



Software Product Management

Product Requirements Engineering

Nov 02, 2010

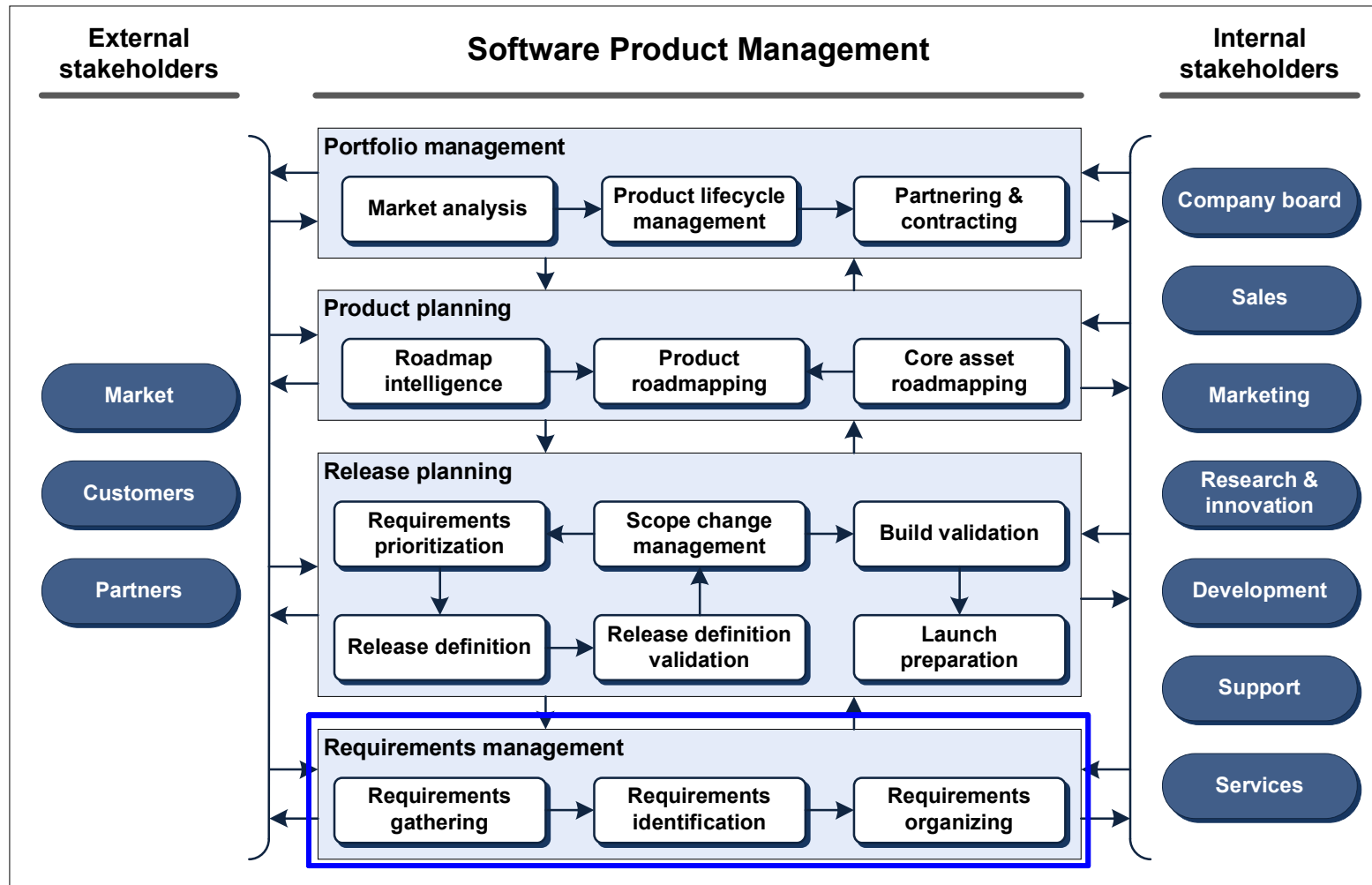
Samuel Fricker
(fricker@ifi.uzh.ch)

Focus



	Market Analysis	Product Analysis	Product Strategy	Product Planning	Development	Marketing	Sales and Distribution	Support and Services
Often on corporate level			Portfolio Management	Resource Allocation	Resource Allocation	Marketing Strategy and Plan	Sales Strategy and Plan	
Product (family) level	Market Research Market Sizing Market Problems Technology Assessment Competitive Analysis	Product Performance Customer Satisfaction Win/loss Analysis Opportunities	Positioning Delivery Model Pricing Model Pricing Business Case Make or buy Ecosystem Legal terms Protection of Intellectual Property	Roadmap Release Plan Requirements Management Functional Specification	Project Plan Technical Specification Project Requirements Management Implementation Quality Assurance Technology Innovation	Launch Plan Customer Analysis Partner Management Operational Marketing Material	Channel Preparation Operational Sales Operational Distribution Material	Customer Support Technical Support Marketing Support Sales Support Services Preparation Operational Services Provision

Focus





Contents

Learning Objectives

- Understand requirements elicitation and triage
- Be able to specify requirement catalogues

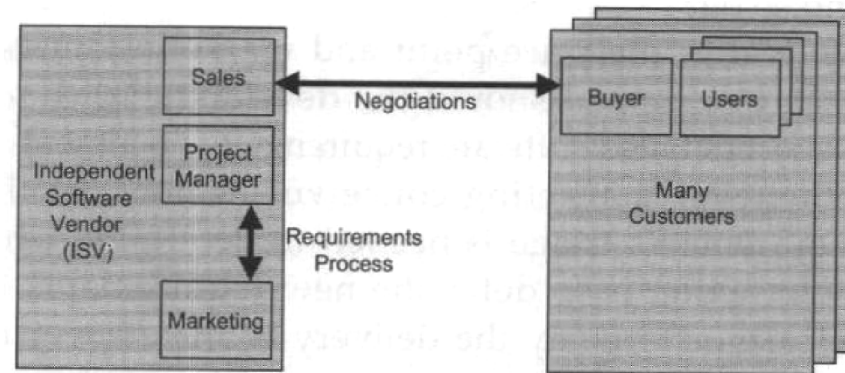
Agenda

- Overview RE in a Market-Driven Environment
- Customer RE
 - Elicitation
- Product RE
 - Triage
 - Specification Documents
 - Requirements Catalogues

Context: Independent Software Vendors

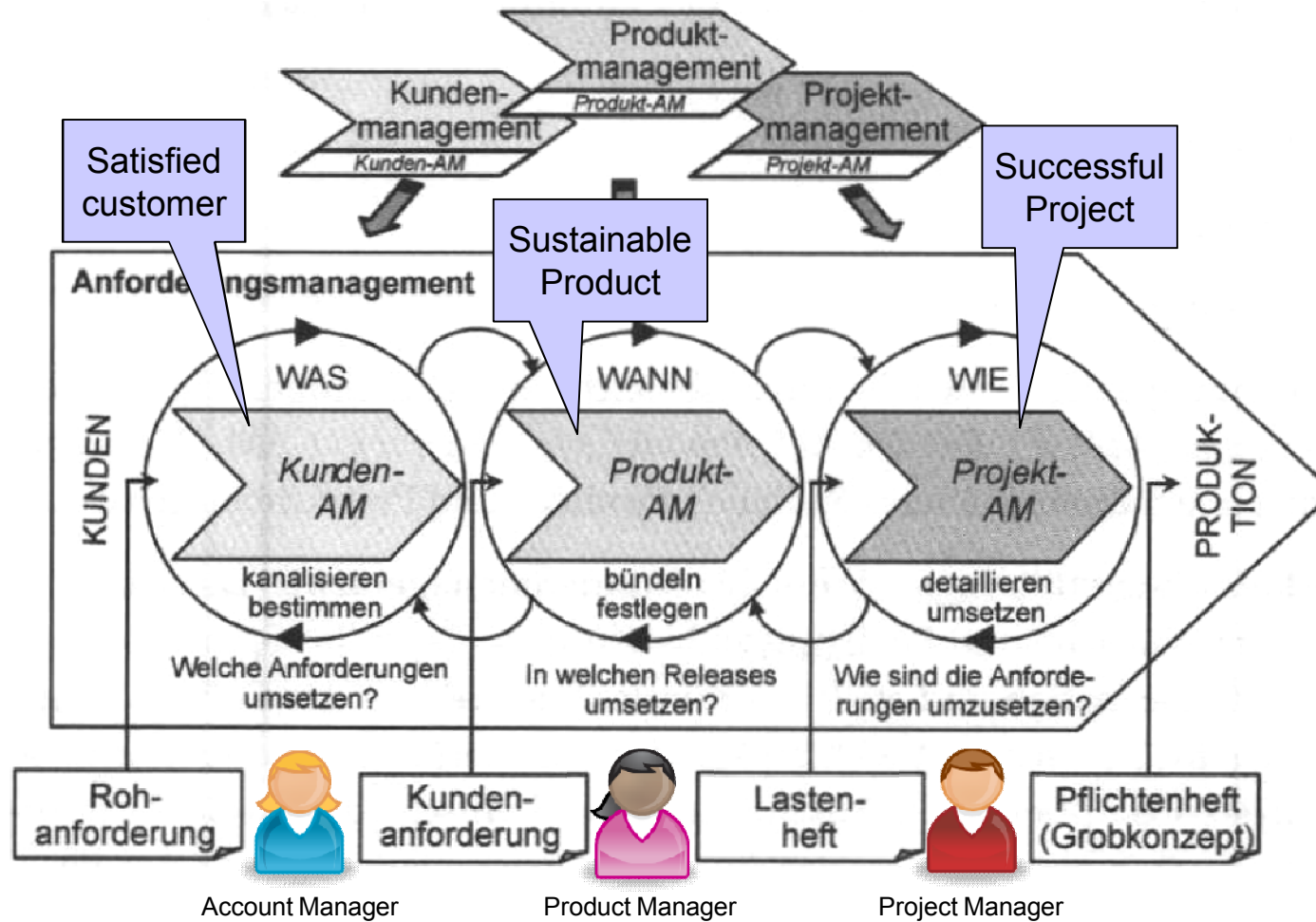


- Product software that intends to sell many times within a market

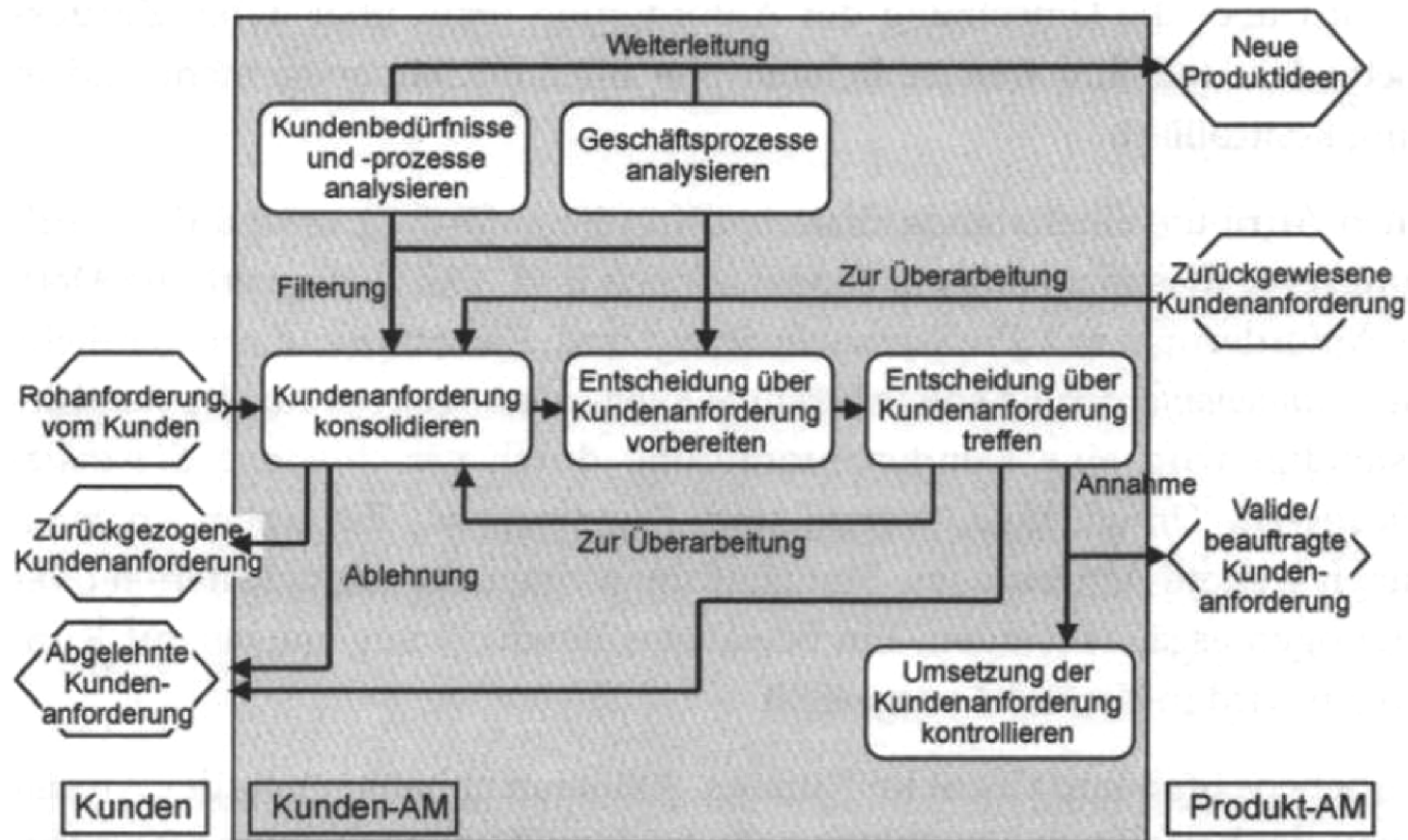


- Difficult to find customers to talk during early stages
- Select a large-enough target market, do market research to identify competitors and customer satisfaction, use sales-force feedback, etc.
- Write a market requirements document that includes desired price, introduction date, and marketing message.

Three Requirements Engineering Phases



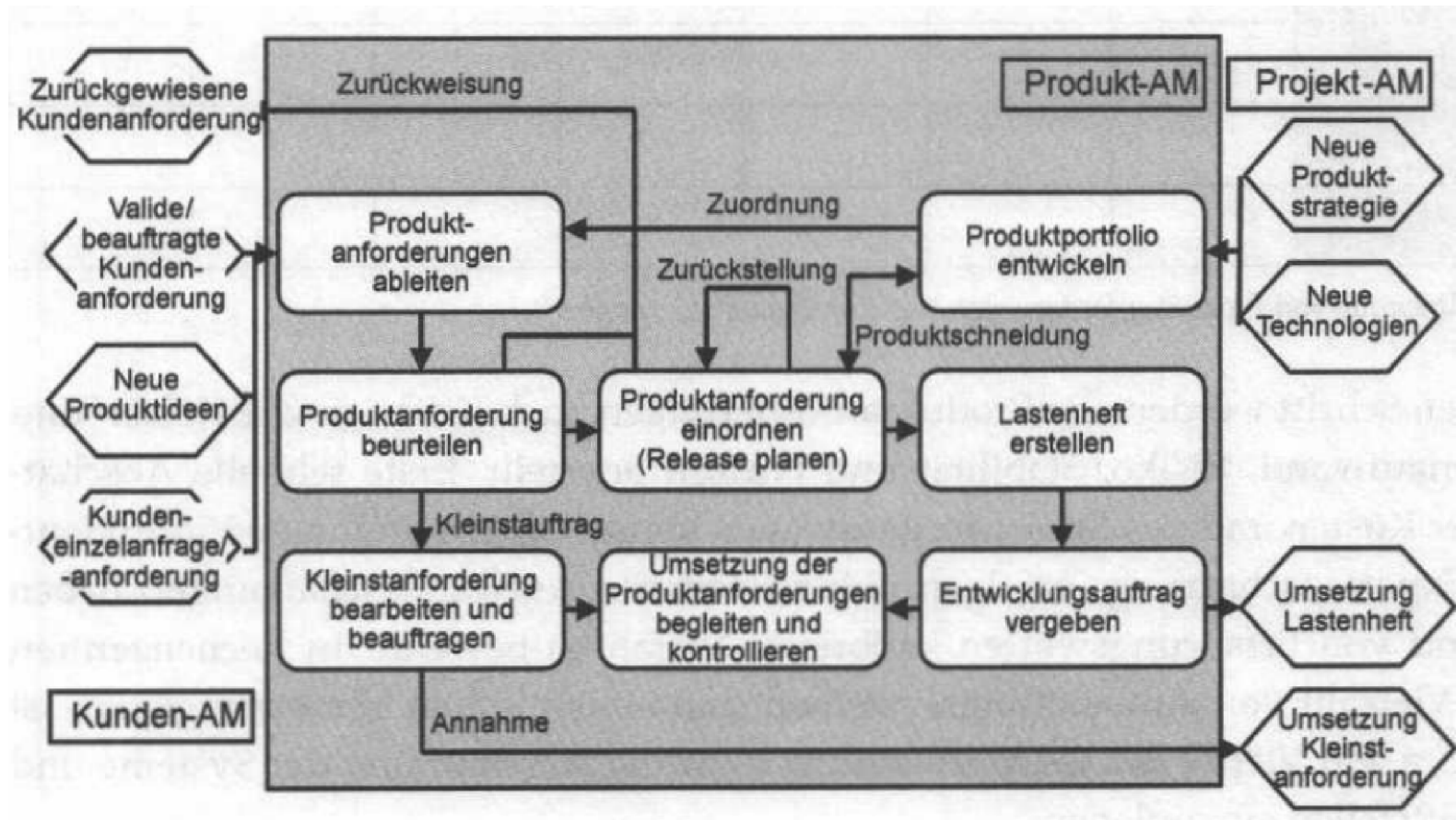
Customer Requirements Engineering



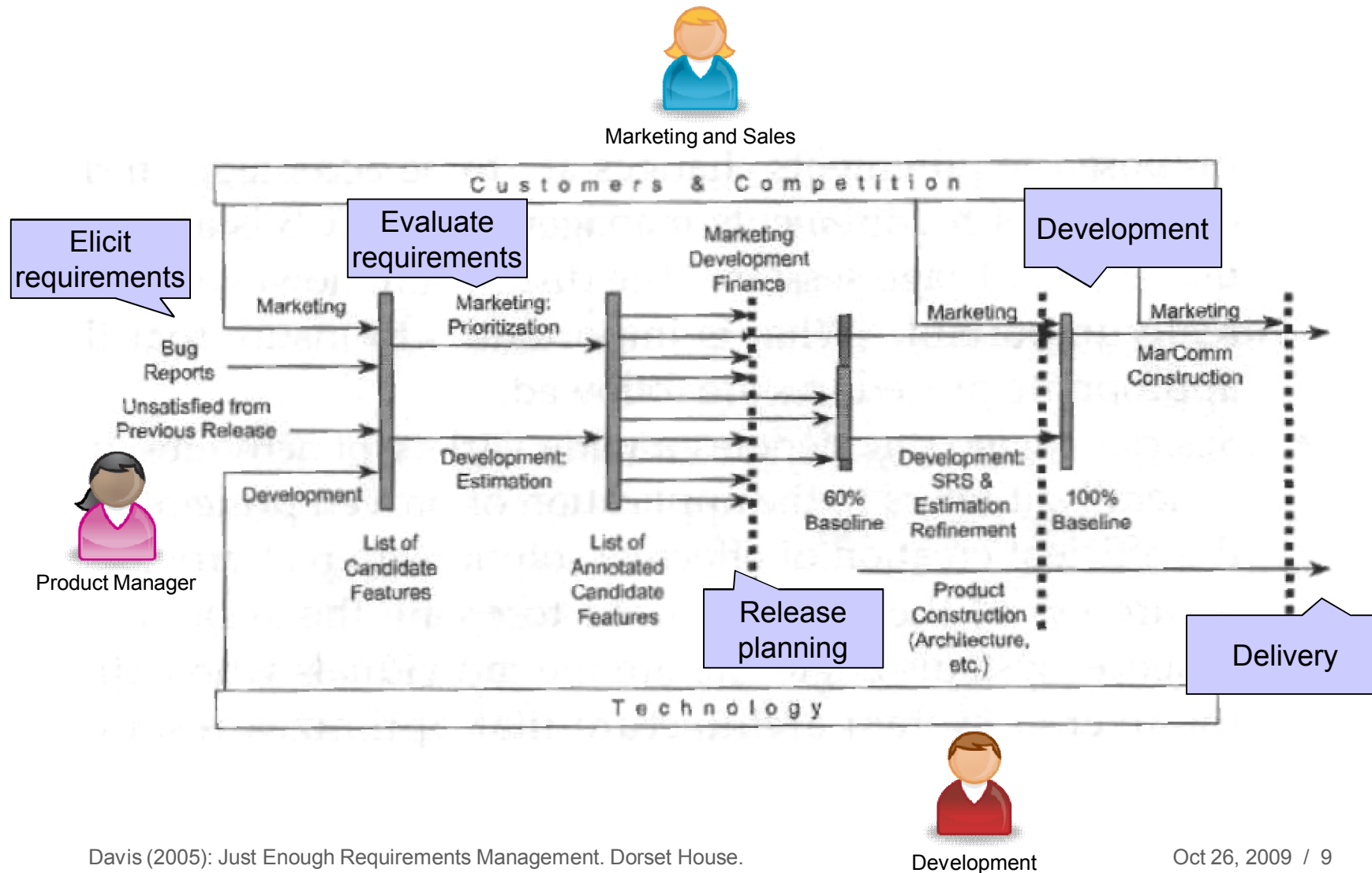
Product Requirements Engineering



University of Zurich



Requirements Lifecycle



Product Requirements Engineering



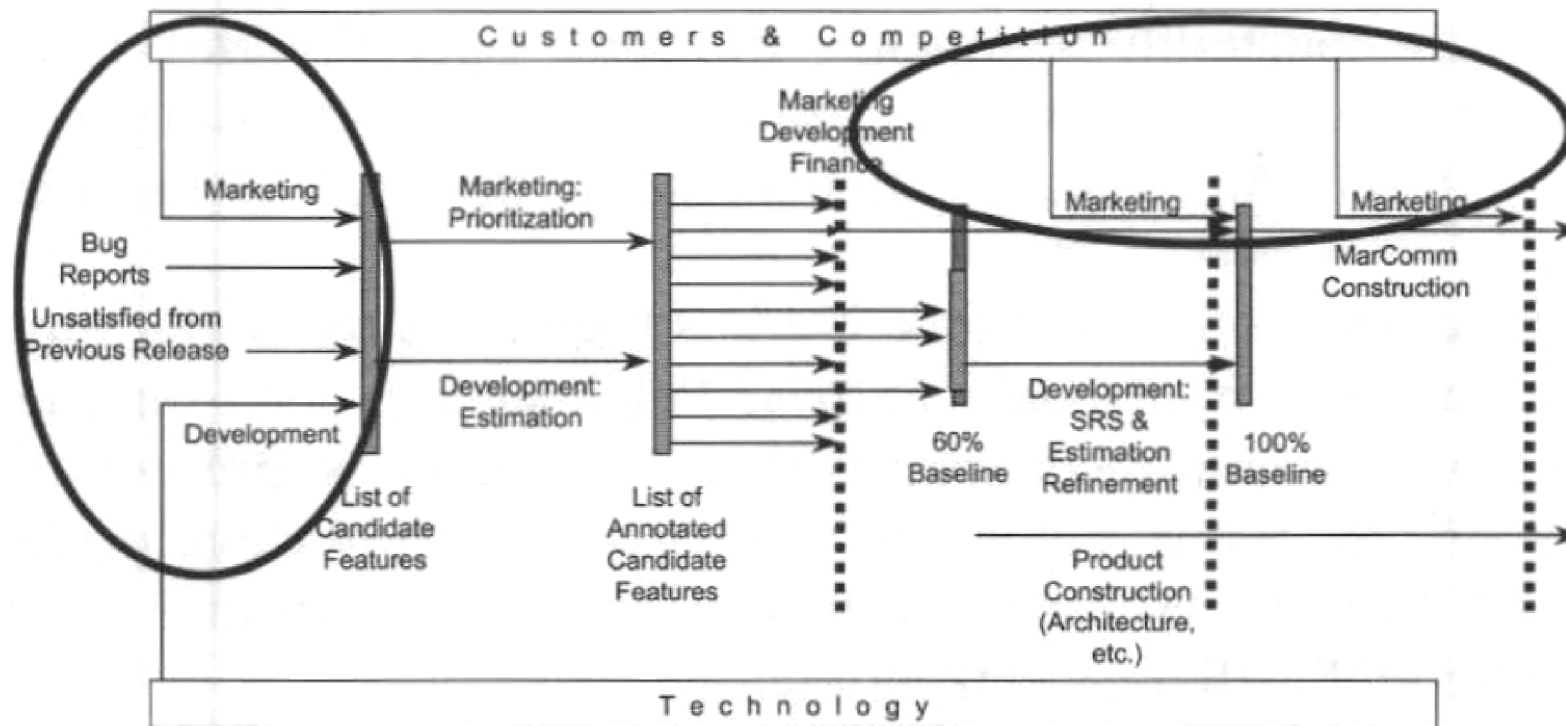
University of Zurich



- Product requirements management is the set of activities that consists of gathering requirements, identifying the right ones to satisfy, and documenting them.
 - **Requirements elicitation**: gather candidate requirements from customers, users, experts, and other stakeholders
 - **Requirements triage**: determine which requirements should be satisfied within available development resources, time to market, revenue goals, and return on investment
 - **Requirements specification**: document the externally visible characteristics of the desired system.

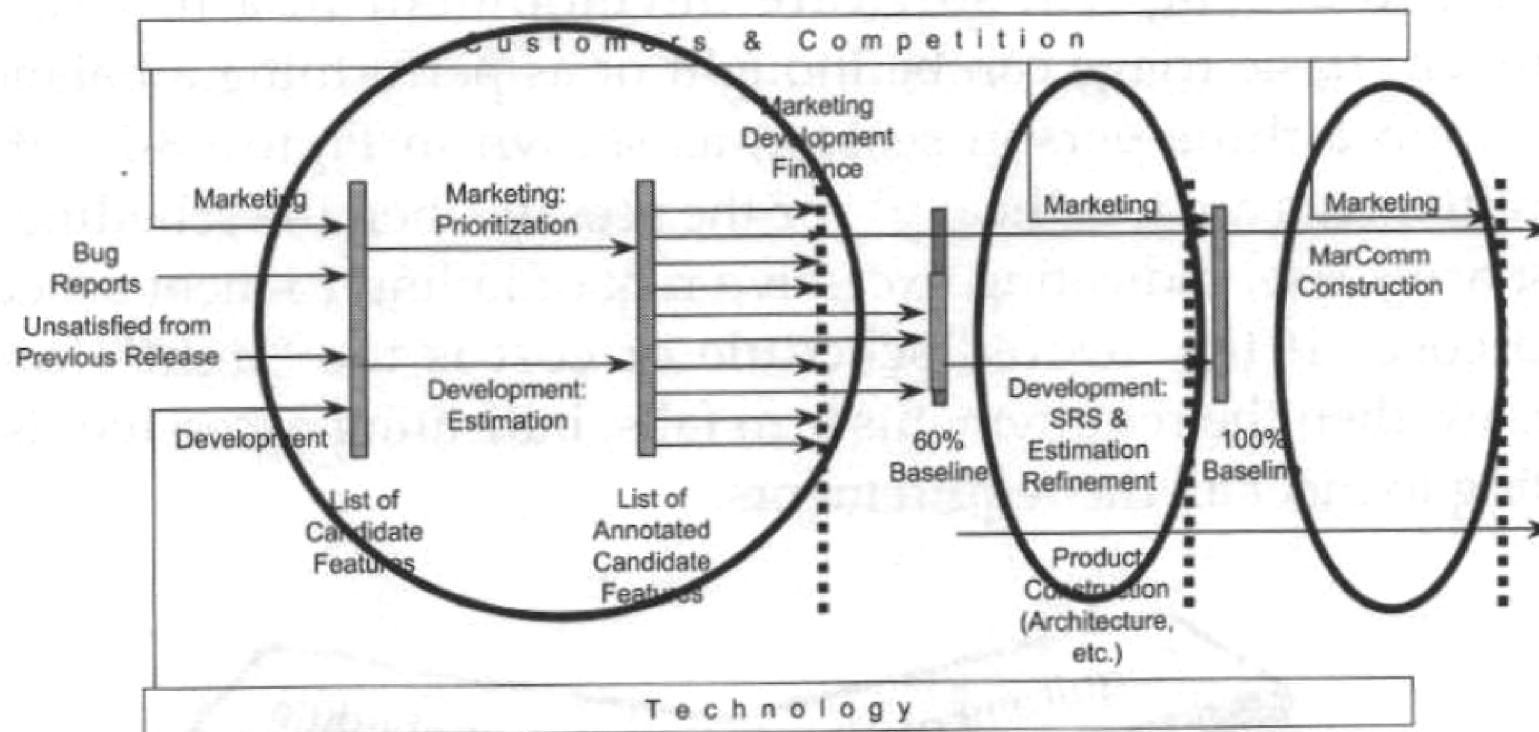


Requirements Elicitation



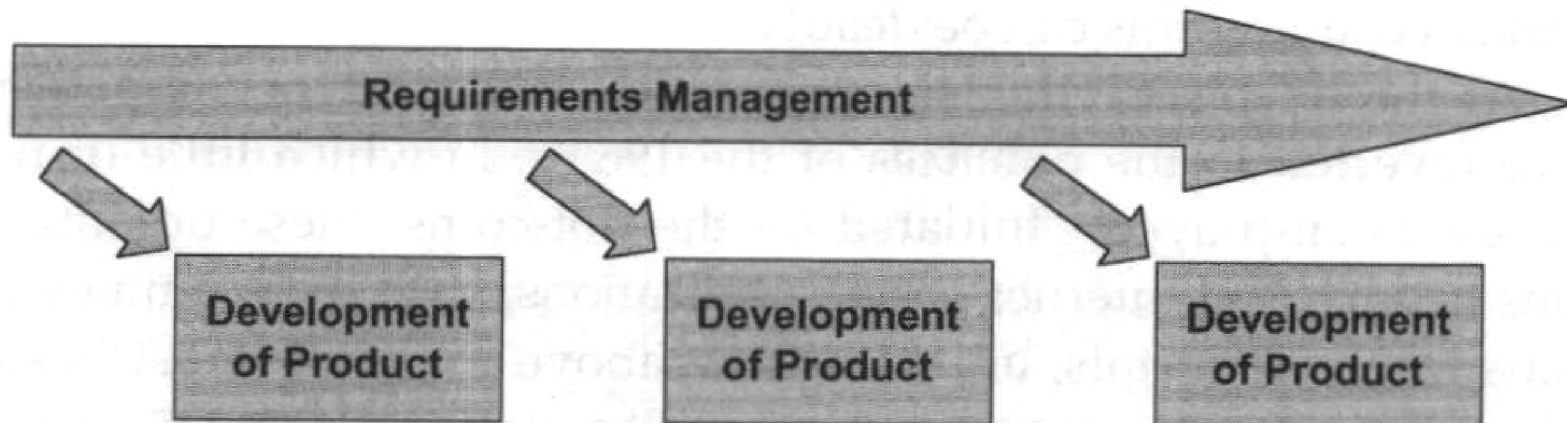


Requirements Triage

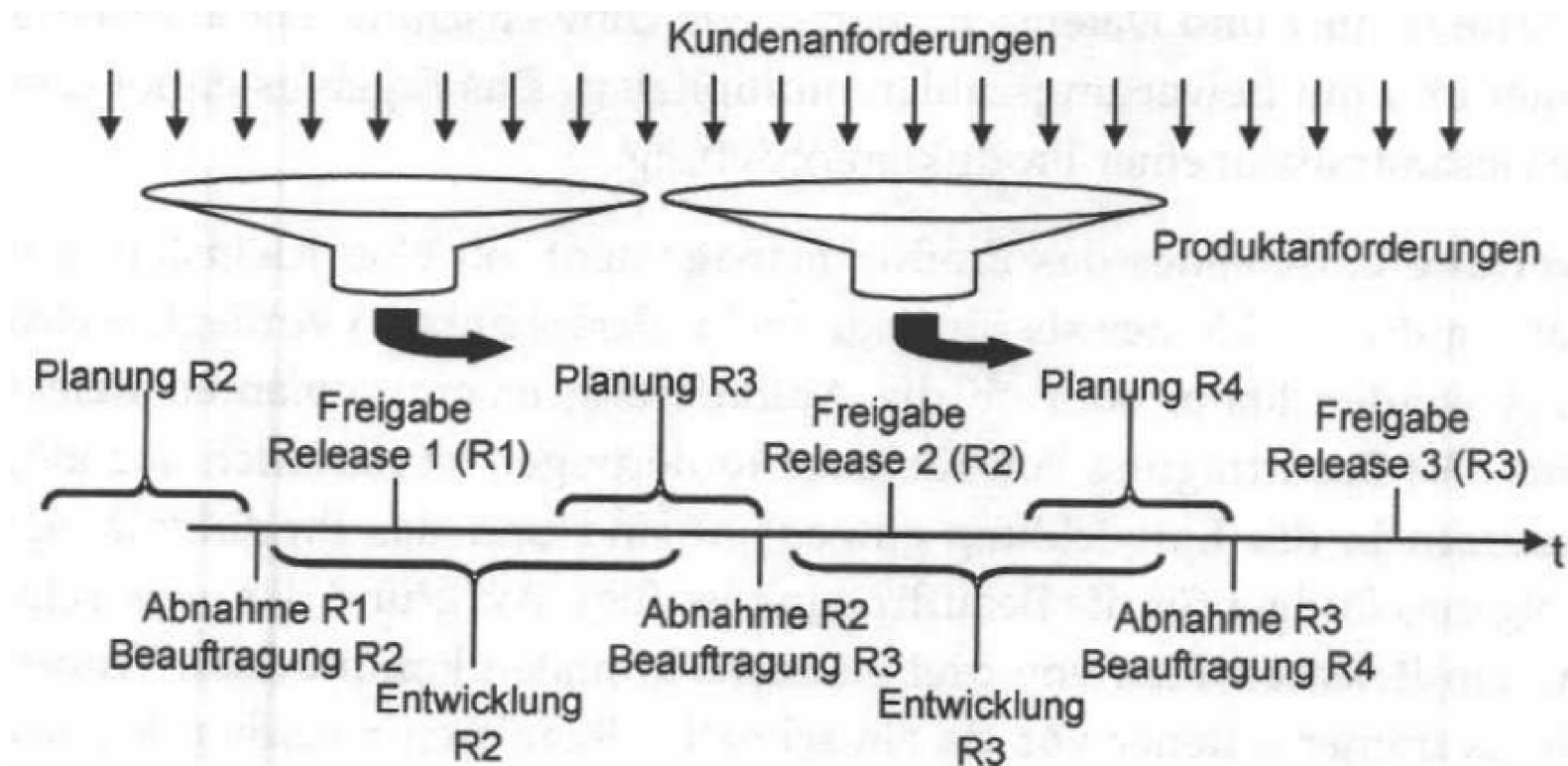


Requirements Triage

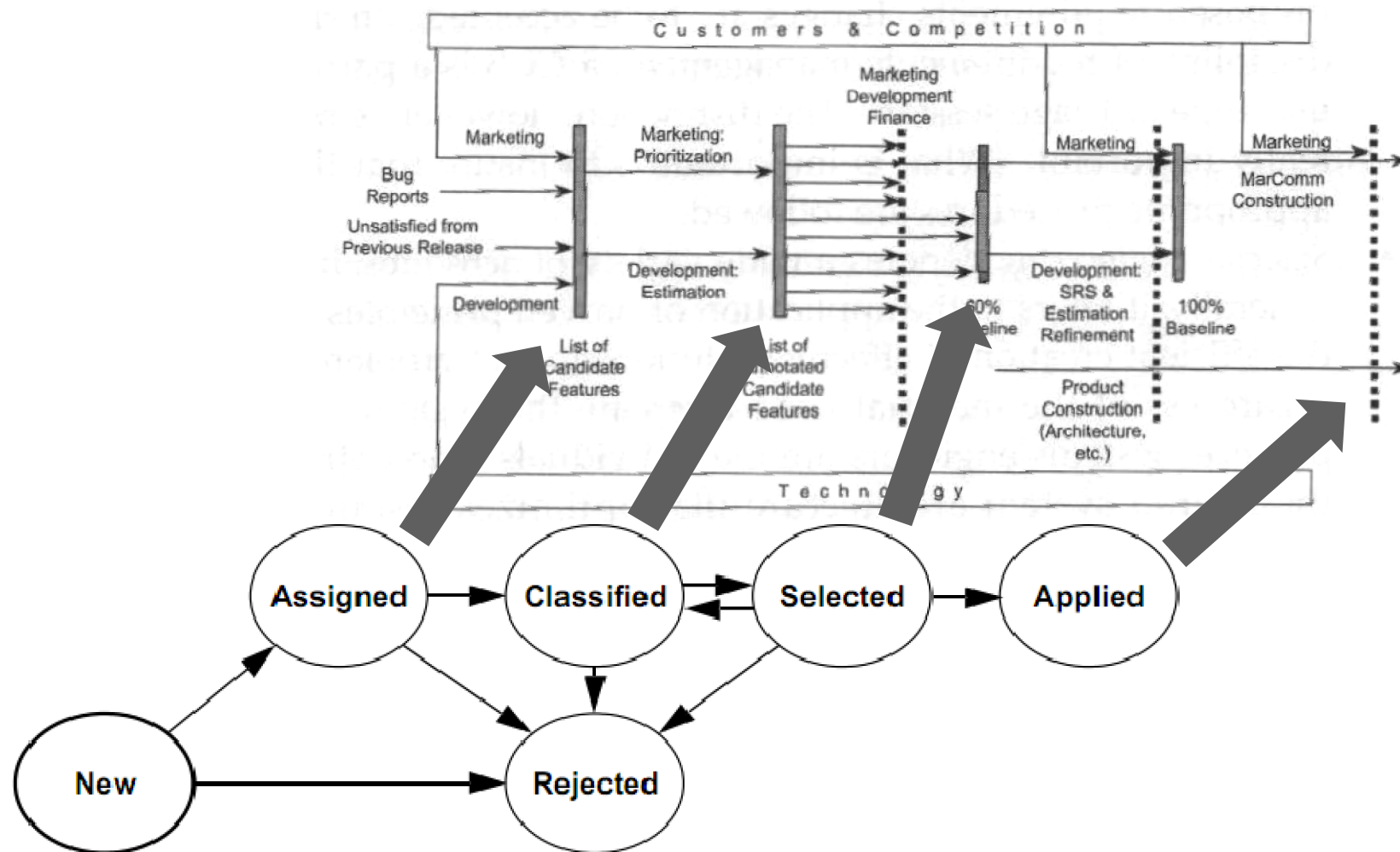
- Annotate candidate features to reflect your understanding of their relative importance, risk, and difficulty of satisfaction
- Select the features and document them as a list of requirements for the system to be built.



Requirements Triage

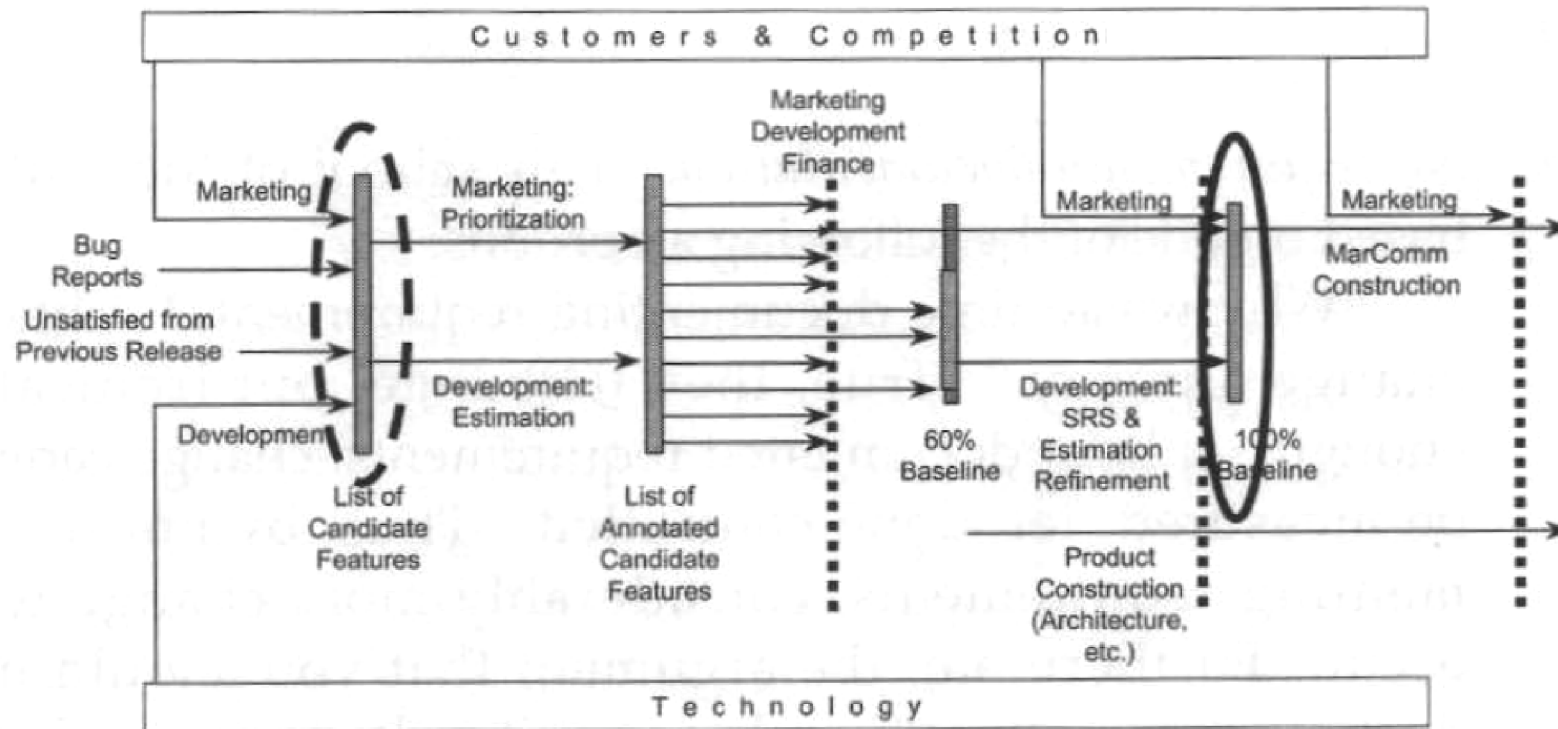


Requirements State Model

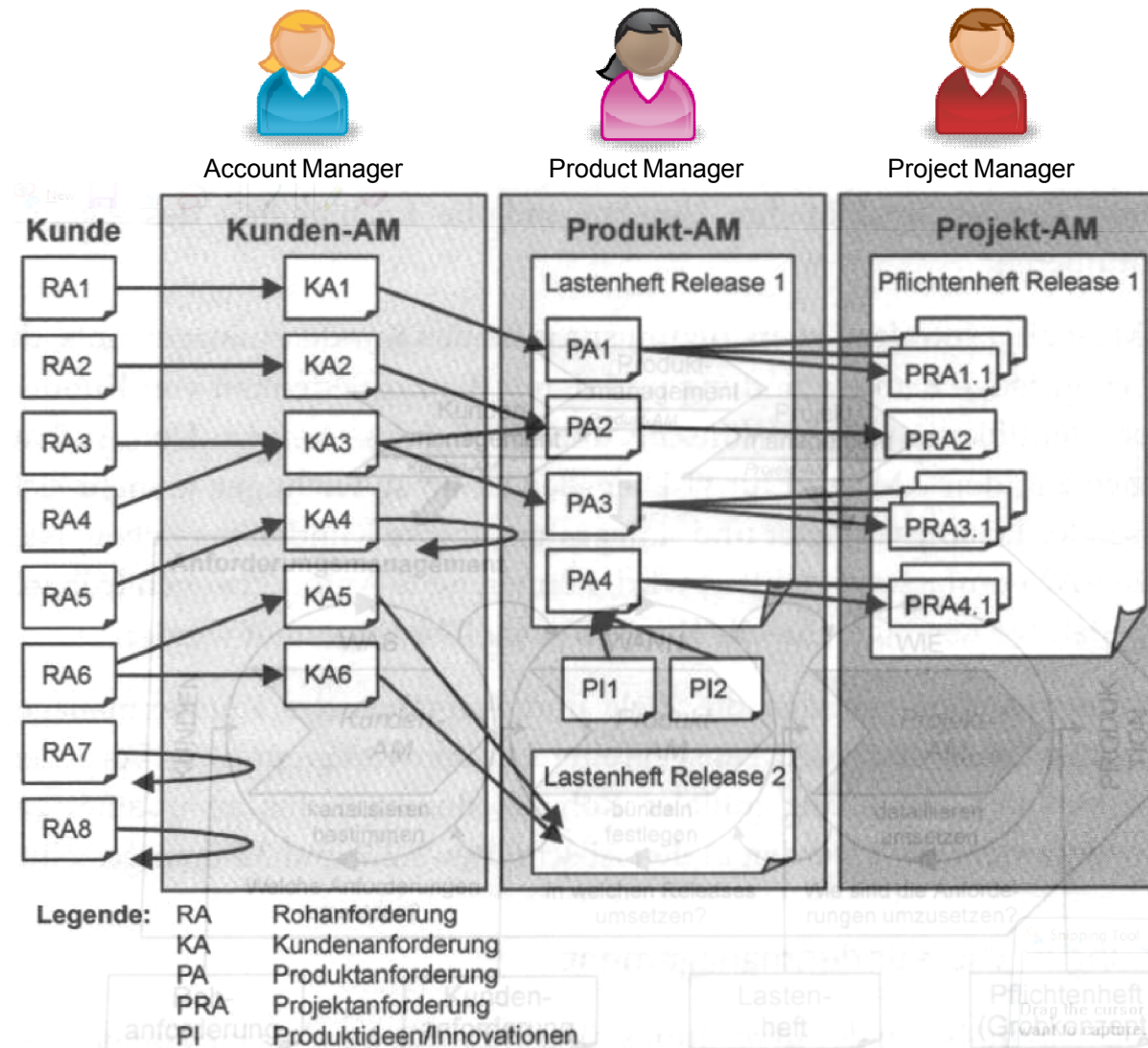




Requirements Specification



Interrelationships between Requirements





Contents

Learning Objectives

- Understand requirements elicitation and triage
- Be able to specify requirement catalogues

Agenda

- Overview RE in a Market-Driven Environment
- Product RE
 - Elicitation
 - Triage
 - Specification Documents
 - Requirements Catalogues

Requirements

- A requirement is...
 - ...an externally observable characteristic of a desired system, which is needed by a stakeholder to solve a problem or to achieve a goal.
 - ...a property or capability that a system must possess to fulfill a contract, a standard, a specification, or any other binding document.
 - ...the documentation of such a property or capability.



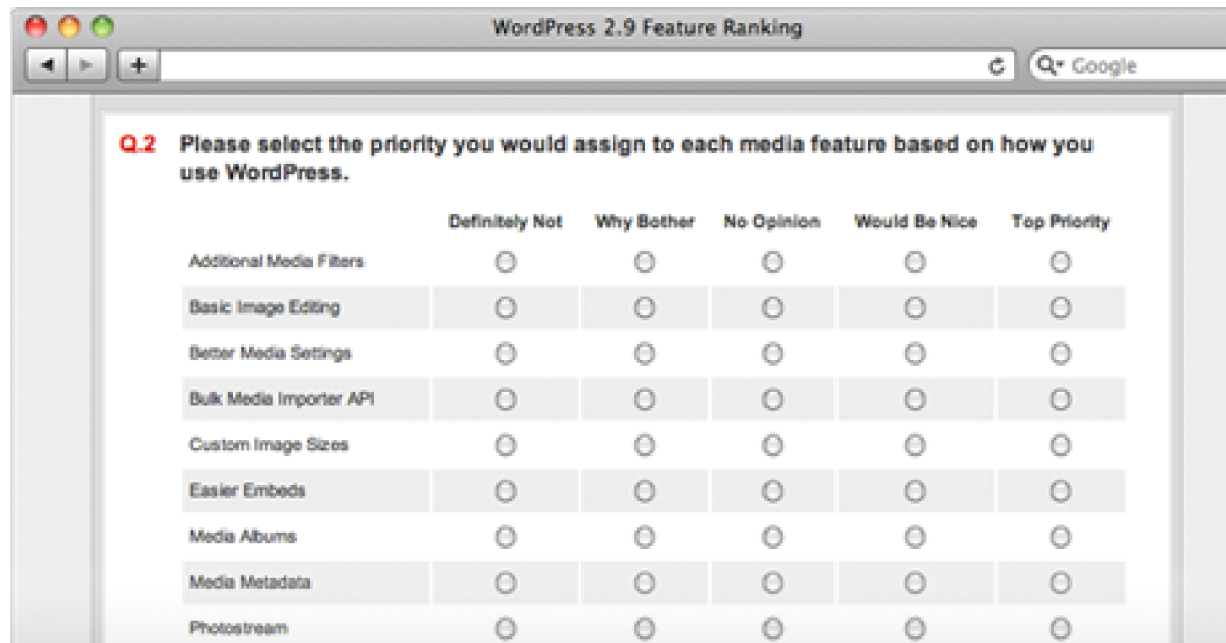
Important Elicitation Techniques

- Interviews
 - Structured and unstructured interviews
- Workshops
 - Creativity techniques: brainstorming, 6 thinking hats, ladders
 - Analysis techniques: card sorting, repertory grids, mind-mapping
 - Design techniques: prototyping (e.g. Joint Application Design, JAD)
 - Feedback techniques: reviews, focus groups
- Observation
 - Protocol analysis
 - Apprenticing
 - Ethnography
- Surveys
 - Questionnaires, self-recording
- Introspection
- Artefacts
 - Perspective-oriented reading
 - System archeology

Surveys



- Goal: Ask as many people as possible
- Technique
 - Paper or electronic questionnaires

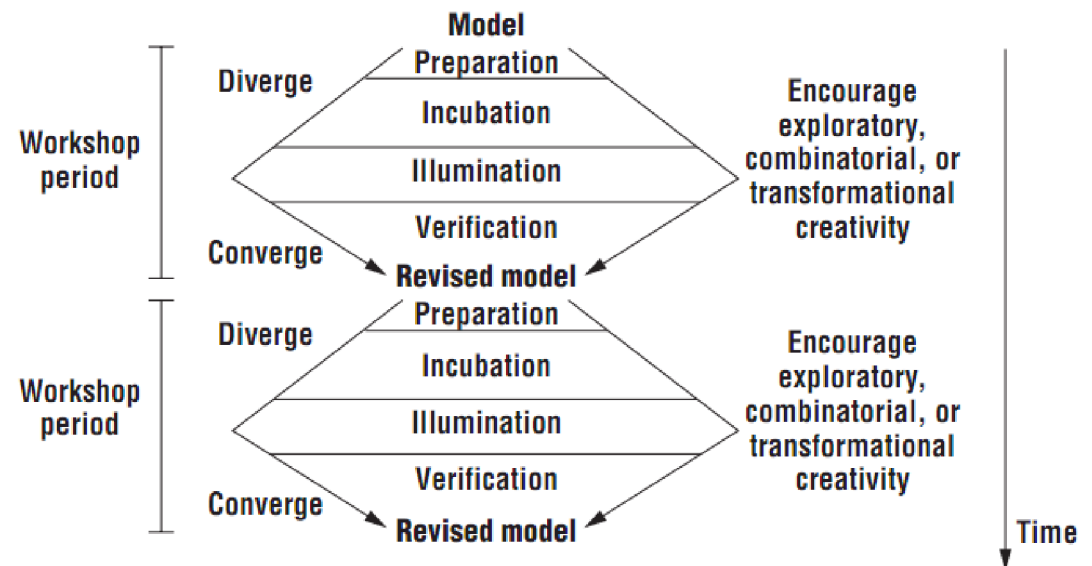


Q.2 Please select the priority you would assign to each media feature based on how you use WordPress.

	Definitely Not	Why Bother	No Opinion	Would Be Nice	Top Priority
Additional Media Filters	☐	☐	☐	☐	☐
Basic Image Editing	☐	☐	☐	☐	☐
Better Media Settings	☐	☐	☐	☐	☐
Bulk Media Importer API	☐	☐	☐	☐	☐
Custom Image Sizes	☐	☐	☐	☐	☐
Easier Embeds	☐	☐	☐	☐	☐
Media Albums	☐	☐	☐	☐	☐
Media Metadata	☐	☐	☐	☐	☐
Photostream	☐	☐	☐	☐	☐

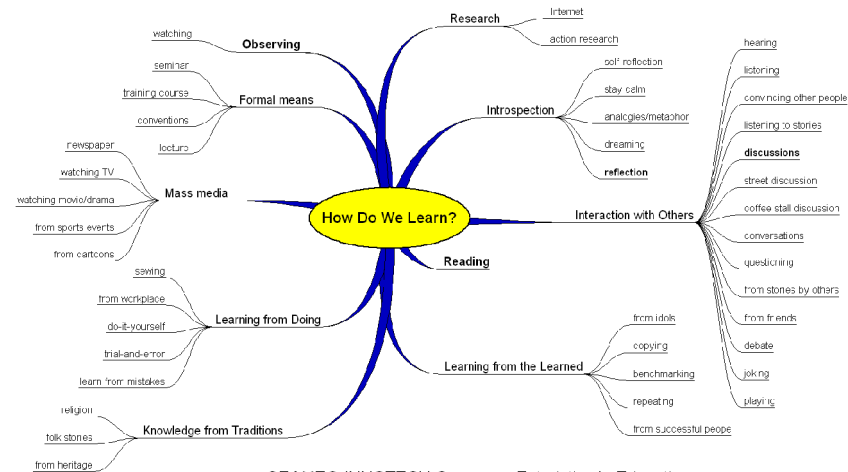
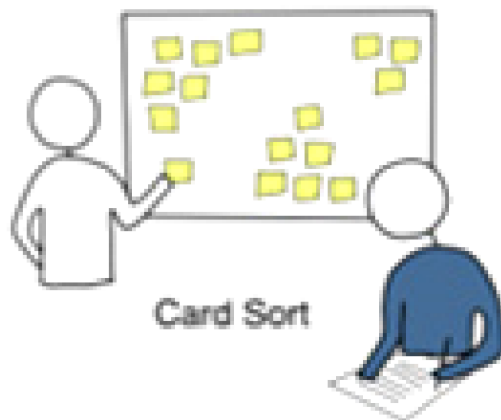
Workshops: Creativity Techniques

- Goal: Develop innovative Requirements
- Technique
 - Brainstorming: develop with a group of 5-10 people within a given time span ideas, use these ideas to develop further ideas, and analyze and filter ideas.
- Variants
 - EPM: Develop Ideas for alternating Stakeholder interest.
 - Change of Perspectives: Evaluate problem from various angles
 - Analogies: Transfer solutions of one domain to another domain



Workshops: Analysis Techniques

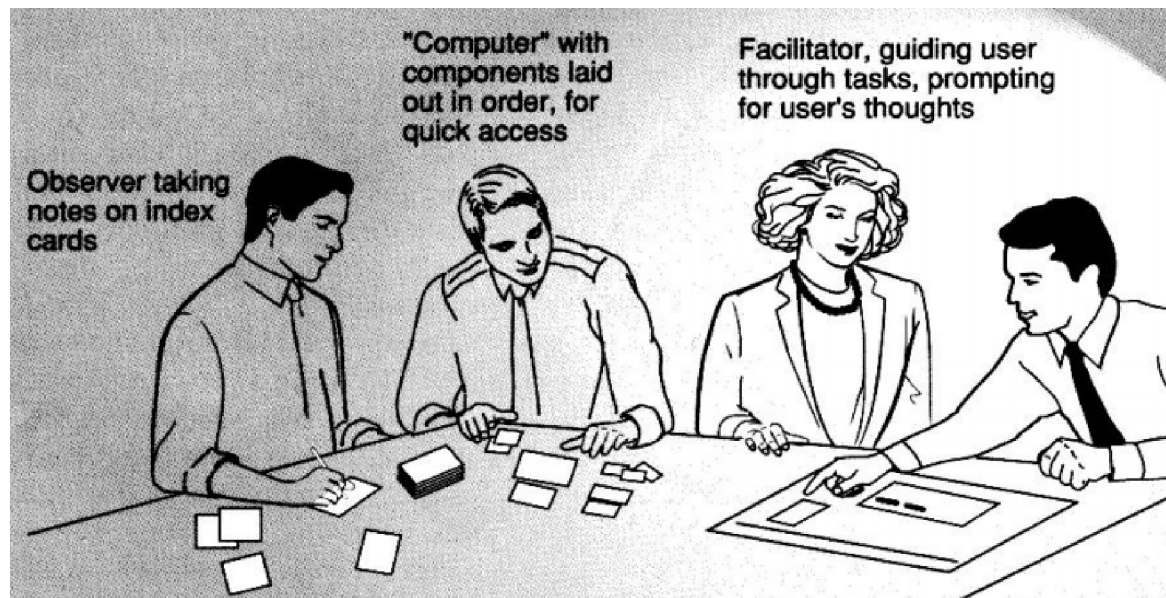
- Goal: Structure information
- Techniques
 - Card sort
 - Mind map



SEAMEO INNOTECH Course on Futuristics in Education
23 August 2005

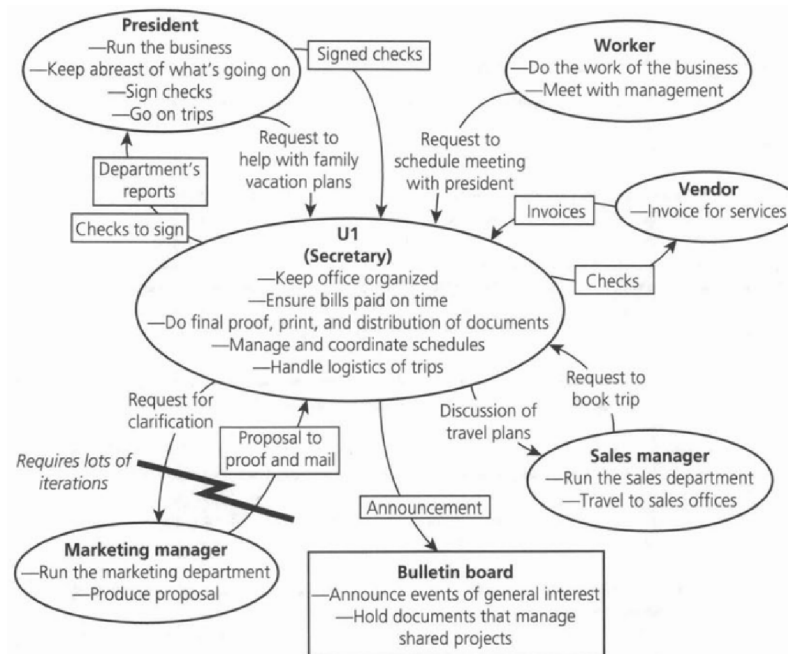
Workshops: Design Techniques

- Goal: Formulate expectations towards the solution
- Techniques:
 - Design user interface with pen and paper
 - Play scenarios with users and solution



Observation

- Goal: Discover implicit knowledge
- Techniques
 - Contextual Design



Artefacts

- Goal: Reuse solutions and experiences with existing systems.
- Techniques
 - Perspective-oriented reading
 - System archeology



Selection of Requirements Elicitation Techniques

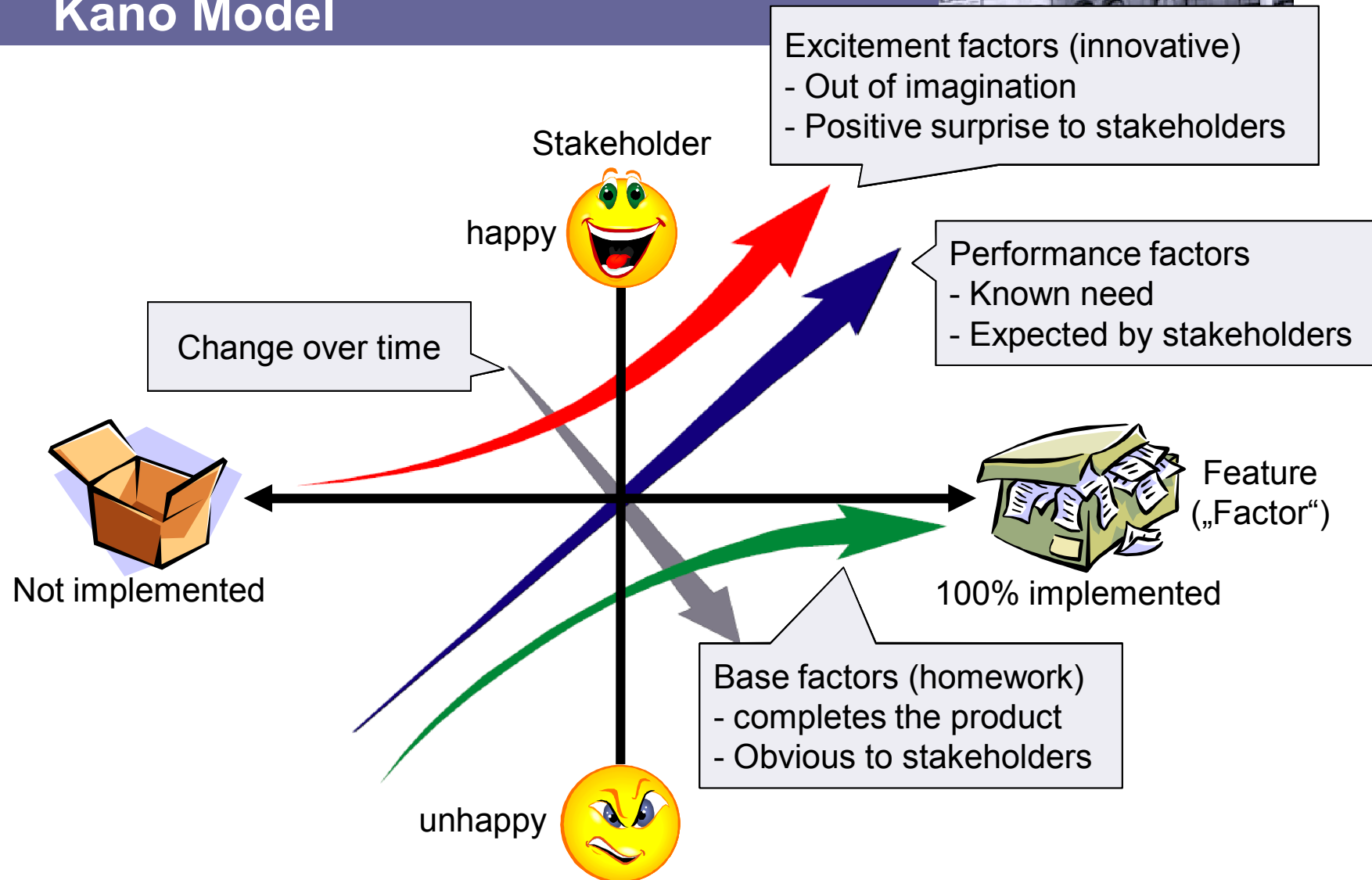


University of Zurich



- Problem:
There is no consensus on the relative yield of a given elicitation technique, except for:
 - Interviews, preferentially structured, appear to be one of the most effective elicitation techniques.
 - Experience of the requirements engineer does not appear to be a relevant factor.
- Requirements Elicitation Techniques should be used situationally.
- Elicitation Technique Selection Approaches:
 - Desired degree of innovation
 - Criteria-based approaches
 - Mirror selection approach used by experts

Kano Model



Selection based on Desired Degree of Innovation



University of Zurich



- Excitement Factors: Innovation
 - Creativity Techniques
 - Introspection
- Performance Factors
 - Structured and unstructured interviews
 - Analytical Techniques: card sorting, repertory grids
 - Survey
 - System archeology
 - Perspective-oriented reading
- Base Factors: „Homework“
 - Prototyping, Reviews, Focus Groups
 - Observation (protocol analysis, apprenticing, ethnography)

Criteria-based Selection



Factors
related to
stakeholders

Project-
related factors

System-
related factors

- - not useful
- rather not
0 neutral
+ rather yes
++ very useful

	- - not useful - rather not 0 neutral + rather yes ++ very useful																					
																						
	Brainstorming	Wechsel d. Perspektive	Mind Mapping	Feldbeobachtung	Apprenticing	Fragebogen	Interview	Selbstaufschreibung	On-Site-Customer	Systemarchäologie	Reuse	Simulationsmodelle	Anforderungsreview	NLP	Workshop	CRC-Karten	Snowcards	Audio-Aufzeichnung	Video-Aufzeichnung	Anwendungsfälle	Essenzbildung	Anforderungen erahnen
Mensch																						
geringe Motivation	-	-	-	+	-	+	+	-	-	0	0	++	0	0	+	+	0	0	+	0	0	++
schlechte kommunikative Fähigkeiten	-	-	0	-	++	0	-	-	-	0	0	+	0	++	-	-	-	0	0	+	0	+
implizites Wissen	+	+	+	++	++	-	-	-	-	0	0	++	0	++	0	0	0	0	0	0	0	++
geringes Abstraktionsvermögen	-	-	-	++	++	+	+	-	+	0	0	+	-	+	0	-	0	0	0	-	++	+
divergierende Stakeholdermeinungen	-	-	-	-	-	++	0	-	-	0	0	+	-	+	+	+	+	0	0	+	++	0
problematische Gruppendynamik	-	0	-	-	++	0	0	+	+	0	0	+	0	-	-	0	-	-	-	0	0	0
Organisatorische Rahmenbedingungen																						
Neuentwicklung	++	++	++	0	0	+	+	+	+	-	0	+	+	0	+	++	++	0	0	0	+	+
Altsystemerweiterung	0	0	0	+	+	+	+	+	+	++	0	+	+	0	+	+	+	0	0	0	0	+
Komplexer Markt	++	++	+	+	+	+	-	-	+	-	-	++	+	++	-	0	+	-	-	+	++	+
Individualentwicklung	0	0	0	+	+	+	+	++	++	+	0	+	+	0	+	0	+	0	0	0	0	+
Produktentwicklung	++	++	++	-	-	+	-	-	-	+	0	+	-	0	0	-	0	-	-	0	0	+
fixiertes, knappes Projektbudget	0	0	0	-	-	+	+	+	-	-	++	-	+	+	0	+	0	++	-	0	0	++
hohe Verteilung d. Stakeholder	-	-	-	0	0	+	-	++	-	0	0	+	0	0	-	-	-	0	0	0	0	0
schlechte Verfügbarkeit d. Stakeholder	-	-	-	++	-	+	-	-	-	0	++	+	0	0	-	-	-	++	++	0	0	++
hohe Zahl von Stakeholdern	-	0	0	-	-	+	-	-	-	0	0	+	-	0	-	-	-	-	-	+	+	0
Fachlicher Inhalt der Anforderungen																						
hohe Kritikalität des Systems	0	+	0	+	-	+	+	+	++	++	-	++	++	++	+	+	+	++	+	0	+	-
großer Systemumfang	0	0	0	++	+	-	+	+	+	+	++	-	+	0	+	+	+	0	0	++	++	+
hohe Komplexität der Systemabläufe	+	+	++	-	+	-	+	+	+	+	+	++	++	0	+	0	0	0	0	+	0	0
geringe Beobachtbarkeit	+	+	+	-	+	+	+	+	+	+	+	++	++	0	+	0	0	0	-	0	+	0
nicht funktionale Anforderungen	-	+	0	-	+	-	-	-	-	+	+	++	0	0	-	0	+	0	+	0	0	0
unbekanntes Fachgebiet	0	0	0	+	++	-	+	++	+	++	-	0	++	0	+	0	0	0	0	+	0	-



Expert Selection Approach

- Major Drivers
 - For each elicitation technique, there exists a specific, unique, small set of predicates concerning situational characteristics that drive experts to seriously consider that technique.
- Anomalies
 - For each elicitation technique, there exists a set of additional predicates which if true cause experts to alter their primary choice.
- Prerequisite Skills
 - For each elicitation technique, there exists a set of basic analyst skills that must be present or the technique will not be effective.
- Success Enhancers
 - For each elicitation technique, there exists a set of additional skills that are not universally needed, but that come into play during the technique's execution without pre-knowledge.

Expert Selection Approach: Example (Workshops)



- When and why to use or not to use workshops for requirements elicitation:

Major drivers	Anomalies	Prerequisite skills	Success enhancers
Multiple stakeholders, disparate needs, and a demand to reach consensus.	Geographical distribution of stakeholders, no suitable venue, and insufficient preparation time.	Communication, leadership, and ability to facilitate meetings.	Modelling, conflict resolution, and creativity skills.



Contents

Learning Objectives

- Understand requirements elicitation and triage
- Be able to specify requirement catalogues

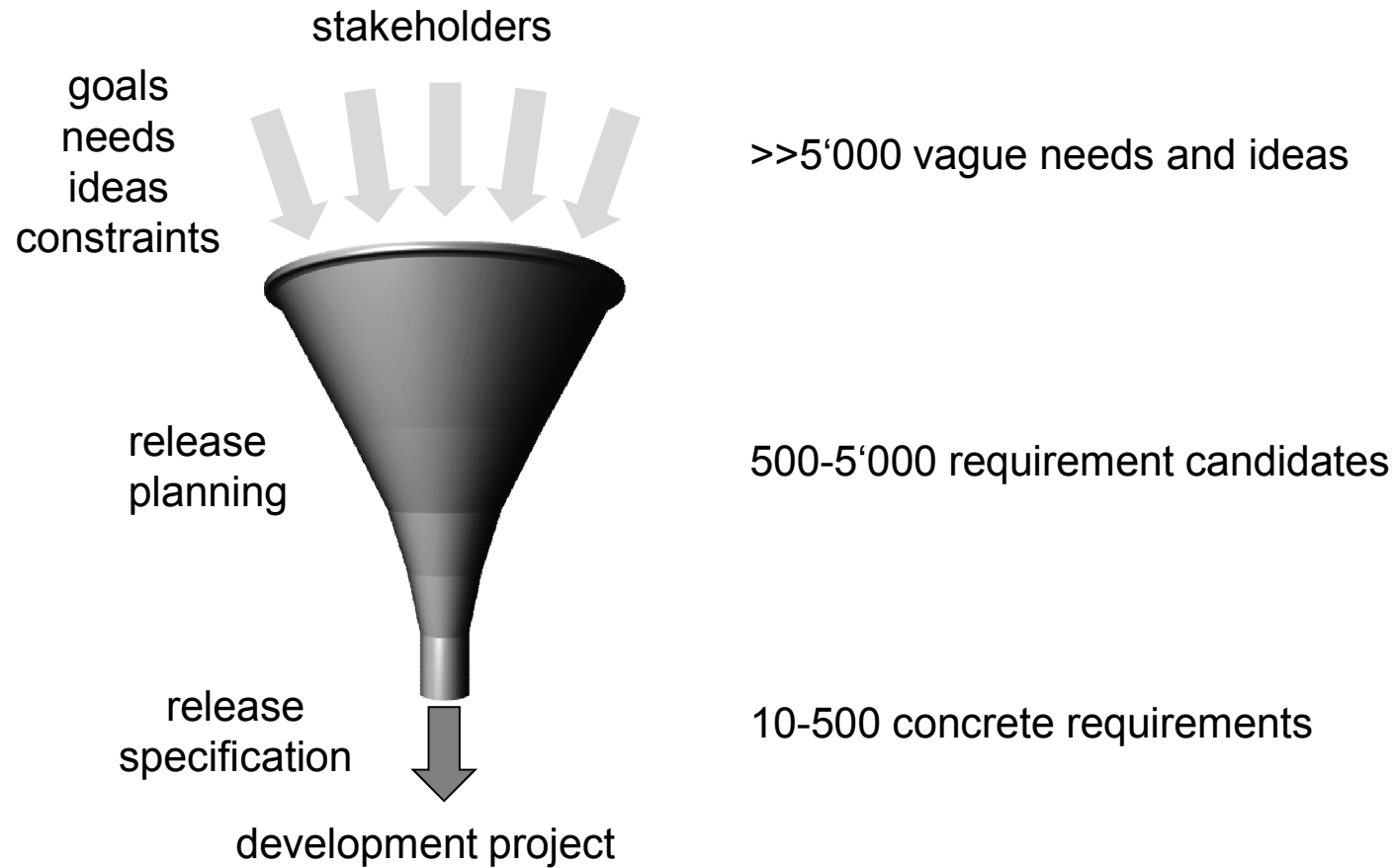
Agenda

- Overview RE in a Market-Driven Environment
- Product RE
 - Elicitation
 - Triage
 - Specification Documents
 - Requirements Catalogues

Typical Situation in a Market-Driven Environment



University of Zurich



Oct 26, 2009 / 34



Scalability Challenges

- Allocation of requirements to releases requires defining an implementation order for the requirements.
- Complexity of comparative sorting algorithms
 - Bubble sort: $O(n^2)$
→ 100 requirements ~ 5'000 comparisons
 - Quicksort: $O(n/\log n)$ in average
→ 100 requirements ~ 900 comparisons
- Stated needs risk to be goals or design constraints, rather than requirements
 - Requirements are means to achieve goals, hence do not compete.
 - Design decisions are means to achieve requirements, hence do not compete.



Structuring Requirements

- Objectives
 - Reduce the number of entities to be considered by evaluation and prioritization activities
 - Prepare the argumentation for a release plan proposal
- Approaches
 - **Separation of abstraction levels**: goals, requirements, and design constraints
 - Means and ends should not be compared to each other when prioritizing.
 - **Thematic grouping**
 - Requirements part of a thematic group should be implemented together.
 - **Allocation to beneficiaries**
 - A software release should sufficiently satisfy selected stakeholders.



Separation of Abstraction Levels

- Principle: means and ends should not be compared to each other when prioritizing.
 - An abstraction level groups those requests that can be compared with each other.
- Abstraction levels
 - Requirements on the same abstraction level are comparable to each other.
 - The highest abstraction level is closest to company strategy
 - The lowest abstraction level is closest to software design.
- Traceability across abstraction levels allows understanding of how software design contributes to implementing the company strategy.

Abstraction Levels for Library Management System



University of Zurich

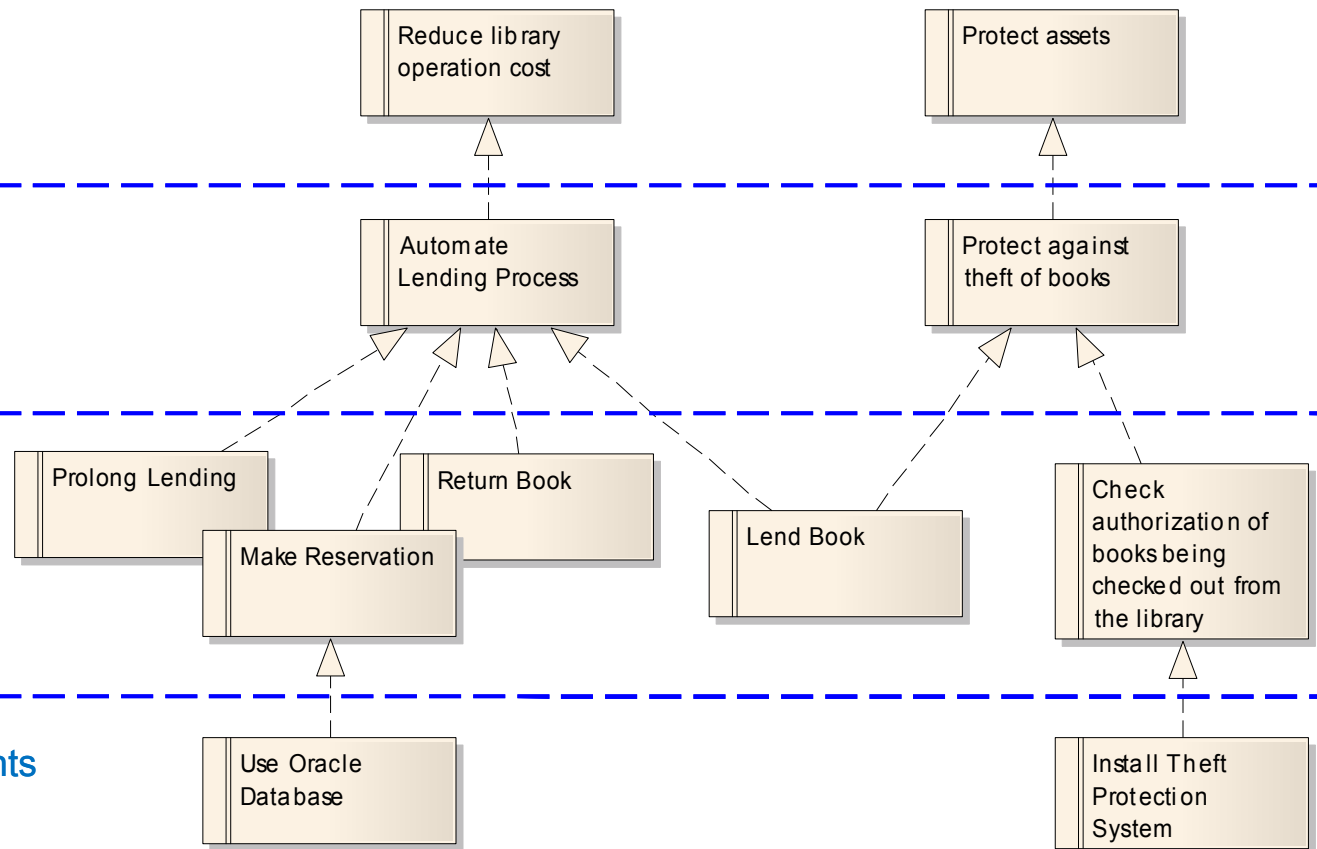


Company Goals

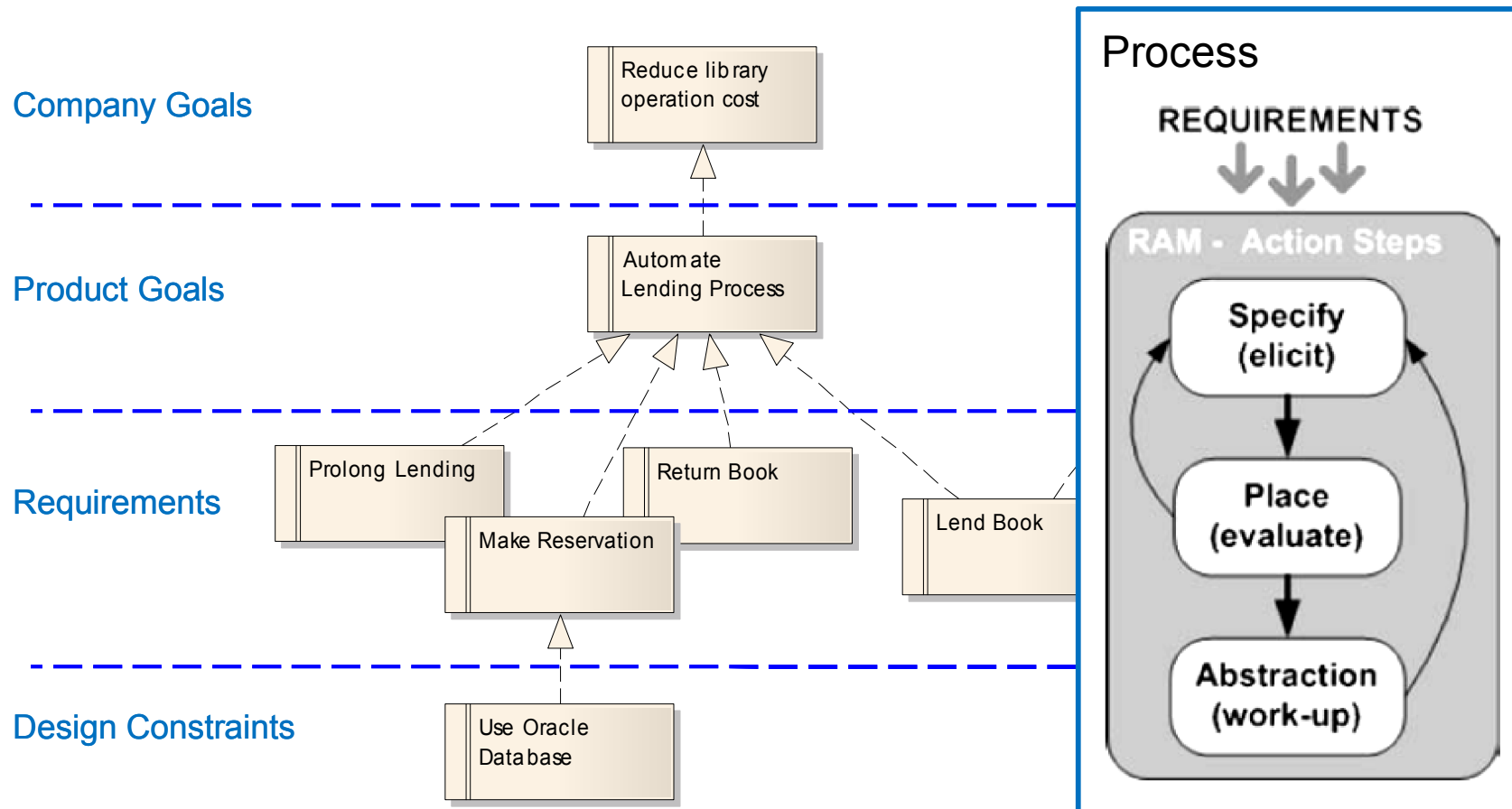
Product Goals

Requirements

Design Constraints



Abstraction Levels for Library Management System

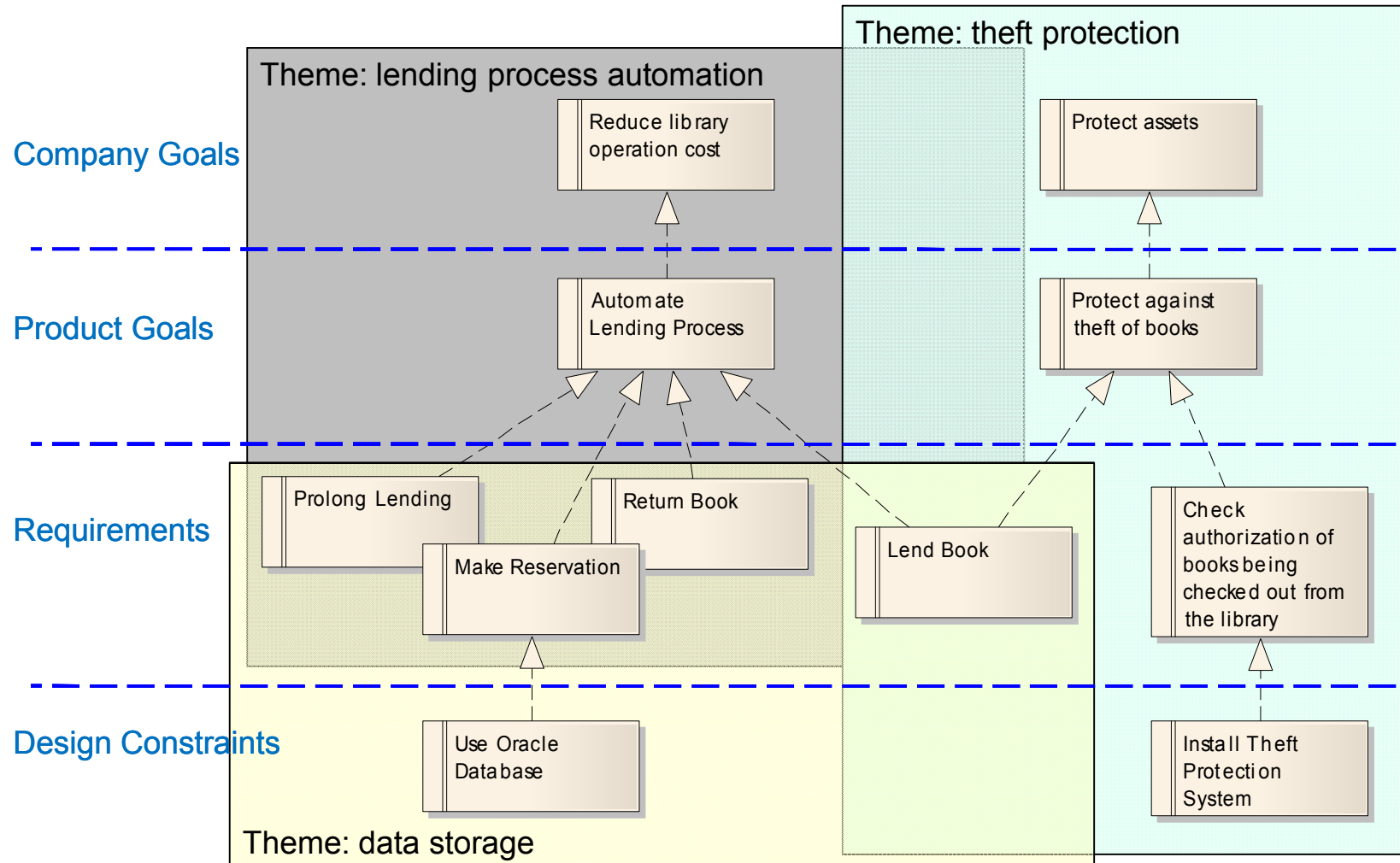




Thematic Grouping

- A theme groups requirements that should be implemented together.
- A release theme typically
 - Is interesting enough to be mentioned in [press releases](#) and used in advertising campaigns
 - Appears in [sales leaflets](#) and product brochures
 - Is small and broad enough for evaluating alternative implementation strategies
- Other appearances of themes
 - [Product Roadmap](#): long-term planning of software product evolution
 - [Requirements Communication](#): negotiation of requirements understanding

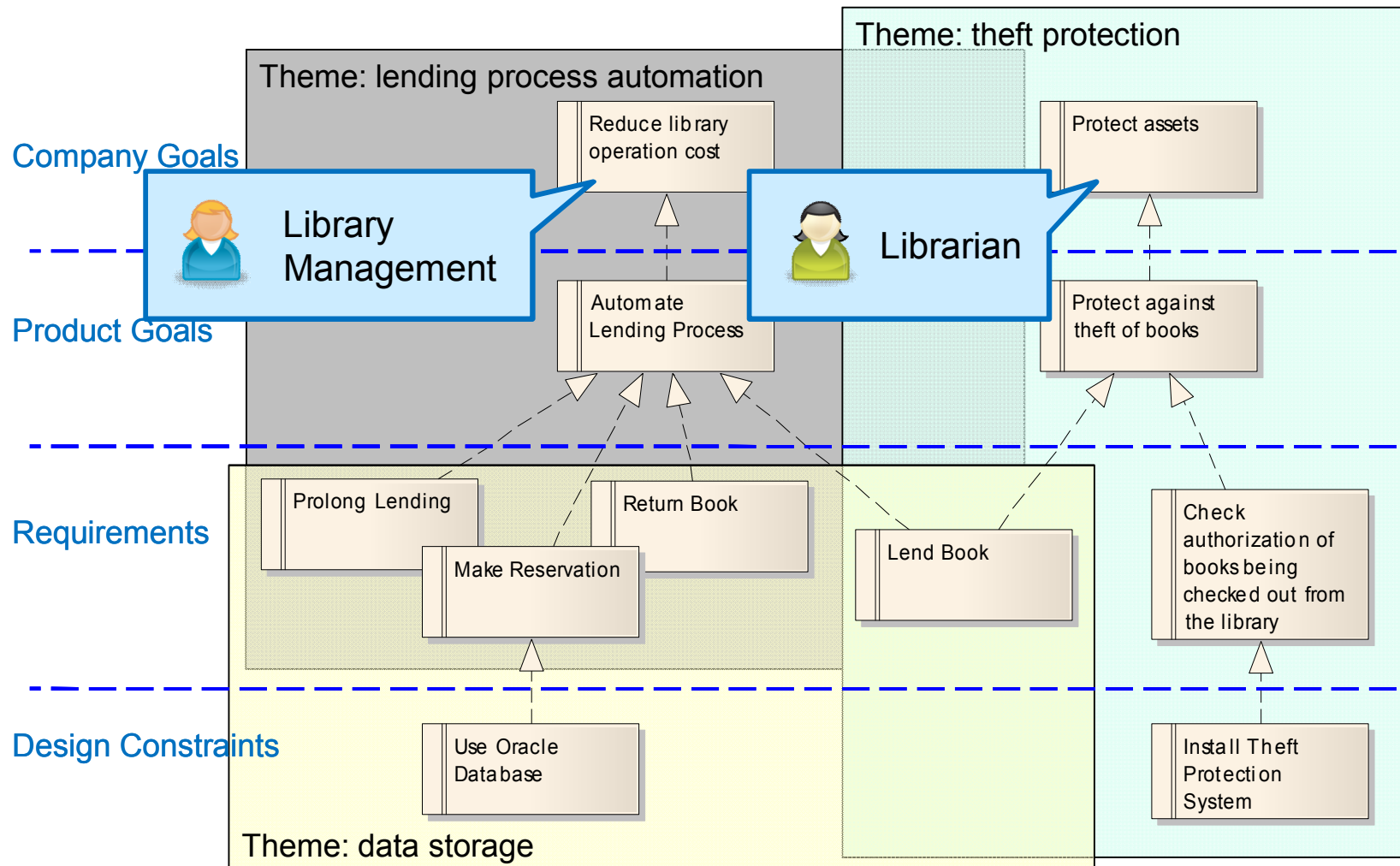
Themes for Library Management System



Allocating to Beneficiaries

- A beneficiary is a stakeholder or stakeholder group that benefits from the implementation of given requirements.
- Beneficiaries help understanding the political situation
 - Who is in power, who not?
 - Who can wait longer, who not?
- Beneficiaries should be informed when themes have been implemented that are important for them.
 - The implemented requirements should allow telling a story to the stakeholder about the release, i.e. allow selling the release.

Beneficiaries of the Library Management System



Benefits and Drawbacks of Requirements Structuring



University of Zurich



- Benefits
 - **Simplification through abstraction levels** (industrial experiences):
Product goals represent about 1/3 of expectations
Requirements represent about 1/3 of expectations
Design constraints represent about 1/4 of expectations
 - **Simplification through thematic grouping** (industrial experiences):
One theme contains 0-51 requirements (average of about 8 requirements)
 - **Consideration of benefitting stakeholders** exposes political environment
- Drawbacks
 - Structuring takes initial effort
 - Often only effective with tool support, e.g. for maintaining traceability



Contents

Learning Objectives

- Understand requirements elicitation and triage
- Be able to specify requirement catalogues

Agenda

- Overview RE in a Market-Driven Environment
- Product RE
 - Elicitation
 - Triage
 - Specification Documents
 - Requirements Catalogues

Standards für Anforderungsspezifikationen



University of Zurich



	Auftraggeber	Auftragnehmer
English	IEEE 1362	IEEE 830
Germany (V-Modell XT)	Lastenheft	Pflichtenheft
Switzerland (HERMES)	Pflichtenheft	(Offerte)
Rational Unified Process	Stakeholder Request	Vision, Use Cases, Supplementary Requirements
Scrum	Product Backlog	Sprint Backlog



IEEE 830: Table of Contents

Table of Contents

1. Introduction

1.1 Purpose

1.2 Scope

1.3 Definitions, acronyms, and abbreviations

1.4 References

1.5 Overview

2. Overall description

2.1 Product perspective

2.2 Product functions

2.3 User characteristics

2.4 Constraints

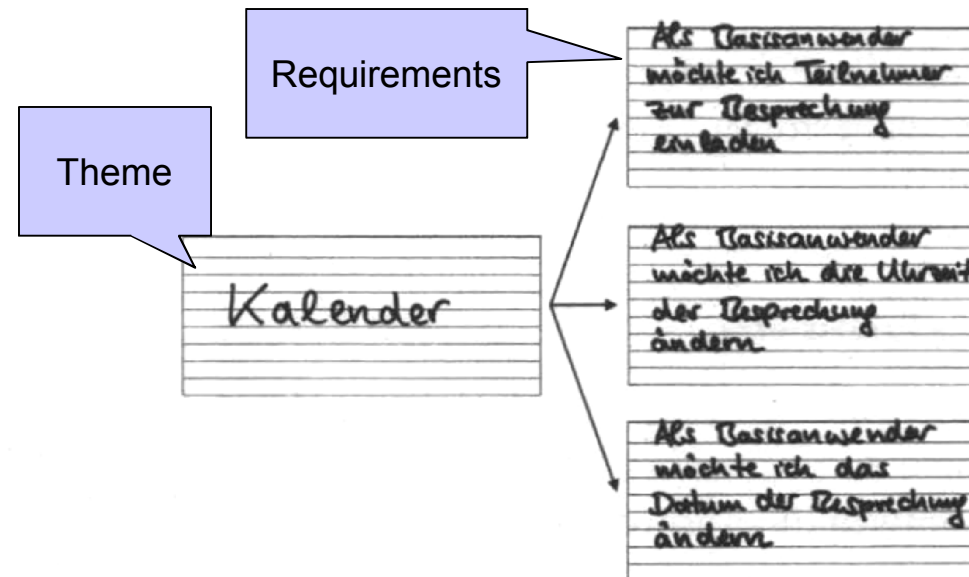
2.5 Assumptions and dependencies

3. Specific requirements (See 5.3.1 through 5.3.8 for explanations of possible specific requirements. See also Annex A for several different ways of organizing this section of the SRS.)

Appendixes

Index

Scrum Product Backlog



Product Backlog
<u>Must</u> have
<u>Should</u> have
<u>Could</u> have
<u>Won't</u> have

Werden in der nächsten Version realisiert

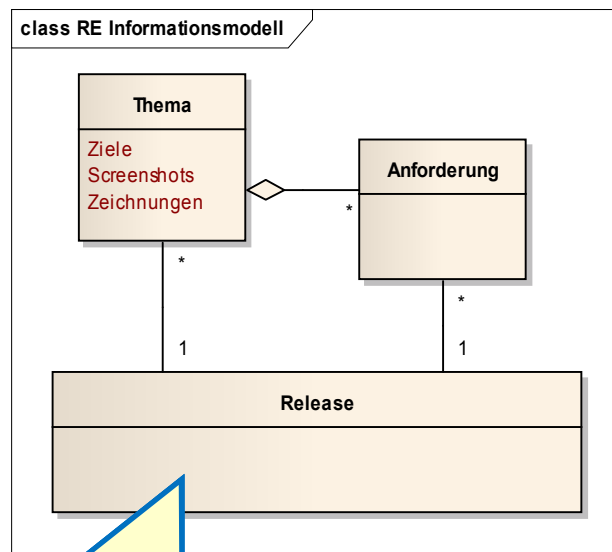
Besprechung anlegen

Als Basisanwender möchte ich eine neue Besprechung anlegen können und den Besprechungs-namen, Angelegenheit, Datum, Start- und Endzeit angeben.

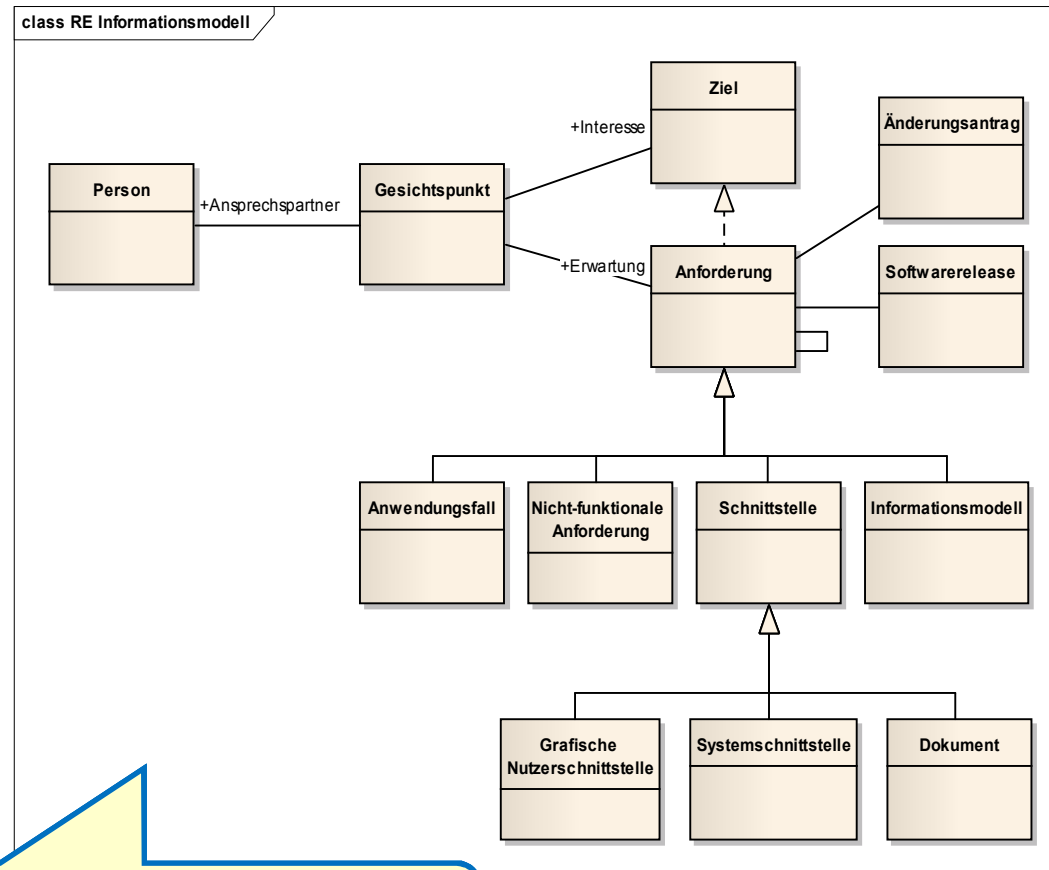
Akzeptanzkriterien

- Startzeit darf nicht vor der Endzeit liegen
- Die Besprechung muss erfolgreich abgespeichert werden
- Das Datum darf nicht in der Vergangenheit liegen

Beispiele von Requirements-Metamodellen



Works well for Agile Development



Works well for IEEE 830-oriented RE



Contents

Learning Objectives

- Understand requirements elicitation and triage
- Be able to specify requirement catalogues

Agenda

- Overview RE in a Market-Driven Environment
- Product RE
 - Elicitation
 - Triage
 - Specification Documents
 - Requirements Catalogues

Specification of Requirements Catalogues



University of Zurich



- SMART
 - Specific
 - Measurable
 - Attainable
 - Realisable
 - Time-bounded
- Specification Guidelines
 1. Use unique identifiers
 2. Write full active-tense sentences
 3. Separate clarification and importance
 4. Differentiate means and ends
 5. Atomize requirements
 6. Identify and concretize vagueness
 1. Refine vagueness with requirements
 2. Refine vagueness with acceptance criteria
 3. Refine vagueness with proposed solutions
 7. Define exceptions and alternatives
 8. Use a limited vocabulary (glossary)
 9. Increase legibility of requirements specification



Case Study: Coffee Machine

- Scenario of buying a coffee machine:
 - We are a large and active family that is regularly visited by family and friends. Unfortunately, our coffee machine broke down this weekend. Before going to the shop, we must try to decide what the new machine must be capable of. We like luxury. We like making coffee in our modern kitchen which has all the latest conveniences. We usually make coffee for the whole family, but at times we also like a nice cup of cappuccino or Espresso.
- The family draws up the following wish list:
 - minimum of 12 cups in one go
 - must be modern
 - quick and easy to clean
 - preferably support different types of coffee
 - has a thermos flask
 - must have a timer

Guideline 1: Use unique identifiers



Unique identifiers: use every identifier only once (even when a requirement has been deleted).

Requirements	ID
Minimum of 12 cups in one go	R01
Must be modern	R02
Quick and easy to clean	R03
Preferably support different types of coffee	R04
Has a thermos flask	R05
Must have a timer	R06

Guideline 2: Write full active-tense sentences



University of Zurich



Unique identifiers: use every identifier only once (even when a requirement has been deleted).

Requirements	ID
Minimum of 12 cups in one go	R01
Must be modern	R02
Quick and easy to clean	R03
Preferably support different types of coffee	R04
Has a thermos flask	R05
Must have a timer	R06

Guideline 2: Write full active-tense sentences



University of Zurich



Subject

Verb

Parameters

Requirements	ID
The coffee machine must be able to make 12 cups of coffee in one go.	R01
The coffee machine must be modern.	R02
It is possible to quickly and easily clean the coffee machine.	R03
The user is able to preferably make different types of coffee with the coffee machine.	R04
The coffee machine has a thermos flask.	R05
The coffee machine must have a timer.	R06

Guideline 3: Separate clarification and importance



University of Zurich



Requirements	ID
The coffee machine must be able to make 12 cups of coffee in one go.	R01
The coffee machine must be modern.	R02
It is possible to quickly and easily clean the coffee machine.	R03
The user is able to preferably make different types of coffee with the coffee machine.	R04
The coffee machine has a thermos flask.	R05
The coffee machine must have a timer.	R06

Guideline 3: Separate clarification and importance



Simplify.
Separate clarification from requirement.
Clarifications should be goals.

Define importance in glossary:
1: essential; 2: important; 3: preferable

Requirements	Importance	ID
The coffee machine is able to make 12 cups of coffee in one go. Clarification: being a large family we would like to be able to make coffee fast and easily.	2	R01
The coffee machine is modern.	1	R02
It is possible to quickly and easily clean the coffee machine.	2	R03
The coffee machine makes different types of coffee.	3	R04
The coffee machine has a thermos flask.	2	R05
The coffee machine has a timer.	1	R06

Guideline 4: Differentiate Abstraction Levels



University of Zurich



Requirements	Importance	ID
The coffee machine is able to make 12 cups of coffee in one go. Clarification: being a large family we would like to be able to make coffee fast and easily.	2	R01
The coffee machine is modern.	1	R02
It is possible to quickly and easily clean the coffee machine.	2	R03
The coffee machine makes different types of coffee.	3	R04
The coffee machine has a thermos flask.	2	R05
The coffee machine has a timer.	1	R06

Guideline 4: Differentiate Abstraction Levels



Abstraction Level

Requirements (what: use and maintenance of the product)	Importance	ID
The coffee machine is able to make 12 cups of coffee in one go.	2	R01
The coffee machine is modern.	1	R02
It is possible to quickly and easily clean the coffee machine.	2	R03
The coffee machine makes different types of coffee.	3	R04
The coffee machine keeps the coffee warm.	2	R05
The user plans the availability of coffee.	1	R06

Reference to Requirement

Implementation (how: design and structure of the product)	Supports	Importance	ID
The coffee machine has a thermos flask.	R05	2	Imp01
The coffee machine has a timer.	R06	1	Imp02

Guideline 5: Atomize and group requirements



University of Zurich



Requirements	Importance	ID
The coffee machine is able to make 12 cups of coffee in one go.	2	R01
The coffee machine is modern.	1	R02
It is possible to quickly and easily clean the coffee machine.	2	R03
The coffee machine makes different types of coffee.	3	R04
The coffee machine keeps the coffee warm.	2	R05
The user plans the availability of coffee.	1	R06

Guideline 5: Atomize and group requirements



1 statement per requirement.

Correct priorities.

New identifiers.

Requirements	Imp.	ID
The coffee machine makes coffee.	1	R07
It is possible to make a minimum of 12 cups of coffee in one go.	2	R01
It is possible to make different types of coffee.	2	R04
The coffee machine is modern.	1	R02
It is possible to clean the coffee machine.	1	R03
It is possible to quickly clean the coffee machine.	2	R08
It is possible to easily clean the coffee machine.	1	R09
The coffee machine keeps the coffee warm.	2	R05
The user plans the availability of coffee.	1	R06

Guideline 6: Identify and concretize vagueness



University of Zurich



Requirements	Imp.	ID
The coffee machine makes coffee.	1	R07
It is possible to make a minimum of 12 cups of coffee in one go.	2	R01
It is possible to make different types of coffee.	2	R04
The coffee machine is modern .	1	R02
It is possible to clean the coffee machine.	1	R03
It is possible to quickly clean the coffee machine.	2	R08
It is possible to easily clean the coffee machine.	1	R09
The coffee machine keeps the coffee warm.	2	R05
The user plans the availability of coffee.	1	R06

Guideline 6: Identify and concretize vagueness



University of Zurich



Statement too strong or weak?

Does everybody understand the same behind the statement?

Requirements	Imp.	ID
The coffee machine makes coffee.	1	R07
It is possible to make <a lot of coffee> in one go.	2	R01
It is possible to make <different types of coffee> .	2	R04
The coffee machine is <modern> .	1	R02
It is possible to clean the coffee machine.	1	R03
It is possible to <quickly> clean the coffee machine.	2	R08
It is possible to <easily> clean the coffee machine.	1	R09
The coffee machine keeps the coffee warm.	2	R05
The user plans the availability of coffee.	1	R06

Guideline 6.1: Refine vagueness with requirements



University of Zurich



Requirements	Imp.	ID
The coffee machine makes coffee.	1	R07
It is possible to make <a lot of coffee> in one go.	2	R01
It is possible to make <different types of coffee> .	2	R04
The coffee machine is <modern> .	1	R02
It is possible to clean the coffee machine.	1	R03
It is possible to <quickly> clean the coffee machine.	2	R08
It is possible to <easily> clean the coffee machine.	1	R09
The coffee machine keeps the coffee warm.	2	R05
The user plans the availability of coffee.	1	R06

Guideline 6.1: Refine vagueness with requirements



University of Zurich



Requirements		Imp.	ID
The coffee machine makes coffee.		1	R02
It is possible to make <different types of coffee>.		2	R04
<different types of coffee> = Espresso		3	R10
<different types of coffee> = Cappuccino		2	R11
<different types of coffee> = Fresh Brew		1	R12

Property

Refinements

Correct priorities.

New identifiers.

Guideline 6.2: Refine vagueness with acceptance criteria



University of Zurich



Requirements	Imp.	ID
The coffee machine makes coffee.	1	R07
It is possible to make <a lot of coffee> in one go.	2	R01
It is possible to make <different types of coffee> .	2	R04
The coffee machine is <modern> .	1	R02
It is possible to clean the coffee machine.	1	R03
It is possible to <quickly> clean the coffee machine.	2	R08
It is possible to <easily> clean the coffee machine.	1	R09
The coffee machine keeps the coffee warm.	2	R05
The user plans the availability of coffee.	1	R06

Guideline 6.2: Refine vagueness with acceptance criteria



University of Zurich



Property

Acceptance criteria

Requirments	Imp.	ID
The coffee machine makes coffee.	1	R07
It is possible to make <a lot of coffee> in one go. <a lot of coffee> = a minimum of 12 cups.	2	R01
It is possible to clean the coffee machine.	1	R03
It is possible to <quickly> clean the coffee machine. <quickly> = within 5 minutes.	2	R08

Guideline 6.3: Refine vagueness with proposed solution



University of Zurich



Requirements	Imp.	ID
The coffee machine makes coffee.	1	R07
It is possible to make <a lot of coffee> in one go.	2	R01
It is possible to make <different types of coffee> .	2	R04
The coffee machine is <modern> .	1	R02
It is possible to clean the coffee machine.	1	R03
It is possible to <quickly> clean the coffee machine.	2	R08
It is possible to <easily> clean the coffee machine.	1	R09
The coffee machine keeps the coffee warm.	2	R05
The user plans the availability of coffee.	1	R06

Guideline 6.3: Refine vagueness with proposed solution



Requirements (What)	Prop. ID	ID
The coffee machine is <modern> .	1	R02
It is possible to clean the coffee machine.	1	R03
It is possible to <easily> clean the coffee machine.	1	R09

Implementation (How)	Supports	Importance	ID
The coffee machine is made of die-cast alloy.	R02	2	Imp03
The coffee machine has an angular shape.	R02	1	Imp04
<Few parts> can get dirty. <Few parts> = a maximum of 5 parts.	R09	1	Imp05
The parts are dishwasher proof.	R09	2	Imp06

Guideline 7: Define exceptions and alternatives



University of Zurich



Rule.
„if [condition]: then [requirement]“

Requirements	Imp.	ID
The coffee machine makes coffee.	1	R02
If the water is gone: the coffee making stops.	1	R13
The coffee machine keeps the coffee warm.	2	R05
If the <warming period> is reached: the warming of coffee stops. <warming period> = 30 minutes.	2	R14
The user plans the availability of coffee.	1	R06
If the set time is reached: coffee making starts	1	R15

Guideline 8: Use a limited vocabulary (glossary)



University of Zurich



Use only defined terms in the requirements specification.

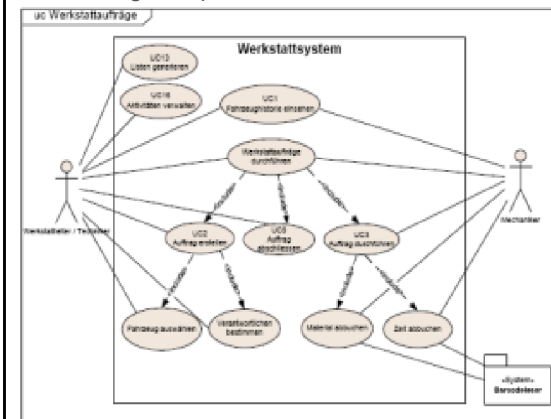
Terms and Abbr.	Definition, Synonyms, Examples
Cappuccino	Coffee with hot milk and milk foam.
Espresso	Black coffee made with steam.
Filter	Porous object or object with small holes that allow liquids through and holds back particles.
Cup	Drinking utensil, consisting of a small round bowl with an ear. Commonly holds 15cl.
Fresh brew	Coffee made by the filter method.
Warming period	Amount of time that the coffee is kept warm by the coffee machine.

Guideline 9: Increase Legibility

- Structure chapters as follows:
 - **Prose**: Summary of contained requirements in plain text.
 - **Drawings**: Graphical structuring of contained requirements.
 - **Tables**: SMART requirements.
- Evolution of requirements:
 - **Early requirements engineering**: Often only prose and low-quality requirements.
 - **Late-phase requirements engineering**: High-quality requirements according to SMART principles

3.7 Chapter XYZ

A backpacker wants to be able to make a good cup of coffee during his trip around the world. However, he is very worried about theft and a good coffee machine is one of his most treasured possessions. Without coffee, he would rather cancel his trip. The problem is that he already has a great many things to take with him. He would like to travel as light as possible.



Requirements	Imp.	ID
The coffee machine makes coffee.	1	R07
It is possible to make <a lot of coffee> in one go.	2	R01
It is possible to make <different types of coffee>.	2	R04
The coffee machine is <modern>.	1	R02
It is possible to clean the coffee machine.	1	R03
It is possible to <quickly> clean the coffee machine.	2	R08

Contents

Learning Objectives

- Understand requirements elicitation and triage
- Be able to specify requirement catalogues

Agenda

- Overview RE in a Market-Driven Environment
- Product RE
 - Elicitation
 - Triage
 - Specification Documents
 - Requirements Catalogues