Software Requirements Engineering (SE2001)

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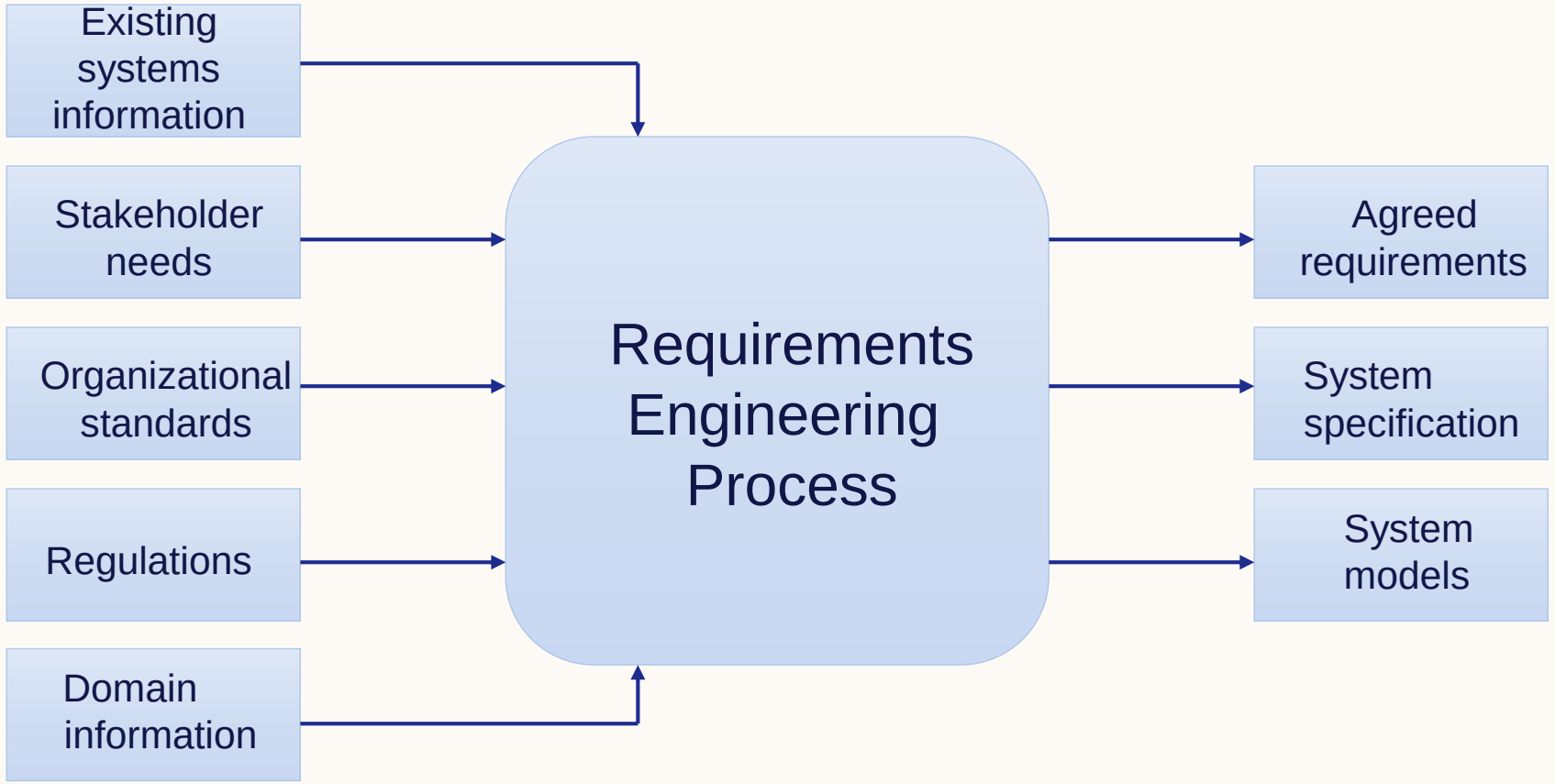
Requirements Engineering Process

The process(es) involved in developing system requirements is collectively known as Requirements Engineering Process

Process - Inputs and Outputs



RE Process - Inputs

It includes:

- **Existing system information**
  - Information about the functionality of systems to be replaced.
  - Information about other systems, which interact with the system being specified.

RE Process - Inputs

- **Stakeholder needs:**
  - Description of what system stakeholders need from the system to support their work.
- **Organizational standards:**
  - Standards used in an organization regarding system development practice, quality management, etc.

RE Process - Inputs

- **Regulations:**
  - External regulations such as health and safety regulations, which apply to the system.
- **Domain information:**
  - General information about the application domain of the system.

RE Process - Outputs

It includes

- **Agreed requirements:**
  - A description of the system requirements, which is understandable by stakeholders and which has been agreed by them.

RE Process - Outputs

- **System specification:**
  - This is a more detailed specification of the system, which may be produced in some cases.

RE Process - Outputs

- **System models**
  - A set of models such as a data-flow model, an object model, a process model, etc., which describes the system from different perspectives.

RE Process

Requirement Engineering Process has a formal starting and ending point in the overall software development life cycle.

- **Begins**
  - There is recognition that a problem exists and requires a solution.
  - A new software idea arises.
- **Ends**
  - With a *complete* description of the external behavior of the software to be built.

RE Process

- It is a continuous process in which the related activities are repeated until requirements are of acceptable quality.
- It is one of the most critical processes of system development.

RE Process

- Based on the need of individual software projects and organizational needs, requirements engineering processes are tailored.

An important point to remember is that "There is no ideal requirements engineering process!"

Two Main Tasks of RE

- There are two main tasks which needs to be performed in the requirements engineering process.

Problem analysis:

- Analysis of a software problem.

Product description:

- Complete specification of the **desired external behavior** of the software system to be built.
- Also known as functional description, functional requirements, or specifications.

Problem Analysis

- Problem analysis is the first and foremost task of requirements engineering process.
- **It includes:**
- Brainstorming, interviewing, eliciting requirements.
- Identifying all possible constraints.
- Expansion of information.

Problem Analysis

- Trading off constraints and organizing information.
- Complete understanding should be achieved.

Problem Description

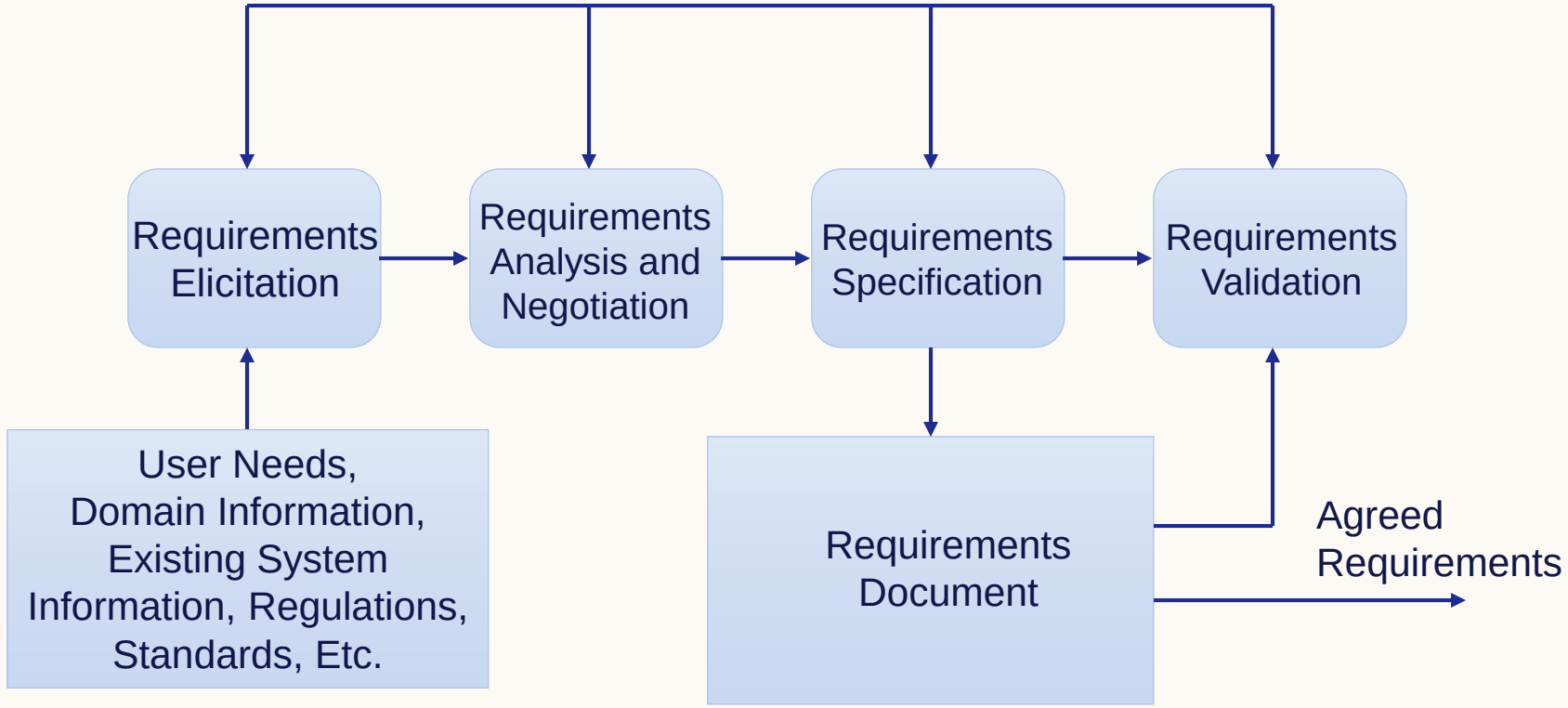
- Product description is another task of requirements engineering process. In this task we:
  - Make decisions to define the external behavior of the software product.
  - Organize ideas, resolve conflicting views, and eliminate inconsistencies and ambiguities.

What really happens

It should be kept in mind that :

“Both problem analysis and product description run in parallel and iteratively throughout the requirements engineering process”

Requirements Engineering Activities



Requirements Elicitation

- Requirements elicitation activity is performed by:
  - Determining the system requirements through consultation with stakeholders, from system documents, domain knowledge, and market studies.
  - Requirements acquisition or requirements discovery.

Requirements Analysis & Negotiation

- Requirements analysis and negotiation activity is performed by :
  - Understanding the relationships among various customer requirements and shaping those relationships to achieve a successful result.
  - Negotiations among different stakeholders and requirements engineers.

Requirements Analysis & Negotiation

- Incomplete and inconsistent information needs to be tackled here.
- Some analysis and negotiation needs to be done on account of budgetary constraints.

Requirements Specification

- Requirements specification includes:
  - Building a tangible model of requirements using natural language and diagrams.
  - Building a representation of requirements that can be assessed for correctness, completeness, and consistency.

Requirements Document

- Detailed descriptions of the required software system in form of requirements is captured in the requirements document.
- Software designers, developers and testers are the primary users of the document.

Requirements Validation

- It involves reviewing the requirements model for consistency and completeness.
- This process is intended to detect problems in the requirements document, before they are used as a basis for the system development.

Who are Actors

- Actors in a process are the people involved in the execution of that process.
- Actors are normally identified by their roles rather than individually, e.g., project manager, purchasing director, and system engineer.

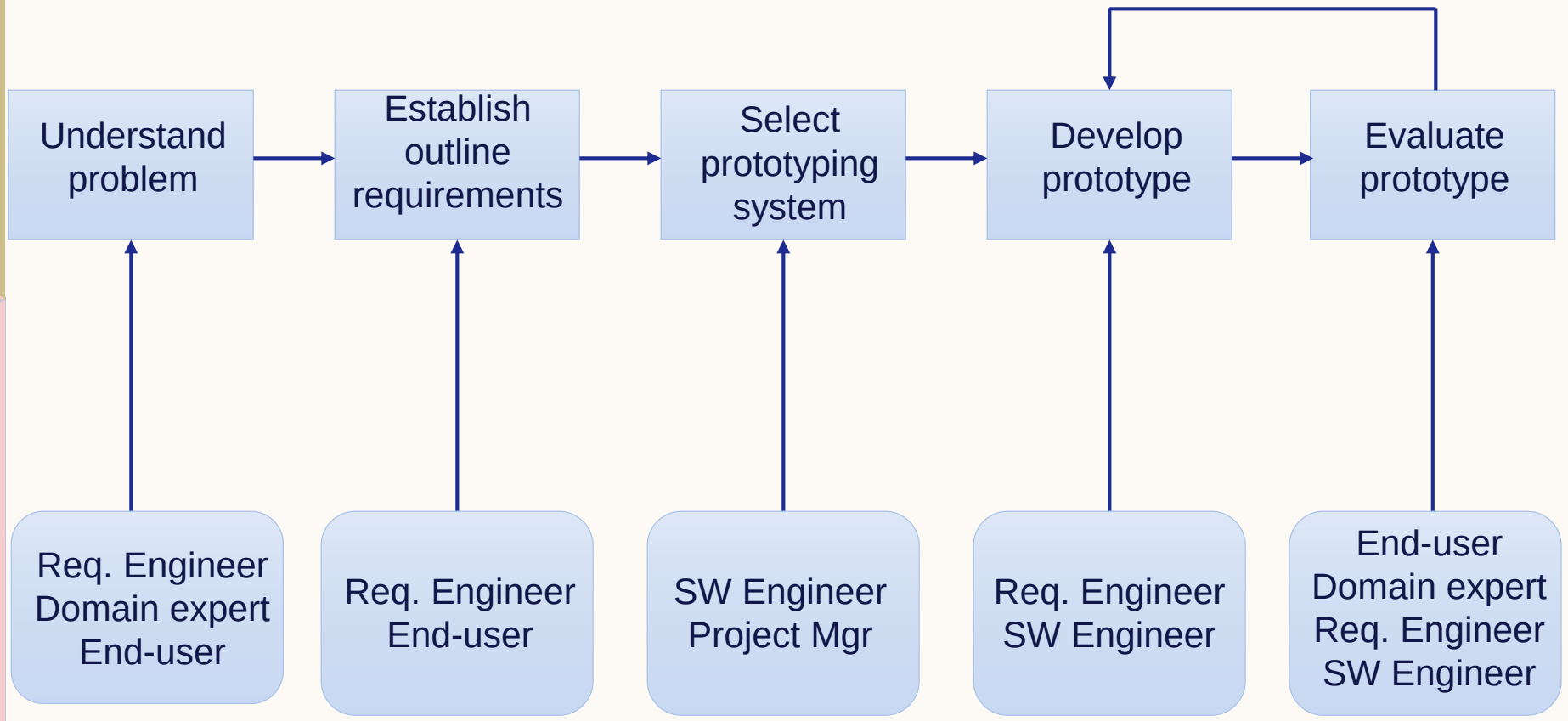
Actors in the RE Process

- RE involves people who are primarily interested in the problem to be solved (end-users, etc)
- As well as people interested in the solution (system designers, etc.).
- Another group of people, such as health & safety regulators, and maintenance engineers may be effected by the existence of the system.

Actors in the RE Process

- Role-action diagrams are process models which show the actors associated with different process activities.
- They document the information needs of different people involved in the process.
- They use model of prototype software system as part of requirements elicitation process.

Role-Action Diagram for Software Prototyping



Role Descriptions

Role	Description
Domain Expert	Responsible for providing information about the application domain and the specific problem in that domain, which is to be solved

Role Descriptions

Role	Description
System End-user	Responsible for using the system after delivery

Role Descriptions

Role	Description
Requirements Engineer	Responsible for eliciting and specifying the system requirements

Role Descriptions

Role	Description
Project Manager	Responsible for planning and estimating the prototyping project

Human and Social Factors

- Requirements engineering processes are dominated by **human**, **social** and **organizational** factors
  - Because they always involve a range of **stakeholders** from **different backgrounds** and with different **individual** and **organizational** goals.

Human and Social Factors

- System stakeholders may come from a range of **technical** and **non-technical** background and from **different disciplines**.

Stakeholders types

- Software engineers
- System end-users
- Managers of system
- External regulators
- Domain experts

Factors influencing requirements

- Personality and status of stakeholders.
- The personal goals of individuals within an organization.
- The degree of political influence of stakeholders within an organization.

Process improvements

- Process improvement is concerned with modifying processes in order to meet some improvement objectives.
- **Improvement objectives:**
  - Quality improvement.
  - Schedule reduction.
  - Resource reduction.

Planning Process Improvement

- **Some important questions arise:**
  - What are the problems with current processes?
  - What are the improvement goals?
  - How can process improvement be introduced to achieve these goals?
  - How should process improvements be controlled and managed?

RE process problems

- Lack of stakeholder involvement.
- Business needs not considered.
- Lack of requirements management.
- Lack of defined responsibilities.
- Stakeholder communication problems.
- Over-long schedules and poor quality requirements documents.

THANK YOU

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