



# TUM

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## Mini-Guideline to Requirements Engineering

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### C. Agreeing on System Vision & Scope

All stakeholders should agree on a common system vision and scope. This implies that the system vision (content item on the System level in Fig. 3) has to be understood by every stakeholder involved — including non-technicians. We advise to use a so-called rich picture [MH98] as illustration. A rich picture captures the key elements of the system vision in (self-explanatory or labelled) icons and depicts their interrelation. Figure 5 shows a rich picture of the system vision of AAT. Rich pictures have proven especially useful as basis for

- Legacy systems and user documentation
- Laws, standards, and regulations
- Customer complaints, unintended uses

To turn the goals into concrete requirements, they have to be refined. The goals that refer to the services to be provided by the system are refined into descriptions of usage behaviour. This often requires additional input from both stakeholders and other information sources. The results of this analysis are captured in the content item Usage Model (on the System level in Fig. 3). Usage can be captured either in service descriptions or in use cases and scenarios. The usage model is a black box specification of the behaviour that hides any realization detail. Figure 6 shows the use case overview of AAT and Figure 7 depicts a detail of the scenario derivation.

Fig. 5. System Vision of Alpine Adventure Tours.

discussion in workshops and meetings. In documentation, i.e. after the stakeholders have agreed on one version of the rich picture, it should be accompanied by an explaining paragraph in natural language.

### D. Gathering Goals, Usage Model, and Constraints

From the stakeholders, we gather the goals (content item on the Operational Environment level in Fig. 3). Goals can be business goals, market goals, functional, quality, or technical goals. The two most common forms of documenting goals are natural language text and goal trees [vL01]. The latter have the advantage of showing the relations between the goals.

Example goals from AAT are:

- Competition with other skiing regions demands high customer satisfaction at low prices.
- Customers must get the business services from one hand.
- Increase of customer satisfaction by reduction of customer complaints.
- Fast market expansion and branding the business image in new markets with collaboration of existing local companies.
- Providing the best service to customers.
- Achieving market lead in skiing courses at region “Zugspitze”.

Apart from the stakeholders, there are other sources of information, usually documents. Some important information sources are:

Fig. 6. Use Case Overview of Alpine Adventure Tours.

Fig. 7. Scenario Detail of Alpine Adventure Tours.

Constraints describe restrictions that arise from the business context (like management or laws) or from the system’s operational environment (like hardware constraints). Both types have to be listed with references to their original source.

### E. Documenting Requirements

On the basis of the goals, the usage model, and the constraints, the requirements are derived and documented. Write your requirements SMART — specific, measurable, attainable, realisable, and time bounded (objective must be achieved by a specific date in the project plan).

Your requirements need a number of attributes:

- ID, version, and configuration (if applicable)
- Origin, author, and responsible
- Rationale and tracing to related requirements or artefacts
- Priority and status

A popular template for requirements documentation is the Volere Template [RR06], see Fig. 8.

Requirement #:	Requirement Type:	Event/use case #:
Description:		
Rationale:		
Source:		
Fit Criterion:		
Customer Satisfaction:	Customer Dissatisfaction:	
Dependencies:	Conflicts:	
Supporting Materials:		
History:		




Fig. 8. Volere Template for Requirements.

### F. Quality Assurance and Acceptance

There are two major stages of review to perform — one by your colleagues (internal) and one by your customer (external). The internal review checks understandability, completeness, consistency, precision, correctness, traceability, and changeability.

The external review by the customer performs the same checks plus the decision whether the requirements specification actually describes what they want. Your goal is agreement with the customer and acceptance of your requirements specification — and the preceding internal review is the basis.

### G. Managing Requirements

Your requirements are likely to be changed by the customer and other stakeholders during development. Therefore, it is important to establish a proper change management process that keeps your requirements specification consistent and their change history traceable. Best practice is to issue change requests that are decided on. These decisions, as well as other decisions taken during development, should be documented for future reference. A helpful template for decision documentation is provided by Tyree [TA05]. It captures issue, decision, status, assumptions, constraints, implications, related decisions and requirements. The extent of a template should be adapted to the project settings — but: document the decisions.

## V. CONCLUSION

This guideline gives concrete steps on the way to accomplish your first requirements engineering project. We welcome feedback to further improve it for the future.

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