2.7.1 Example diagrams incl. explanation

2.7.2 Reflection

3 Overall assessment of model use

Expected content of this section

Assess whether the model used in your project has helped you to document the requirements of stakeholders more transparently and accurately. Discuss at a glance who used the diagrams and whether (or where) resistances were more likely to occur. How do you retrospectively rate the effectiveness of the use of modeling?

Evaluation criteria for this section

This section is a focus of the written assignment. In this section it is assessed whether the candidate has succeeded in reflecting on the facts of the project described in section 1 in a correct, structured, understandable and comprehensible way. This section is judged on the extent to which the candidate has succeeded in justifying the significance or effect of a model for requirements documentation. Advantages and disadvantages should be given in a balanced way. The argumentation should take a critical look at the impact of the model on the people involved in the project.

The evaluation of this section of the written assignment is based on the following criteria:

- General reflection of the use of diagrams:
  Reflection on the use of modeling requirements and critical evaluation
- General challenges and solutions:
  e.g., when communicating diagrams, or management of models
- General evaluation of the benefits:
  for consumers and the resulting adaptation and critical evaluation
- Binding nature of the diagrams:
  Discussion of the binding nature of the requirement diagrams and critical evaluation
- General Lessons Learned:
  Change and development in the application of modeling
- General reference of the requirement diagrams to other artifacts:
  Link to further descriptions (text, requirements, screens, ...) can be specified more precisely at individual diagram types