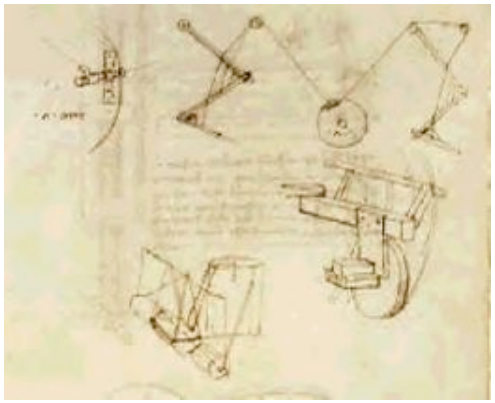
PMR 5020

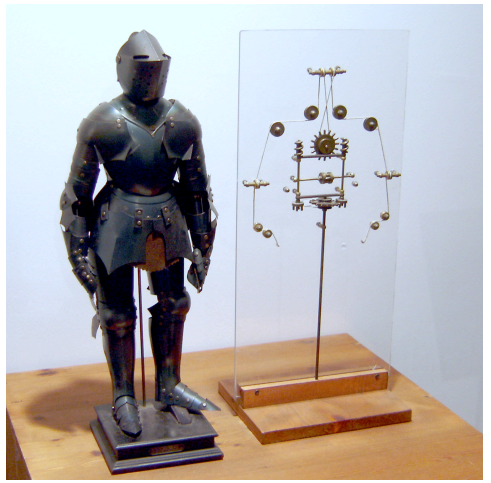
Metodologia do *Projeto* de Sistemas

Aula 5: Engenharia Requisitos

Prof. Dr. José Reinaldo Silva

reinaldo@poli.usp.br





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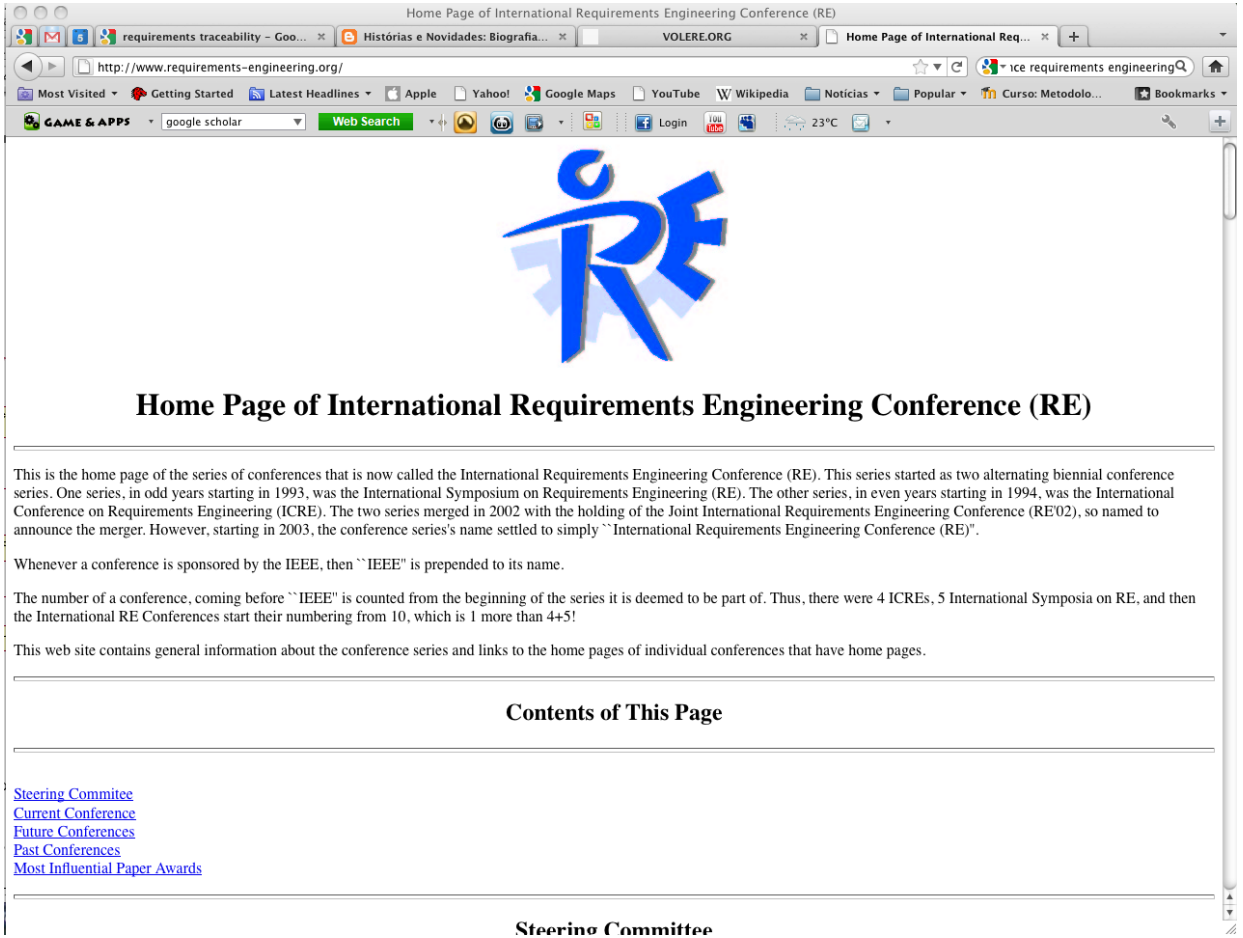
MECATRÔNICA

Pesquisa Internacional em RE



www.requirements-engineering.org

2011: Trento, Italy 29 August -- 2 September 2011

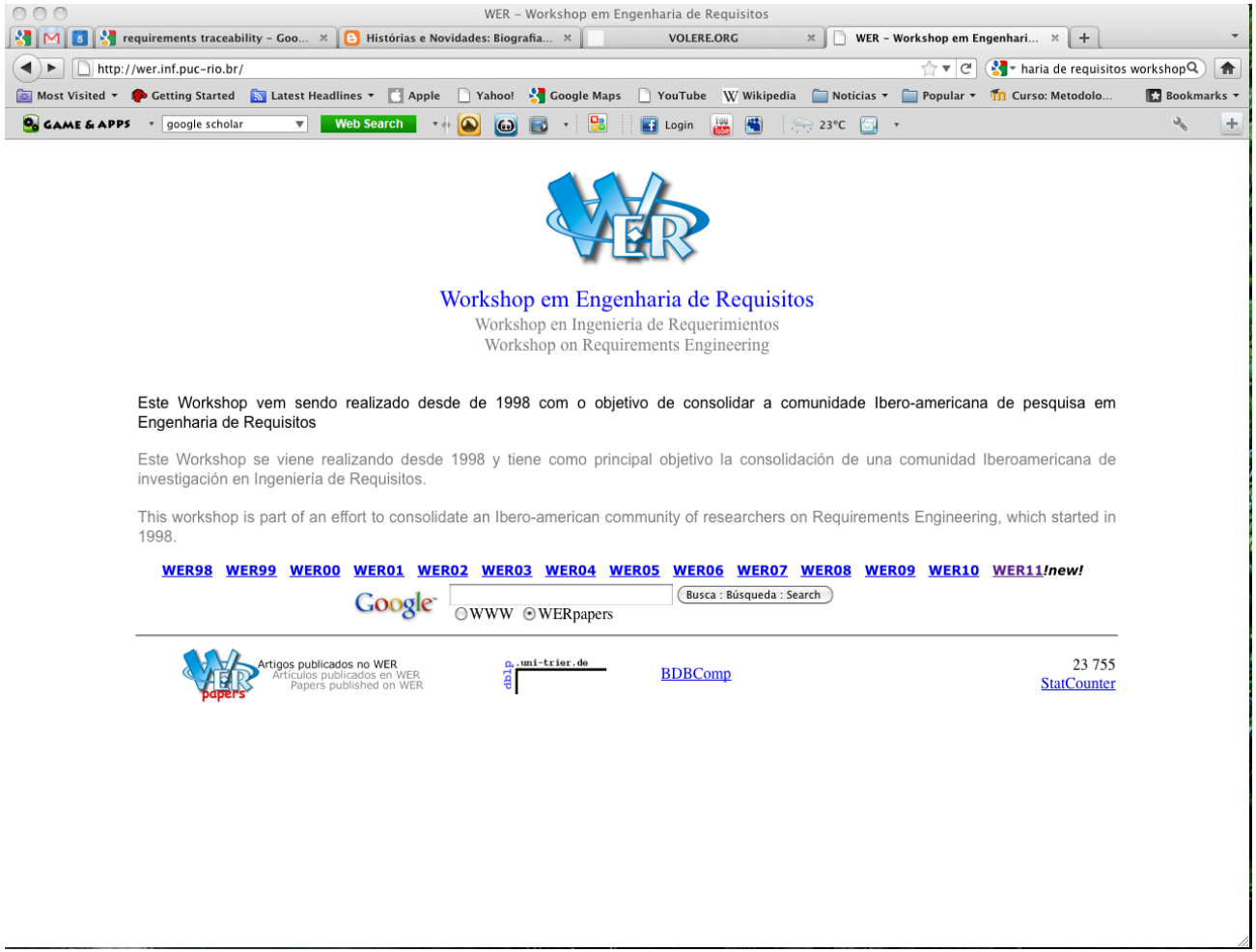
Proceedings: Not ready yet!

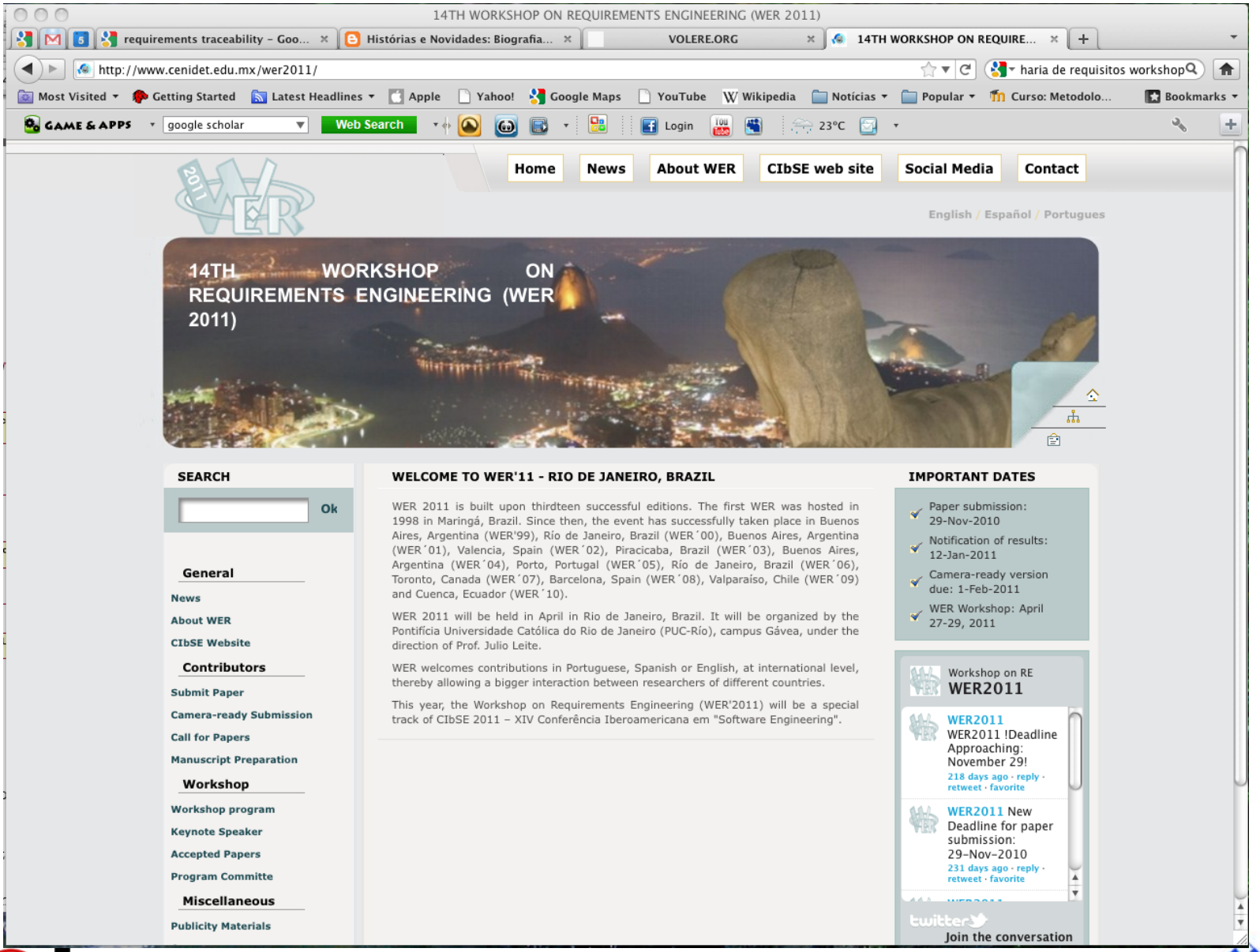
Future Conferences

2012: Chicago, IL, USA 24 -- 28 September 2012

Proceedings: Not even a twinkle in any author's eyes!

Pesquisa em RE e grupos do Brasil

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WER 2011 is built upon thirdteen successful editions. The first WER was hosted in 1998 in Maringá, Brazil. Since then, the event has successfully taken place in Buenos Aires, Argentina (WER'99), Río de Janeiro, Brazil (WER´00), Buenos Aires, Argentina (WER´01), Valencia, Spain (WER´02), Piracicaba, Brazil (WER´03), Buenos Aires, Argentina (WER´04), Porto, Portugal (WER´05), Río de Janeiro, Brazil (WER´06), Toronto, Canada (WER´07), Barcelona, Spain (WER´08), Valparaíso, Chile (WER´09) and Cuenca, Ecuador (WER´10).
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IMPORTANT DATES
Paper submission: 29-Nov-2010
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O que é realmente capturado?

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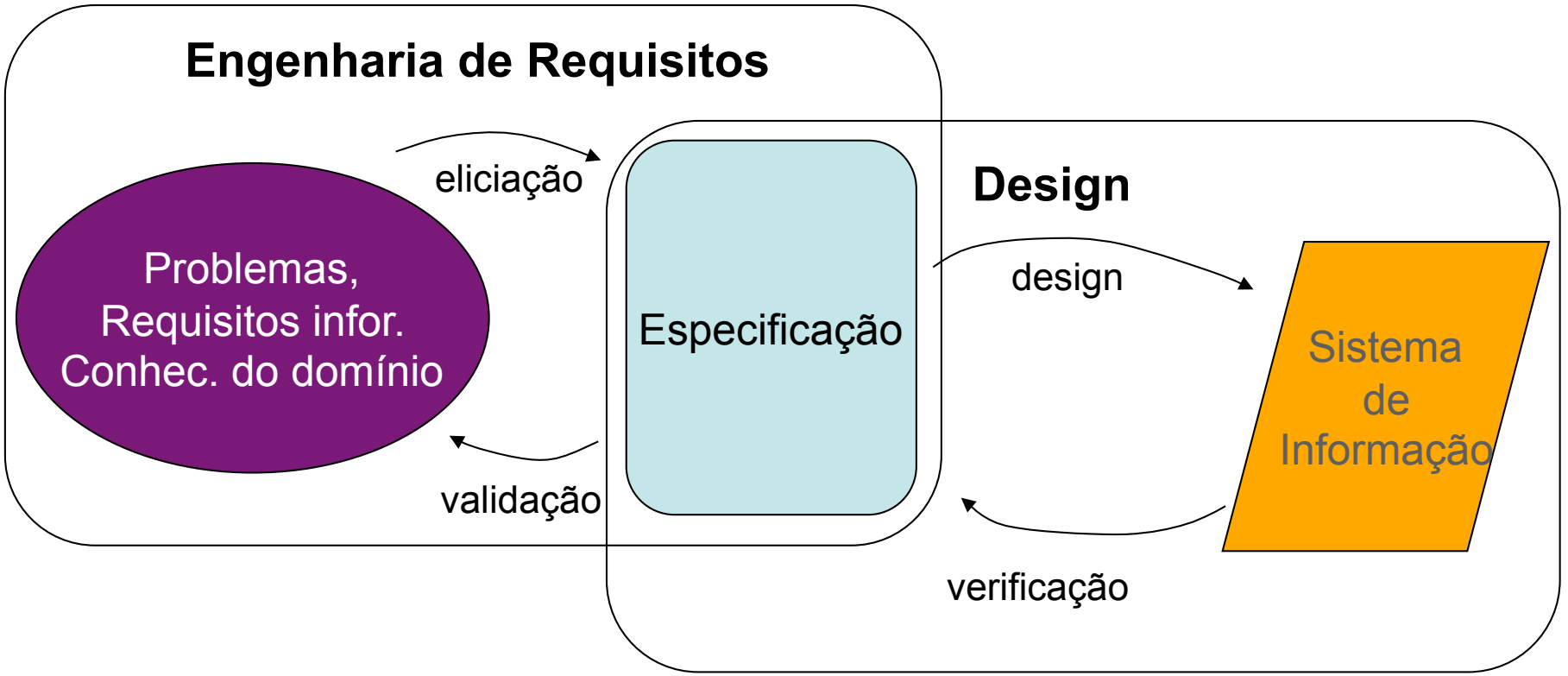
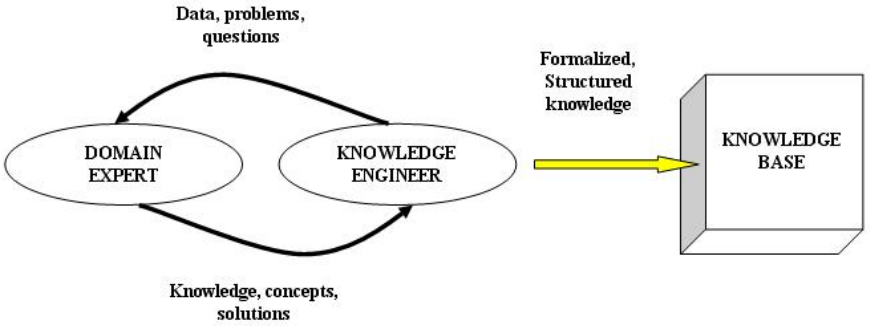


Modelando Requisitos

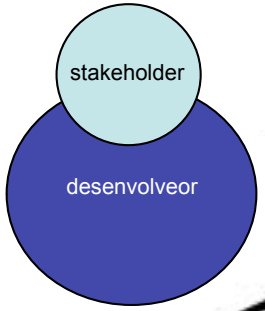
Processo de projeto da ER consiste em modelar sistemas em várias vistas, tais como:

- Modelagem organizacional
- Modelagem Estática (ou modelagem de dados)
- Modelagem Comportamental (ou dinâmica)
- Modelagem Contextual (ou de domínio)
- Modelagem Não-funcional

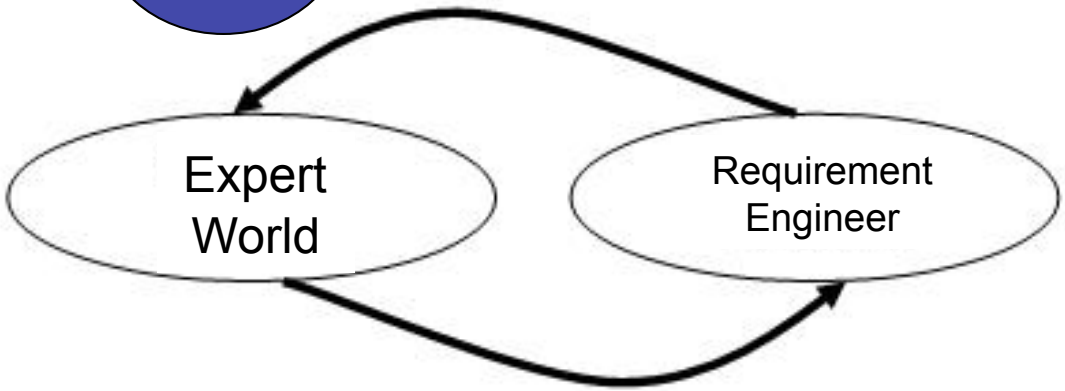
O Processo de eliciação



Domínios acoplados

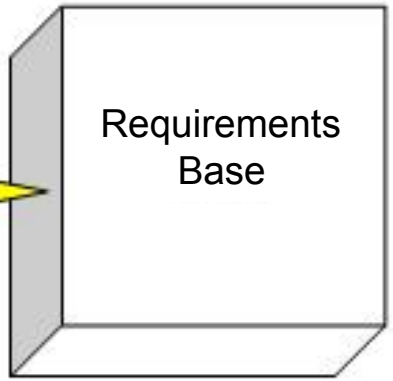


Questions, feedback

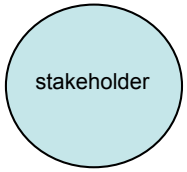


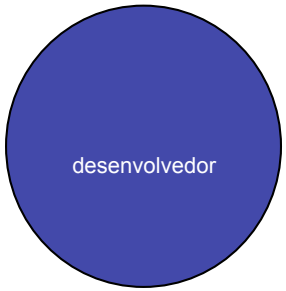
Knowledge, concepts, Application results

Unformalized Structured Knowledge

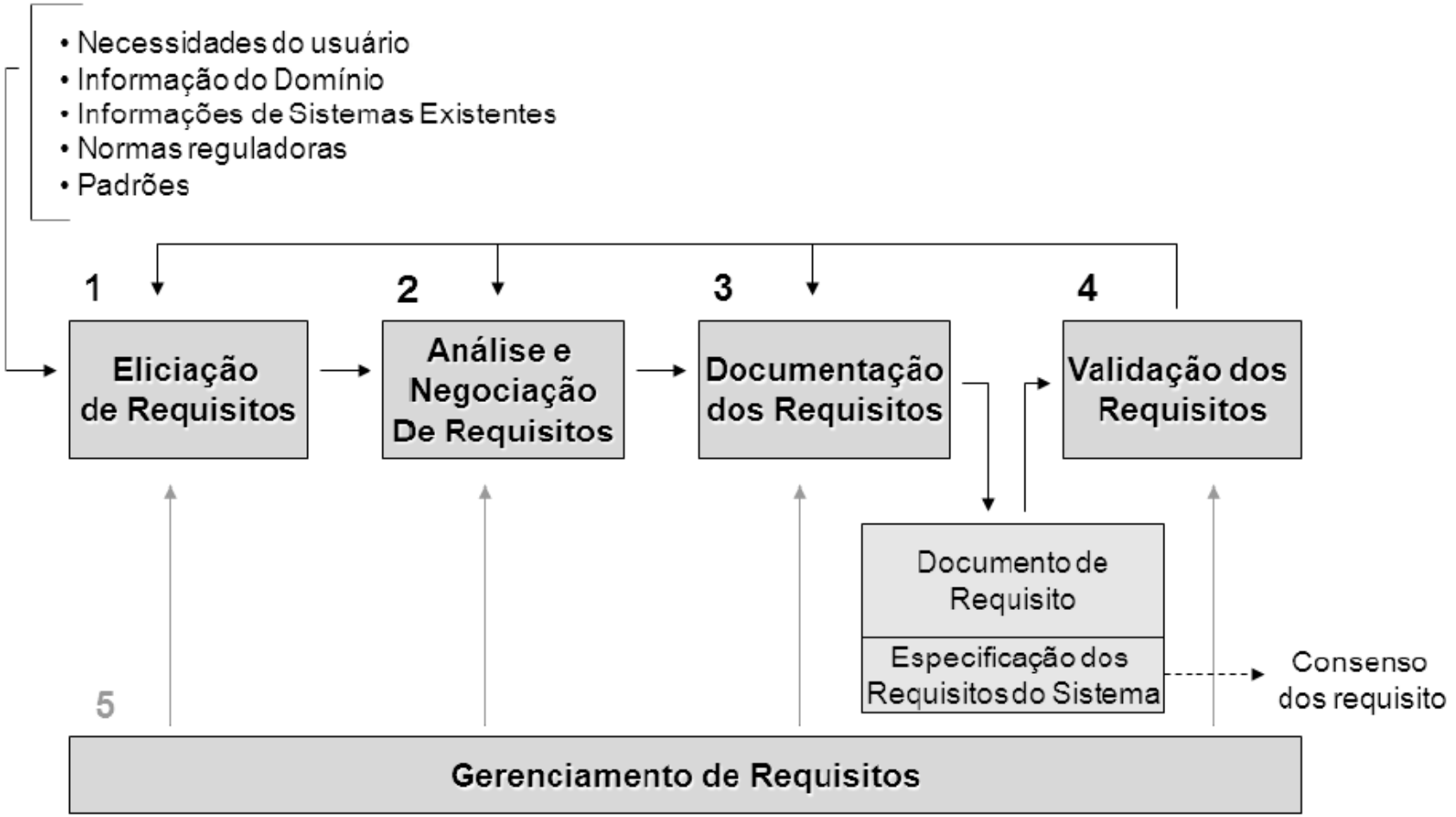


Domínios disjuntos





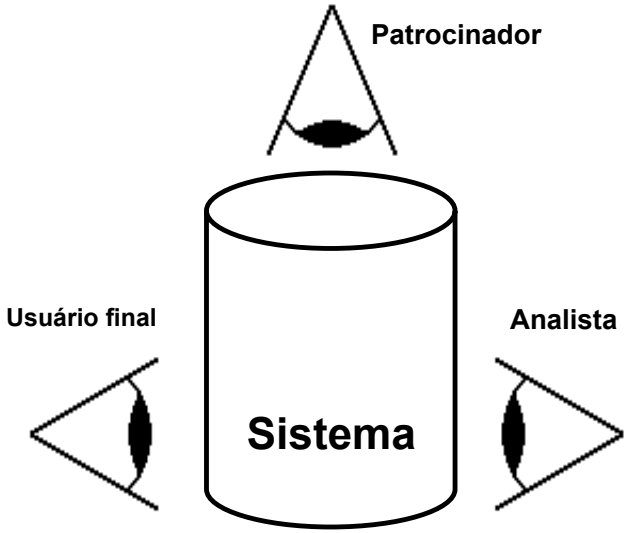
O ciclo da Enga. de requisitos



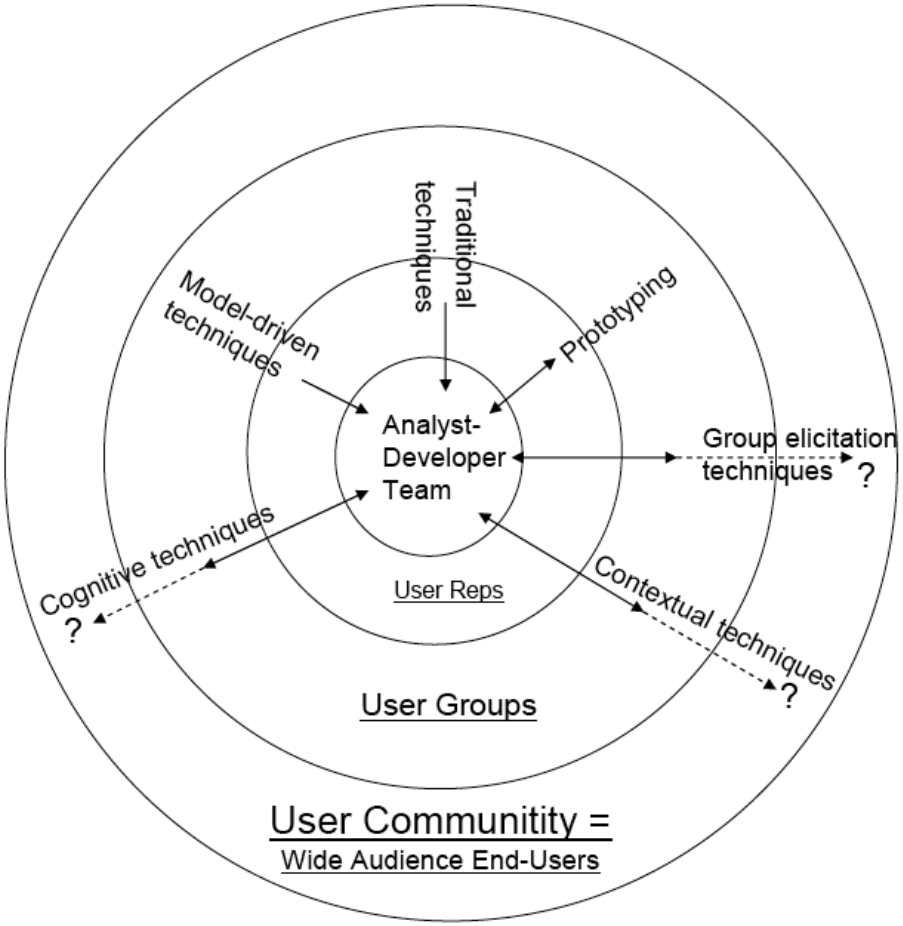
O Ciclo da ER

Refinando o ciclo de vida da ER, temos as seguintes fases:

- Síntese do problema
- Eliciação de requisitos
- Análise de Requisitos
  - Modelagem
  - Análise
  - Validação local
- Especificação de requisitos
- Verificação e validação
- Gerenciamento de requisitos



Requisitos para os SoSs



Tuunanen, T., A New Perspective on Requirements Elicitacion Methods, Journal of Information Technology Theory and Application, pp 45-72, vol. 5, no. 3, 2003.

A pedra filosofal...

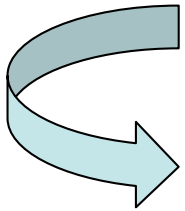
O Ponto de partida para a fase inicial do design é a documentação dos requisitos eliciados. Isto implica em ter uma representação que não pode ainda ser formal, que é flexível e tem características de modelagem visual. Admtiremos sem maiores discussões que a UML é (ainda) a melhor candidata para esta tarefa, apesar das críticas que recentes.

O Estudo da UML é um requisito desta disciplina (co-requisito)

O que modelar?

(Nuseibeh and Easterbrook, 2000)

- Modelagem do contexto (enterprise modeling)
- Modelagem estática (de dados)
- Modelagem comportamental
- Modelagem de domínio
- Modelagem não-funcional



Análise

Métodos de Análise

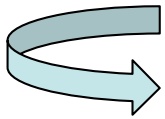
Métodos de Análise é um conjunto de técnicas (formais ou Semi-formais) dedicadas à análise dos requisitos e aderentes ao método adotado.

Métodos de análise NÃO se confundem com métodos e muito menos com "metodologia".

Classificação dos métodos de análise

Os métodos de análise podem ser classificados como:

1. Análise dinâmica (animação);
2. Métodos baseados em conhecimento
   - Case based reasoning (CBR)
   - Constraint Satisfaction
   - KBS analysis and critics
3. Análise de consistência
   - Verification
   - Model checking

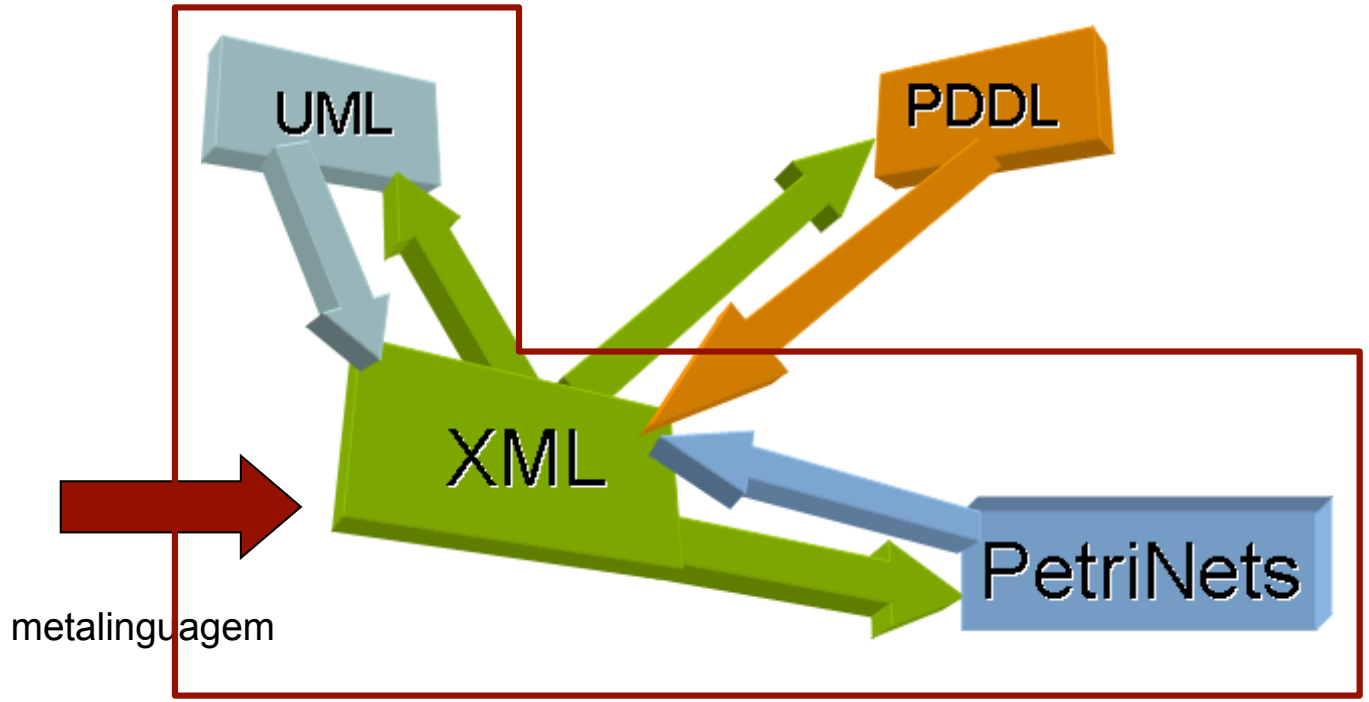


Validação

PROTOTYPING

itSIMPLE

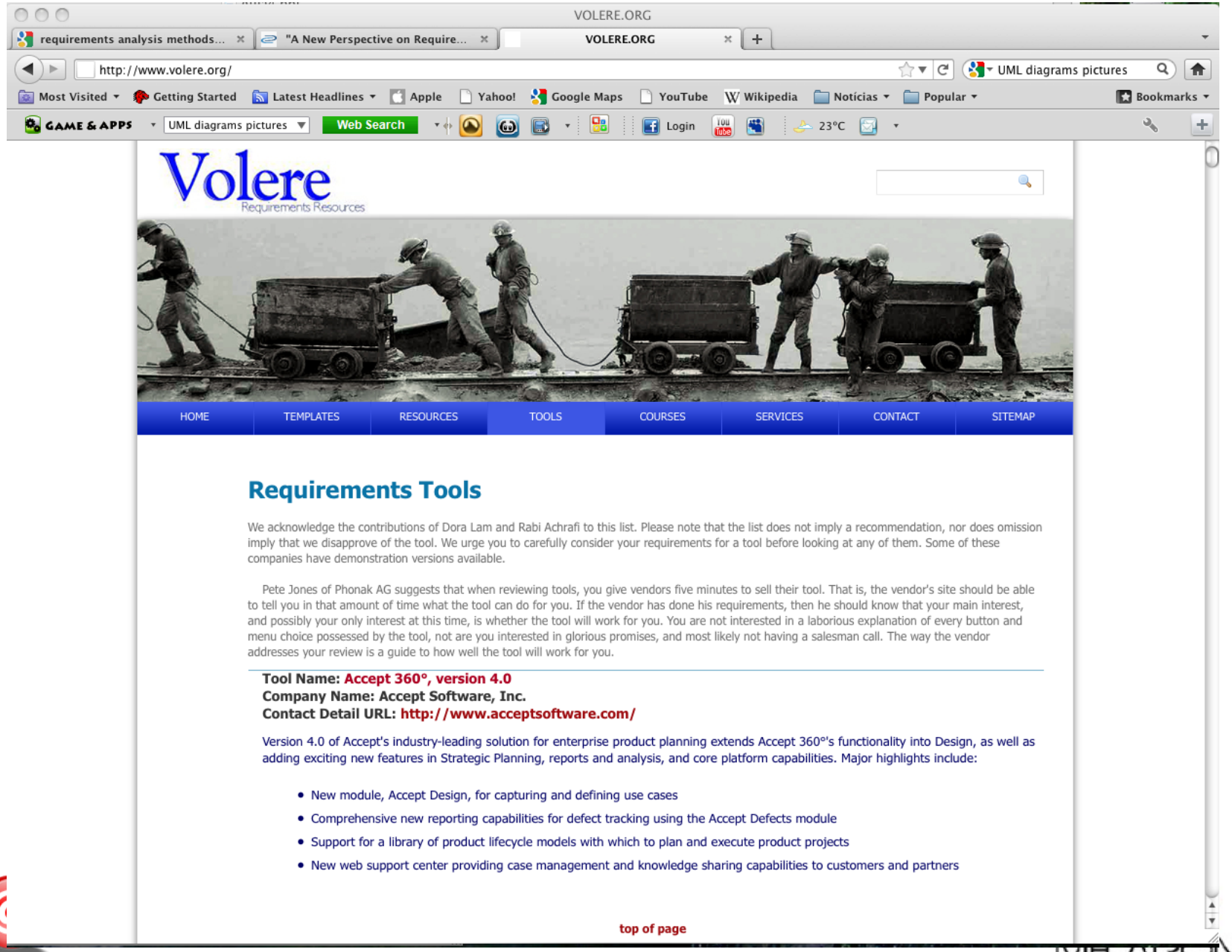
Linguagem para especificação de planos



Tracebility ?

Existe o CARE?

www.volere.org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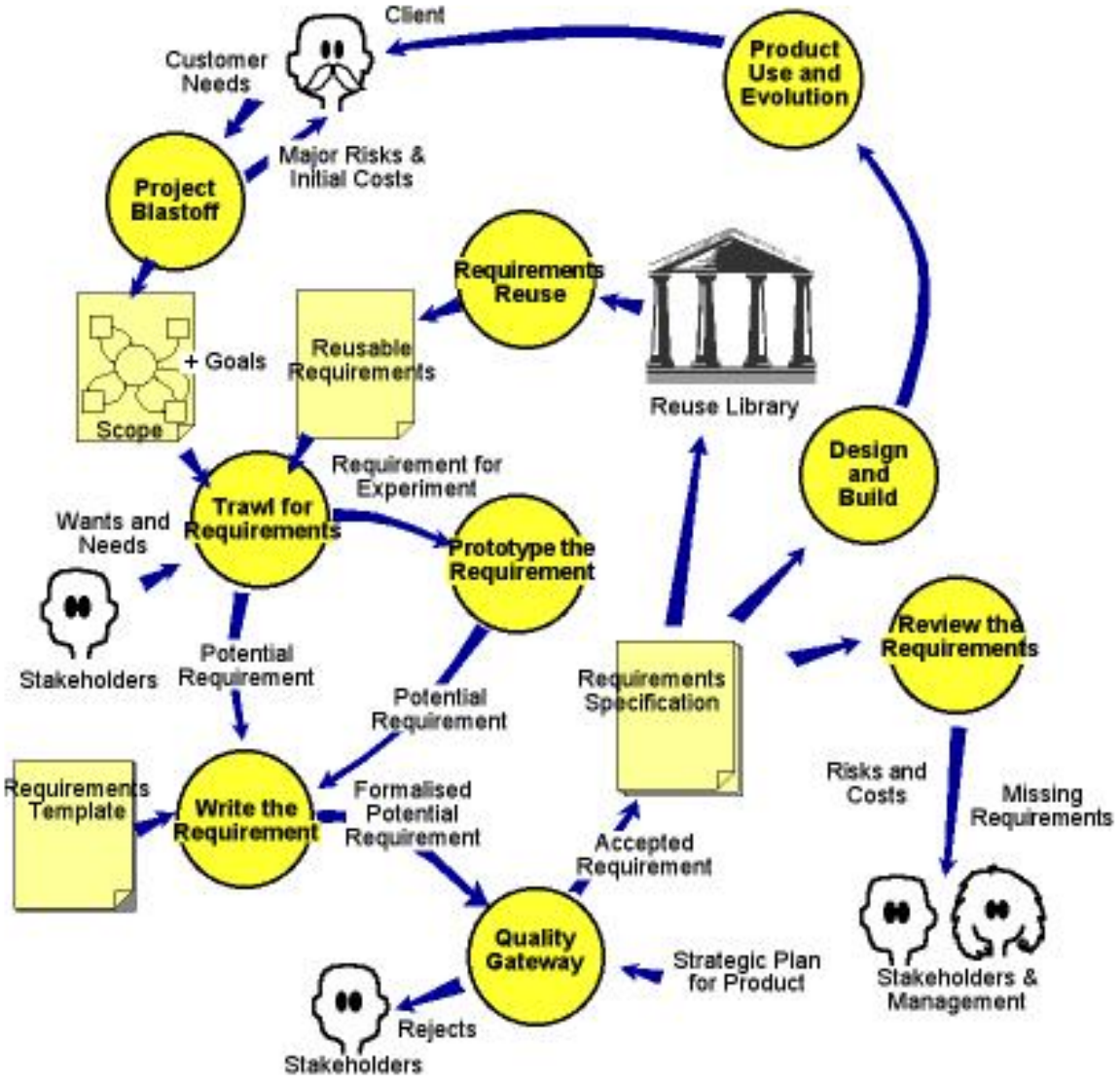
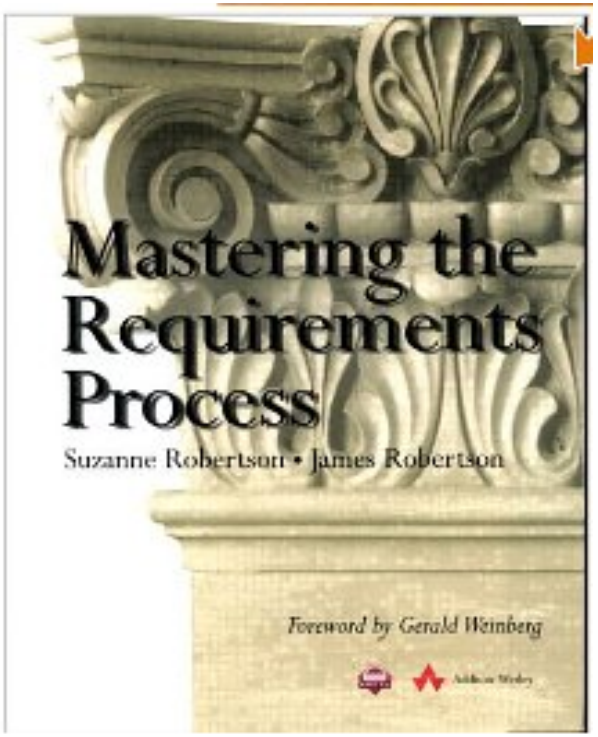
Web Search
Login
23°C
Volere
Requirements Resources
HOME
TEMPLATES
RESOURCES
TOOLS
COURSES
SERVICES
CONTACT
SITEMAP
Requirements Tools
We acknowledge the contributions of Dora Lam and Rabi Achrafi to this list. Please note that the list does not imply a recommendation, nor does omission imply that we disapprove of the tool. We urge you to carefully consider your requirements for a tool before looking at any of them. Some of these companies have demonstration versions available.
Pete Jones of Phonak AG suggests that when reviewing tools, you give vendors five minutes to sell their tool. That is, the vendor's site should be able to tell you in that amount of time what the tool can do for you. If the vendor has done his requirements, then he should know that your main interest, and possibly your only interest at this time, is whether the tool will work for you. You are not interested in a laborious explanation of every button and menu choice possessed by the tool, not are you interested in glorious promises, and most likely not having a salesman call. The way the vendor addresses your review is a guide to how well the tool will work for you.
Tool Name: Accept 360°, version 4.0
Company Name: Accept Software, Inc.
Contact Detail URL: http://www.acceptsoftware.com/
Version 4.0 of Accept's industry-leading solution for enterprise product planning extends Accept 360°'s functionality into Design, as well as adding exciting new features in Strategic Planning, reports and analysis, and core platform capabilities. Major highlights include:
New module, Accept Design, for capturing and defining use cases
Comprehensive new reporting capabilities for defect tracking using the Accept Defects module
Support for a library of product lifecycle models with which to plan and execute product projects
New web support center providing case management and knowledge sharing capabilities to customers and partners
top of page

Volere


Client
Customer Needs
Major Risks & Initial Costs
Project Blastoff
Product Use and Evolution
Requirements Reuse
Reusable Requirements
Reuse Library
+ Goals
Scope
Requirement for Experiment
Trawl for Requirements
Prototype the Requirement
Design and Build
Wants and Needs
Stakeholders
Potential Requirement
Potential Requirement
Review the Requirements
Requirements Specification
Requirements Template
Write the Requirement
Formalised Potential Requirement
Risks and Costs
Missing Requirements
Accepted Requirement
Quality Gateway
Strategic Plan for Product
Stakeholders & Management
Rejects
Stakeholders

Produto X Sistemas

Mastering the Requirements Engineering Process
Suzanne and James Robertson
Addison Wesley, 1999

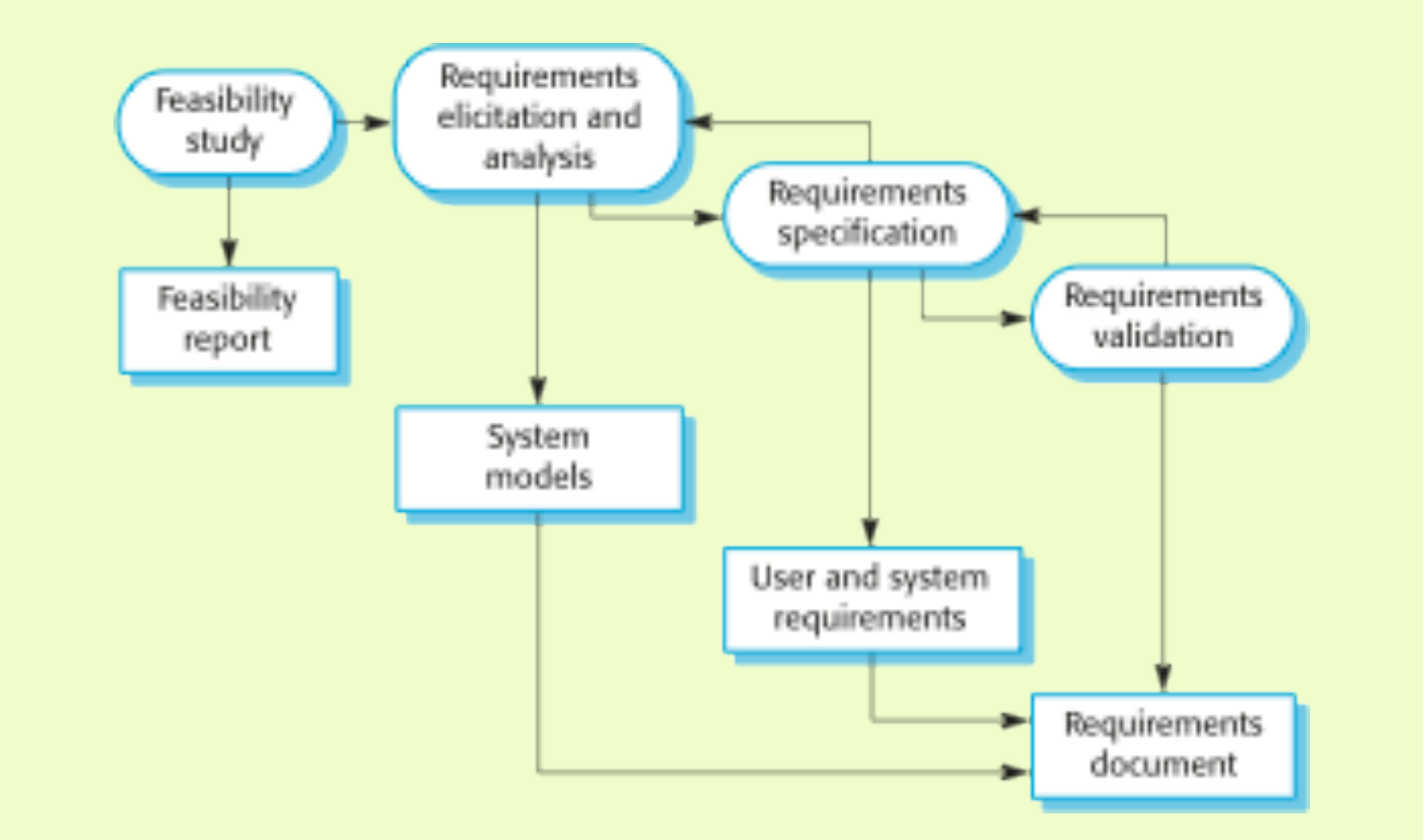


Resumindo…

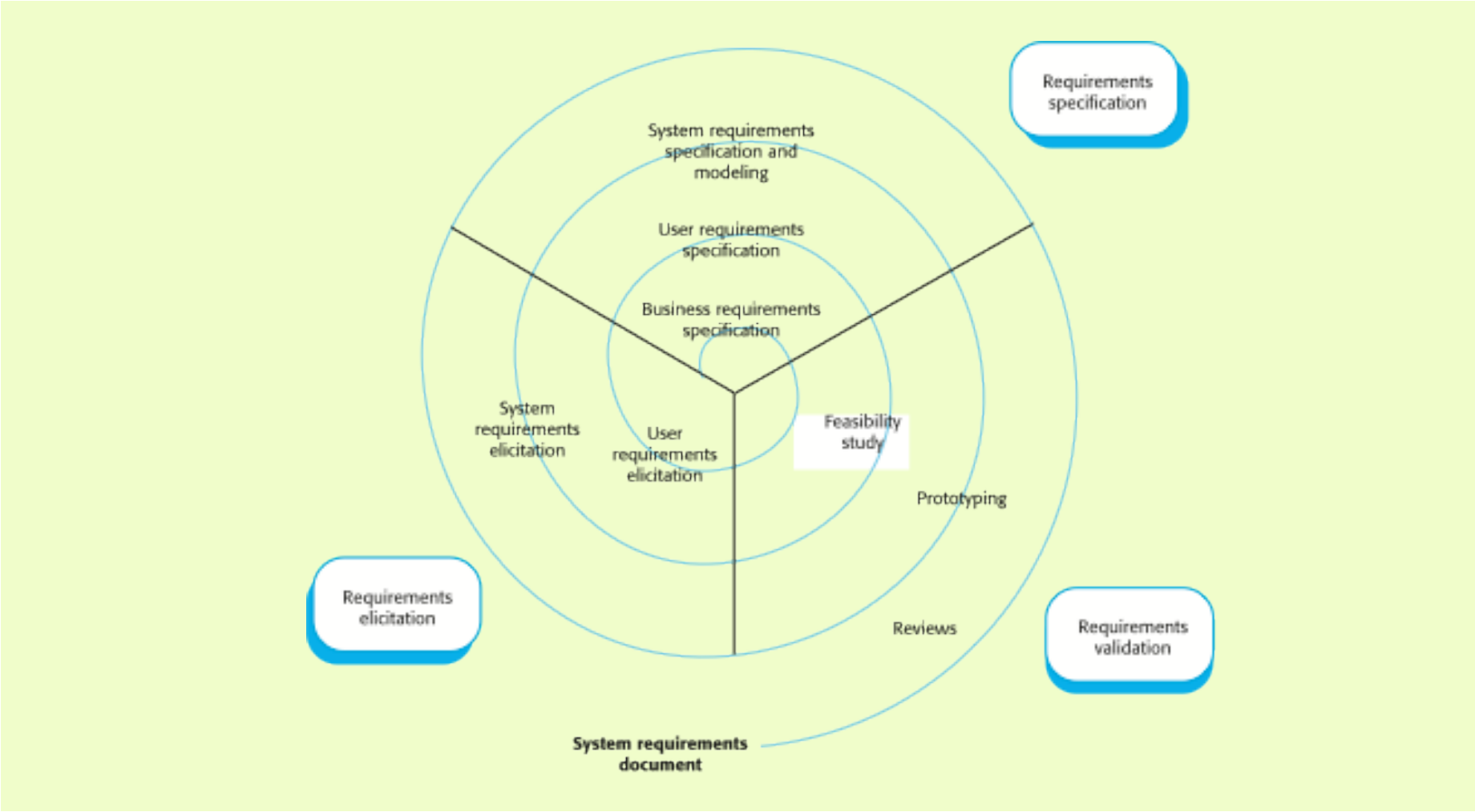
A Engenharia de requisitos pode ser resumida em três campos básicos:

- a eliciação de requisitos
- a análise de requisitos
- a validação dos requisitos
- o gerenciamento dos requisitos

Resumindo o processo



Superposição de fases



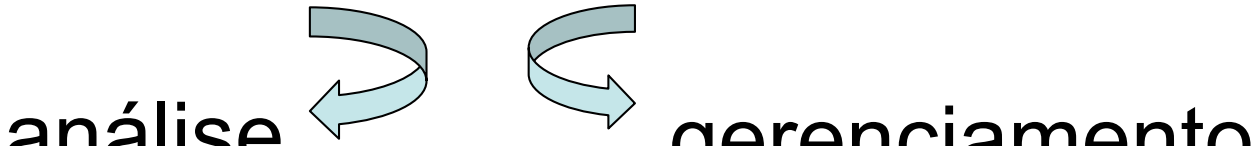
Resumindo…

A Engenharia de requisitos pode ser resumida em três campos básicos:

- a eliciação de requisitos
- a análise de requisitos
- a validação dos requisitos
- o gerenciamento dos requisitos

Validation

- Validity. Does the system provide the functions which best support the customer's needs?
- Consistency. Are there any requirements conflicts?
- Completeness. Are all functions required by the customer included?
- Realism. Can the requirements be implemented given available budget and technology
- Verifiability. Can the requirements be checked?



Validation Techniques

- Requirements reviews
  - Systematic manual analysis of the requirements.
- Prototyping
  - Using an executable model of the system to check requirements. Covered in Chapter 17.
- Test-case generation
  - Developing tests for requirements to check testability.

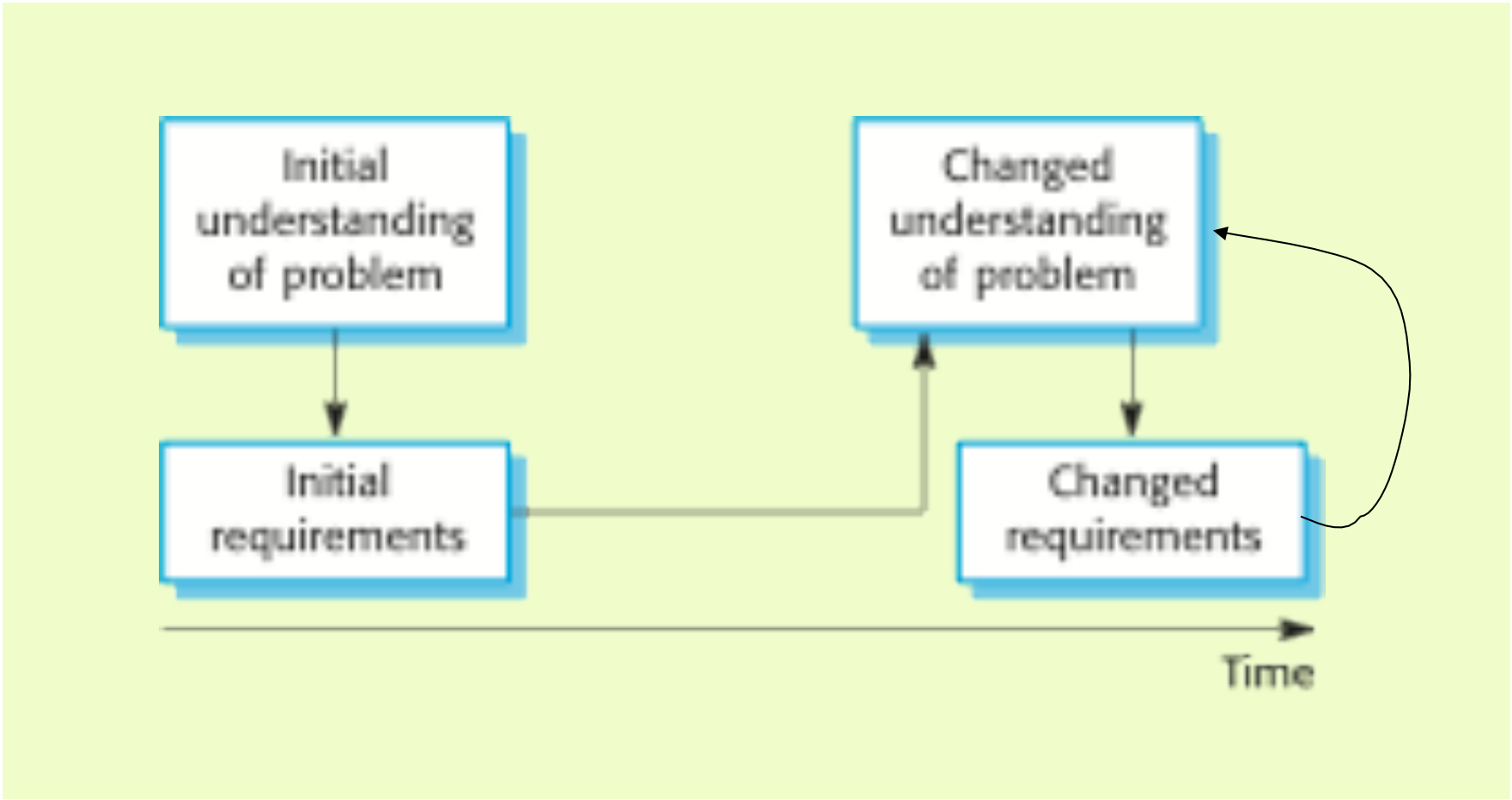
The key questions

- Verifiability. Is the requirement realistically testable?
- Comprehensibility. Is the requirement properly understood?
- Traceability. Is the origin of the requirement clearly stated?
- Adaptability. Can the requirement be changed without a large impact on other requirements?

The key problems

- The priority of requirements from different viewpoints changes during the development process.
- System customers may specify requirements from a business perspective that conflict with end-user requirements.
- The business and technical environment of the system changes during its development.

The evolutive trap



Good req's X Bad req's

- Enduring requirements. Stable requirements derived from the core activity of the customer organisation. E.g. a hospital will always have doctors, nurses, etc. May be derived from domain models
- Volatile requirements. Requirements which change during development or when the system is in use. In a hospital, requirements derived from health-care policy

Requirement Type	Description
Mutable requirements	Requirements that change because of changes to the environment in which the organisation is operating. For example, in hospital systems, the funding of patient care may change and thus require different treatment information to be collected.
Emergent requirements	Requirements that emerge as the customer's understanding of the system develops during the system development. The design process may reveal new emergent requirements.
Consequential requirements	Requirements that result from the introduction of the computer system. Introducing the computer system may change the organisations processes and open up new ways of working which generate new system requirements
Compatibility requirements	Requirements that depend on the particular systems or business processes within an organisation. As these change, the compatibility requirements on the commissioned or delivered system may also have to evolve.

The traceability concept

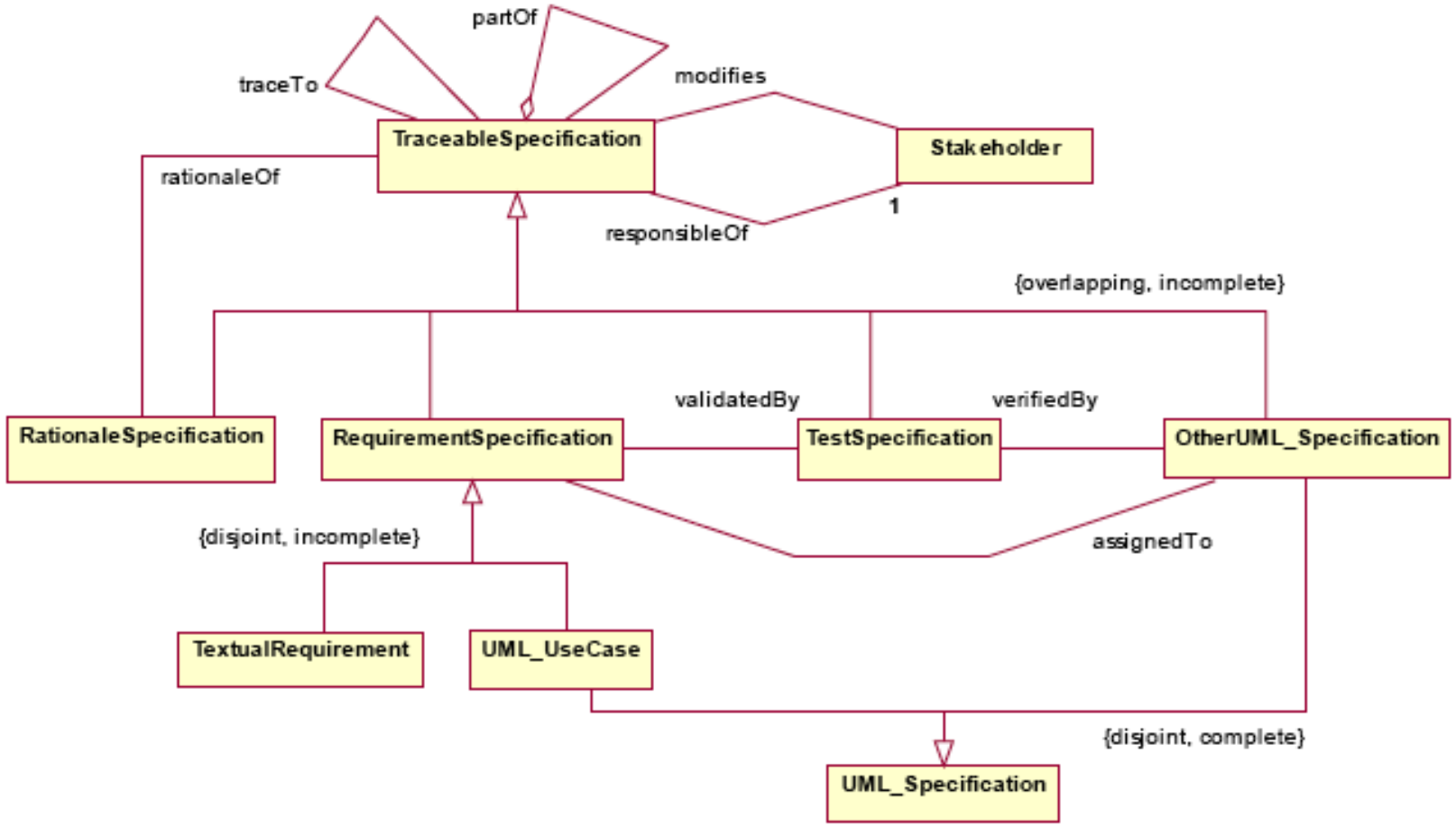
- Traceability is concerned with the relationships between requirements, their sources and the system design
- Source traceability
  - Links from requirements to stakeholders who proposed these requirements;
- Requirements traceability
  - Links between dependent requirements;
- Design traceability
  - Links from the requirements to the design;

Traceability

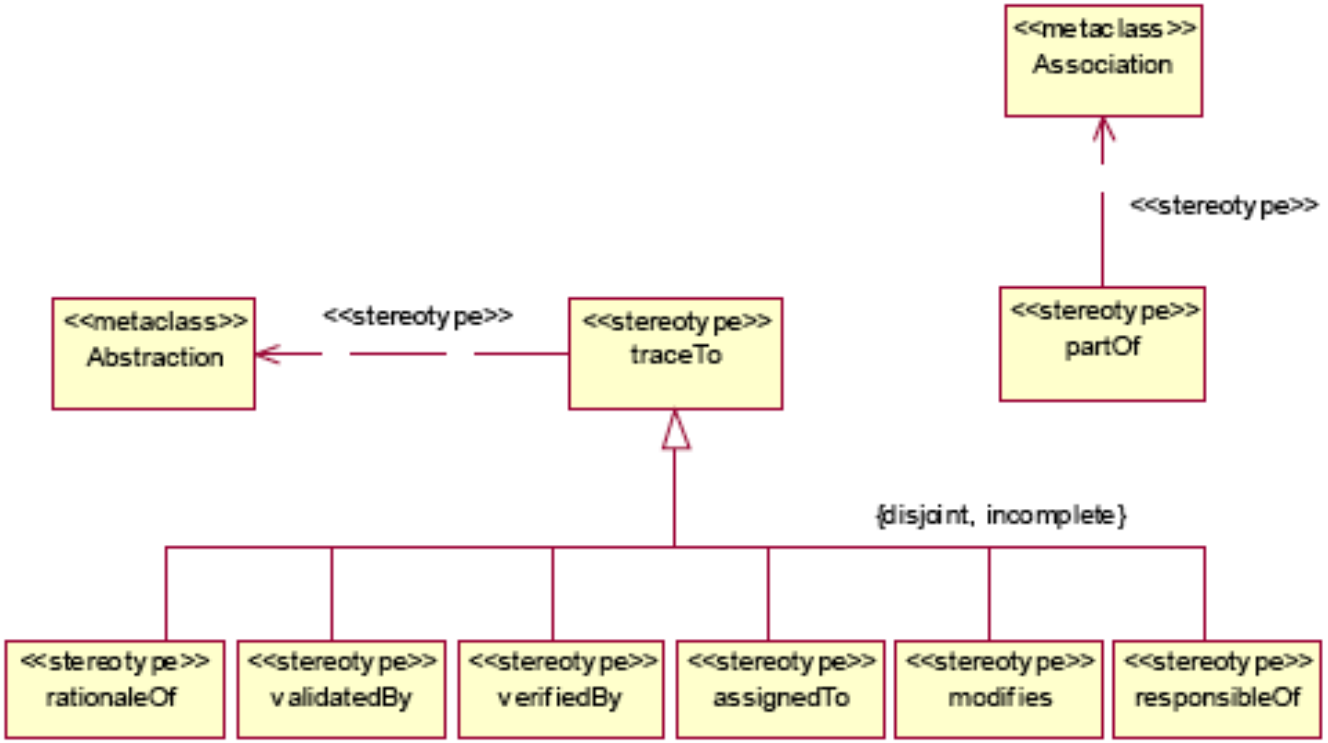
"The requirements traceability is the ability to describe and follow the life of a requirement, in both a forward and backward direction, i.e. from its origins, through its development and specification, to its subsequent deployment and use, and through periods of ongoing refinement and iteration in any of these phases."

Gotel, O., Filkenstein, A.; An Analysis of the Requirements Traceability Problem, in Proc. of the First Int. Conf. on Requirements Engineering, pp 94-101, Colorado Springs, USA, 1994.

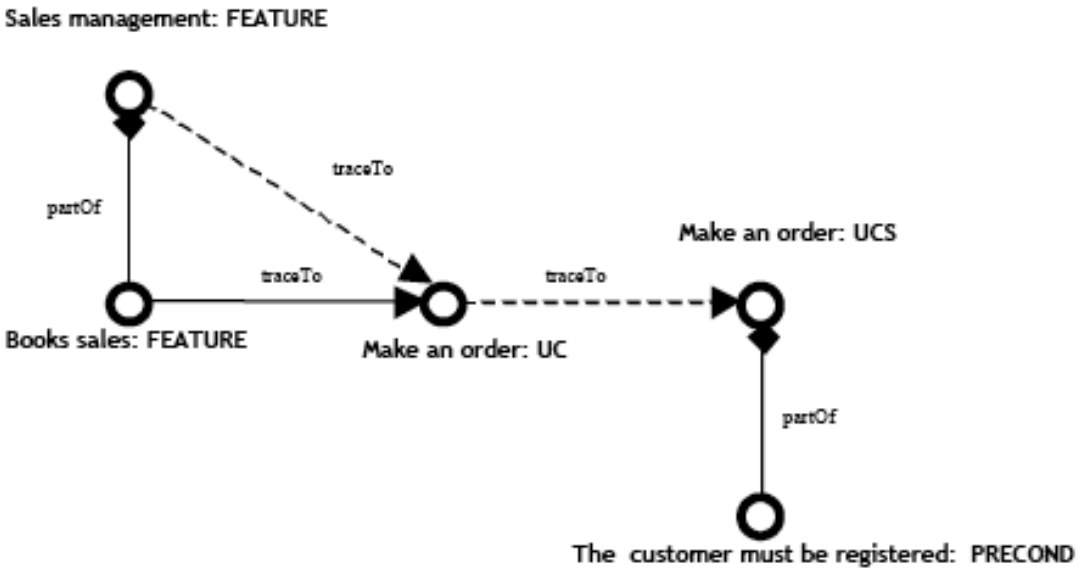
Traceability metamodel



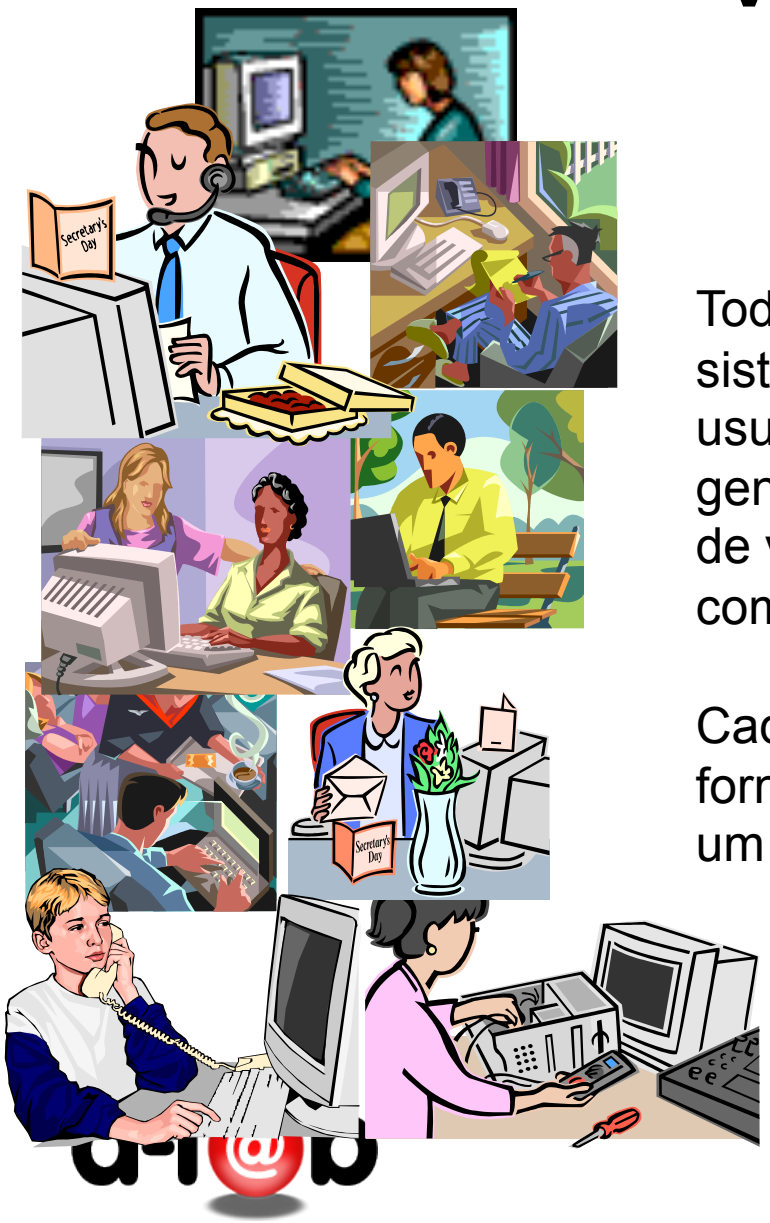
Traceability links



Traceability graph



Viewpoints



Todo sistema baseado em recursos computacionais – sistemas computáveis – tem uma gama variada de usuários e interessados nos seus recursos (chamados genericamente de agentes), que podem ser pessoas de variados perfis (profissionais e de relacionamento com o sistema, outros sistemas, máquinas, etc.)

Cada um destes agentes interage com o sistema de forma diferente e requer deste coisas diferentes. Cada um deles mantém o seu ***viewpoint*** sobre o sistema.

Mastering viewpoints

- Viewpoints are a way of structuring the requirements to represent the perspectives of different stakeholders. Stakeholders may be classified under different viewpoints.
- This multi-perspective analysis is important as there is no single correct way to analyse system requirements.

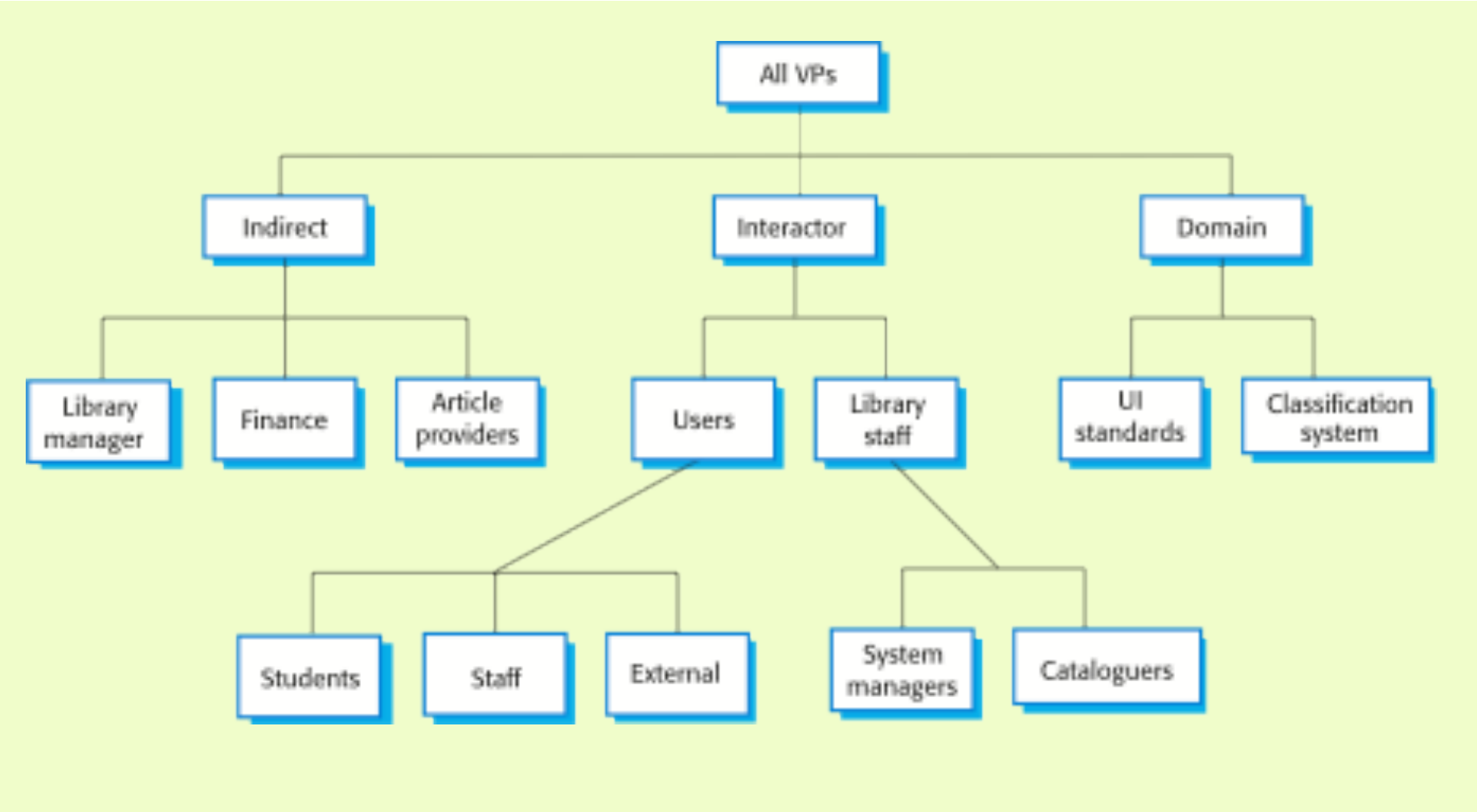
Viewpoint classification

- Interactor viewpoints
  - People or other systems that interact directly with the system. In an ATM, the customer's and the account database are interactor VPs.
- Indirect viewpoints
  - Stakeholders who do not use the system themselves but who influence the requirements. In an ATM, management and security staff are indirect viewpoints.
- Domain viewpoints
  - Domain characteristics and constraints that influence the requirements. In an ATM, an example would be standards for inter-bank communications.

Identifying Viewpoints

- Identify viewpoints using
  - Providers and receivers of system services;
  - Systems that interact directly with the system being specified;
  - Regulations and standards;
  - Sources of business and non-functional requirements.
  - Engineers who have to develop and maintain the system;
  - Marketing and other business viewpoints.

An example: a Lib system



Viewpoints

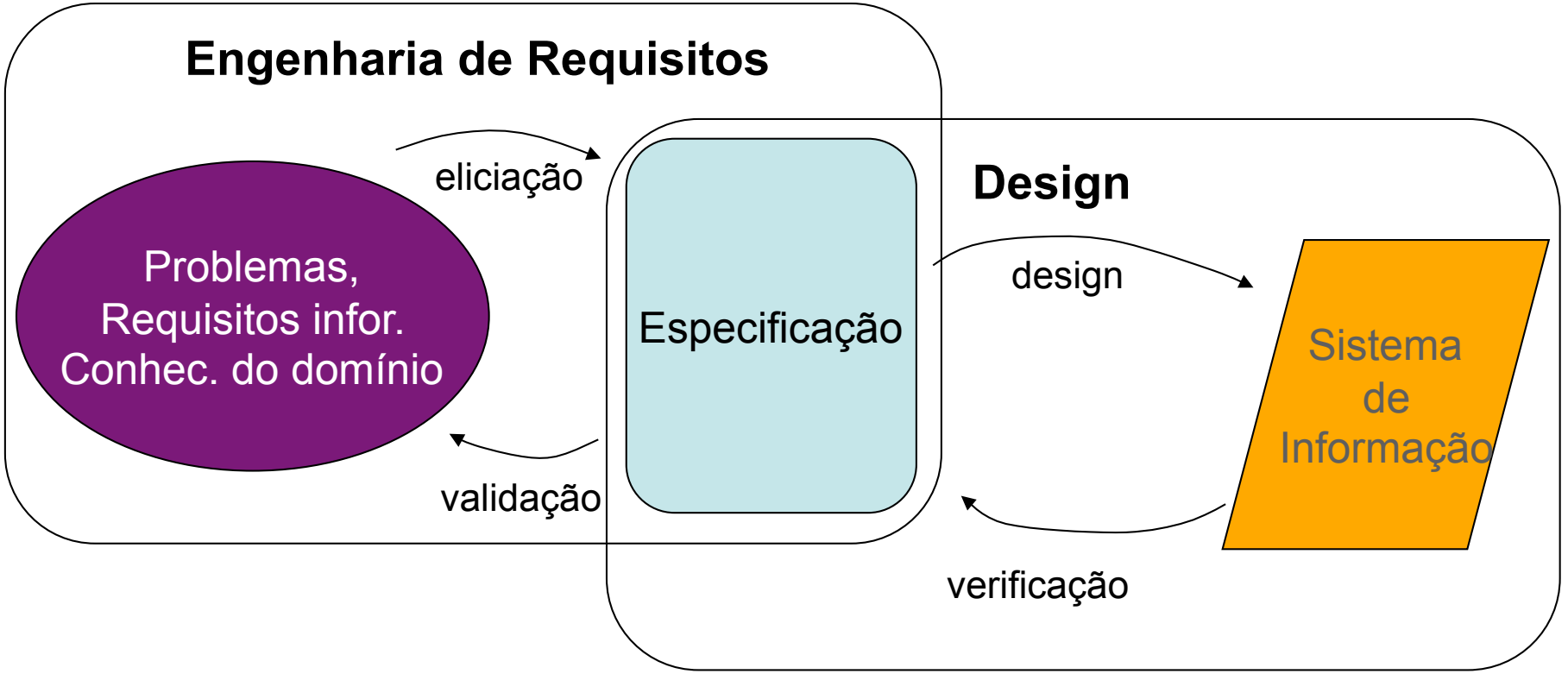
- Structured Analysis and Design Technique (SADT)
- Controlled Requirements Expression (CORE)
- Viewpoint-oriented System Engineering (VOSE)
- Viewpoint-oriented Requirements Definition (VORD)
- Viewpoint-oriented Requirements Validation (VORV)

Para a próxima aula:

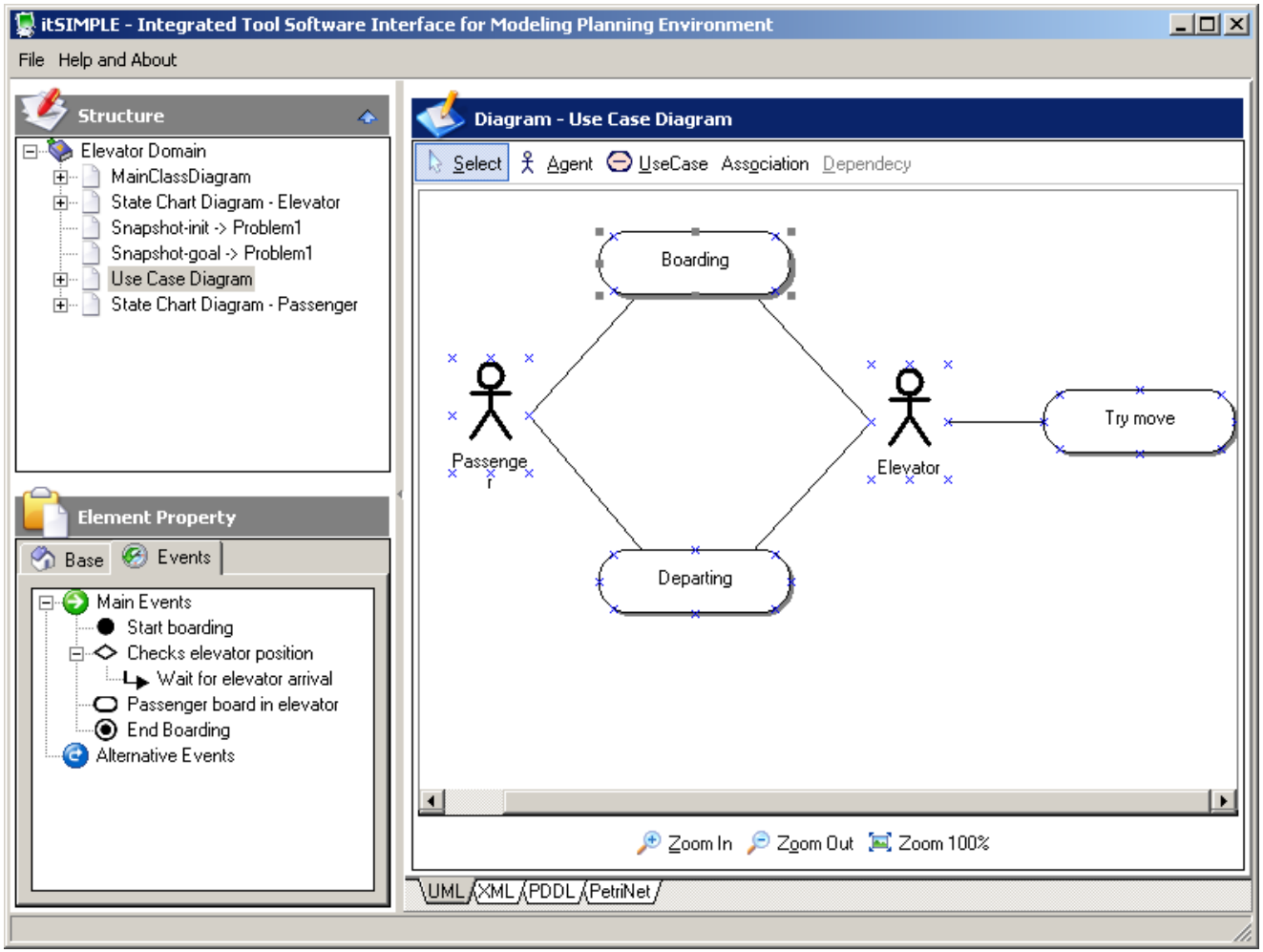
Preparar um texto onde se analisa a possibilidade de inserir traceability e a análise baseada em viewpoints em cada um dos projetos. A justificativa para não usar cada um destes processos é também parte do exercício.

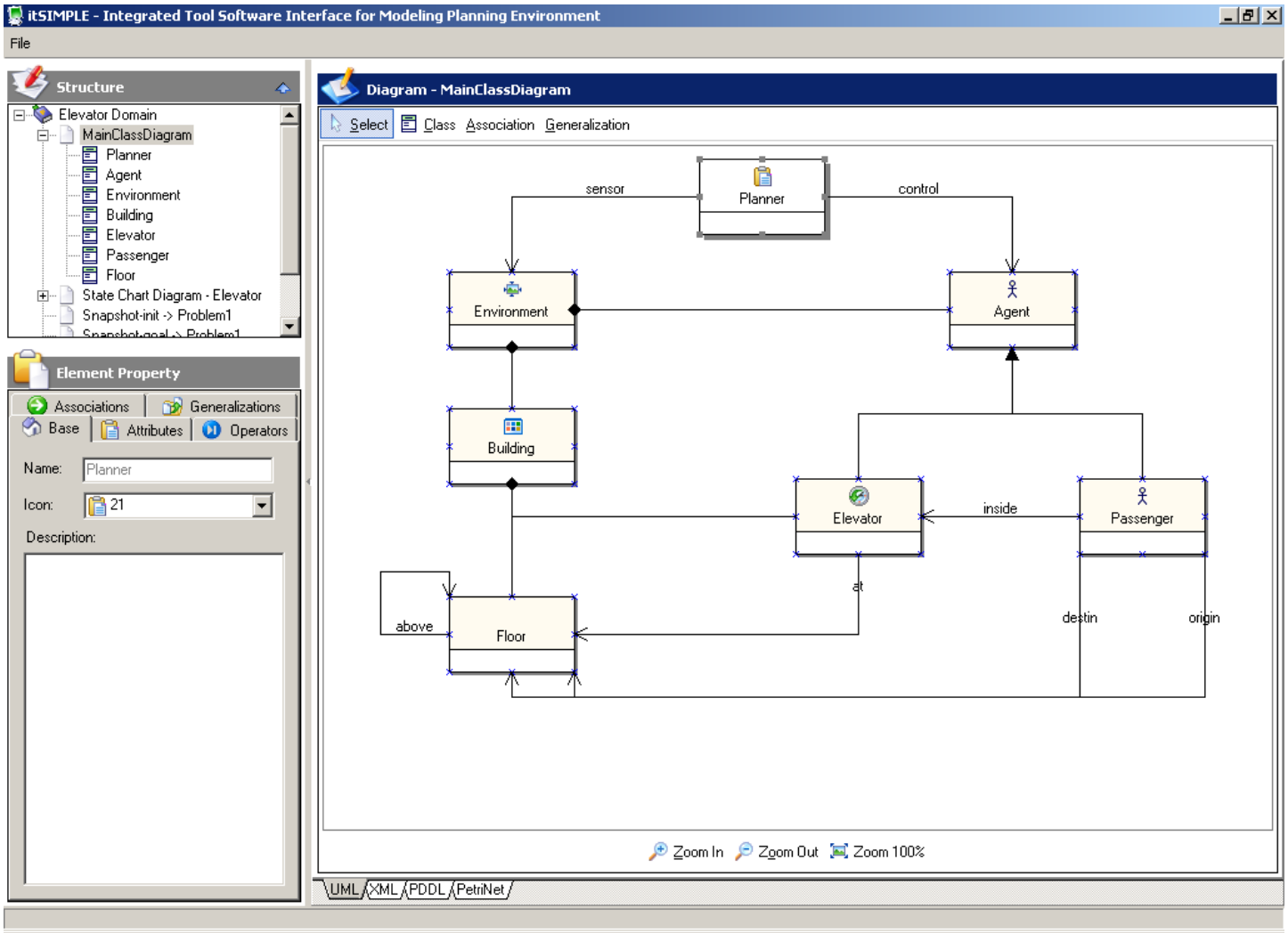
O que é realmente capturado?

Jarke, M., Bubenko, J., Rolland, C., Sutcliff, A., Vassilious, Y.; Theories Underlying Requirements Engineering: An Overview of NATURE at Genesis.

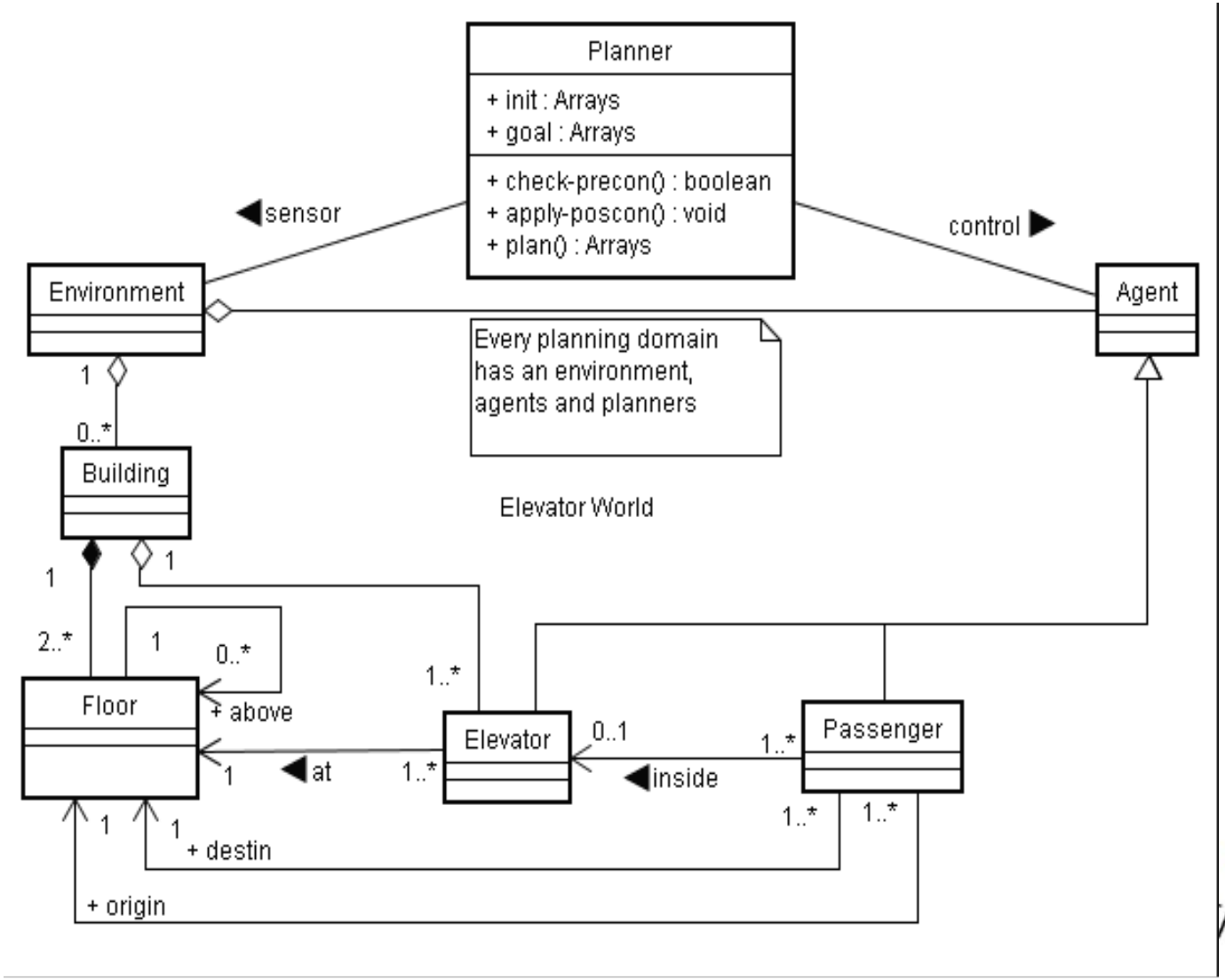


Exemplo: elevador inteligente

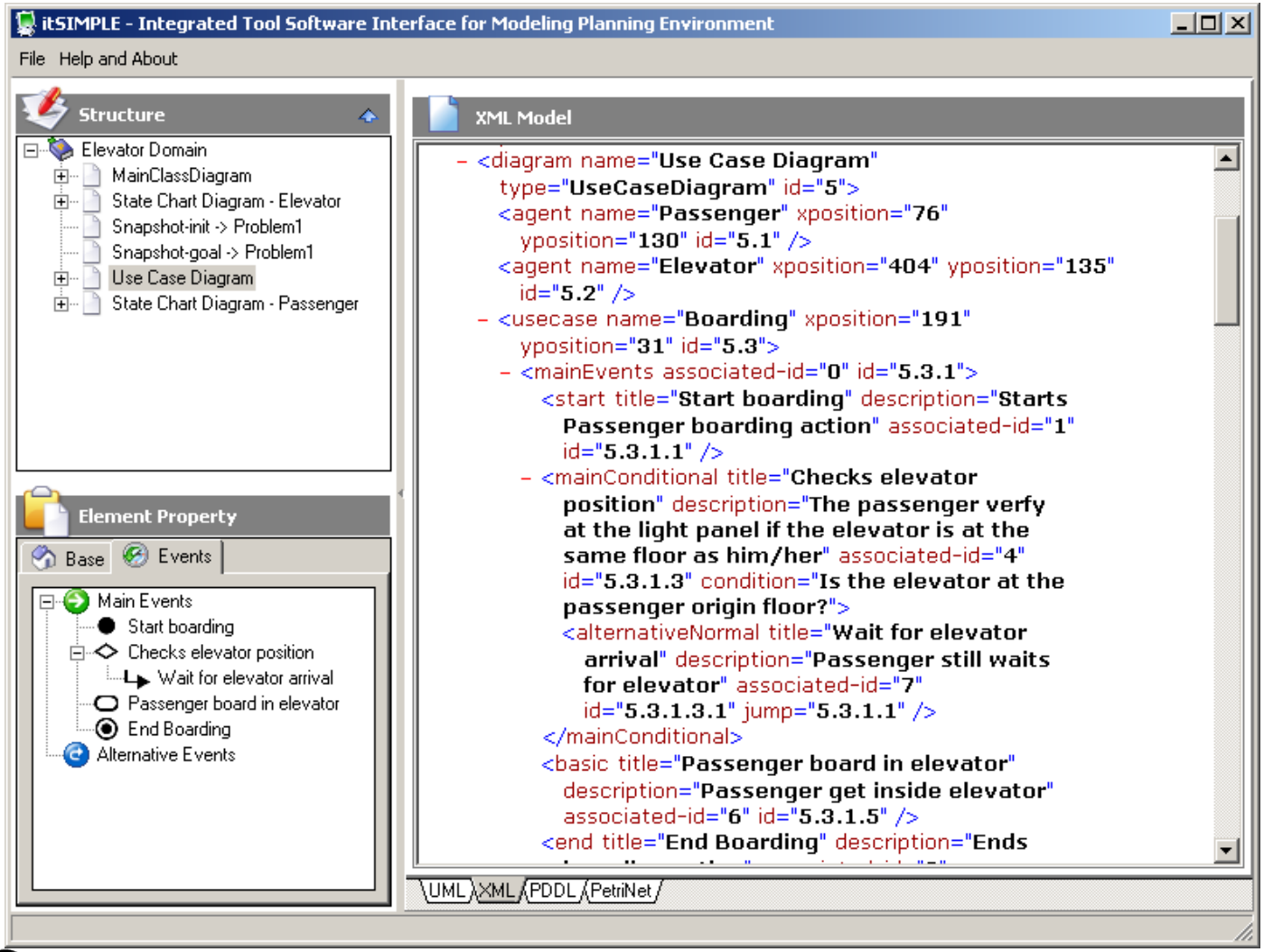



itSIMPLE - Integrated Tool Software Interface for Modeling Planning Environment
File
Structure
Elevator Domain
MainClassDiagram
Planner
Agent
Environment
Building
Elevator
Passenger
Floor
State Chart Diagram - Elevator
Snapshot-init -> Problem1
Element Property
Associations
Generalizations
Base
Attributes
Operators
Name:
Planner
Icon:
21
Description:
Diagram - MainClassDiagram
Select
Class
Association
Generalization
sensor
control
Planner
Environment
Agent
Building
Elevator
inside
Passenger
above
Floor
at
destin
origin
Zoom In
Zoom Out
Zoom 100%
UML
XML
PDDL
PetriNet

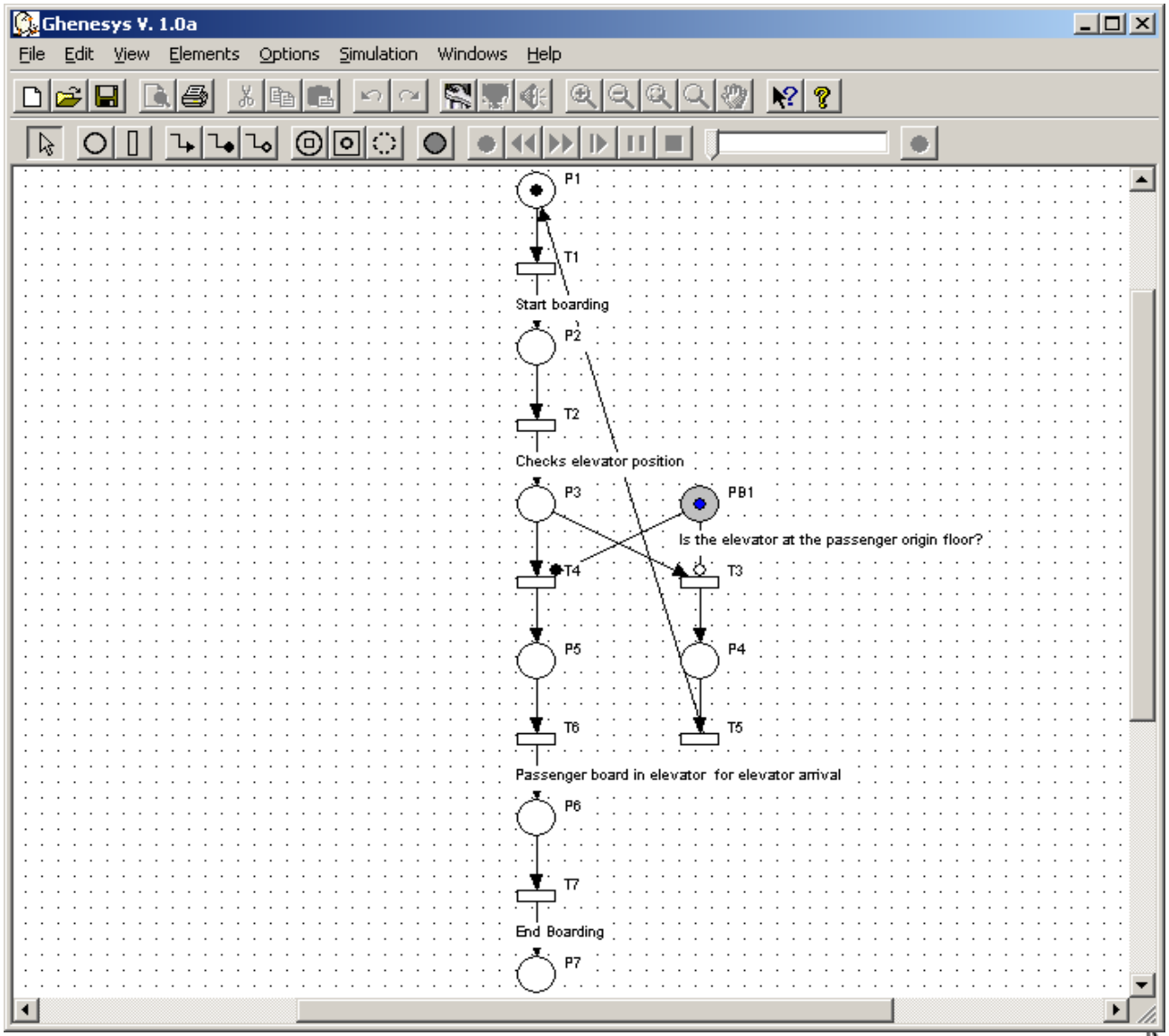
Detalhe do diagrama de classes para o problema do elevador



Formato Use-case textual



Transformação para Redes de Petri



Para reflexão!

A representação escolhida para a análise de requisitos e a representação escolhida para a especificação que encerra o processo da Engenharia de requisitos teria alguma influência no restante do processo de design?

Fim