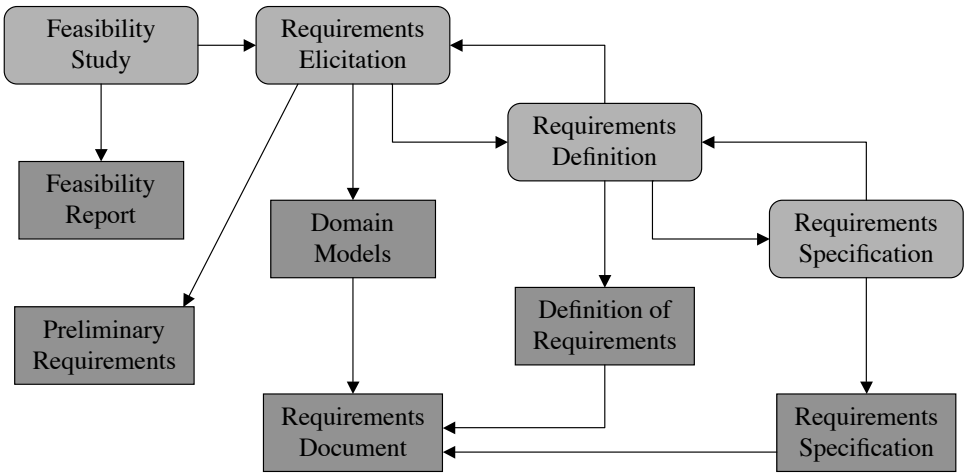
Requirements Elicitation

- Who are the stakeholders in determining system requirements, and how does their viewpoint influence the process?
- How are non-technical factors such as political, social, and organizational issues taken into account?
- How will requirement documents be used and maintained, especially as requirements evolve?
- What processes, methods, and techniques are available, and how effective are they?

Outline

- Requirements Process
- Documents
- Validation
- Evolution
- Elicitation
  - Viewpoints and Stakeholders
  - Methods
- System Contexts
- Social and Organizational Issues

Requirements Engineering Process



Requirements Process (2)

- Feasibility Study
  - Quick and Cheap
  - Can user needs be met using current technology?
  - Will the proposed system be cost effective?
  - Is more detailed analysis warranted?

Requirements Process (3)

- Requirements Elicitation
  - Observation of existing systems, processes
  - Discussion with potential users, procurers
  - Development of problem domain models
    - Process, State, Data flow, E/R, etc.
  - Prototype development

Requirements document requirements

- Should specify only external behavior
- Should specify constraints on the implementation
- Should be easy to change
- Should serve as a reference tool for system maintainers
- Should record forethought about life cycle
- Should characterize acceptable responses to undesired events.

Requirements document contents

- Introduction
- Glossary
- Domain models
- Functional requirements
- Non-functional requirements
- System evolution
- Requirements specification
- Index and table of contents

Requirements Validation

- Correctness
  - Any set of requirements is a compromise across a diverse group of users
- Completeness
- Consistency
- Realism
  - There is no point in specifying unrealistic requirements

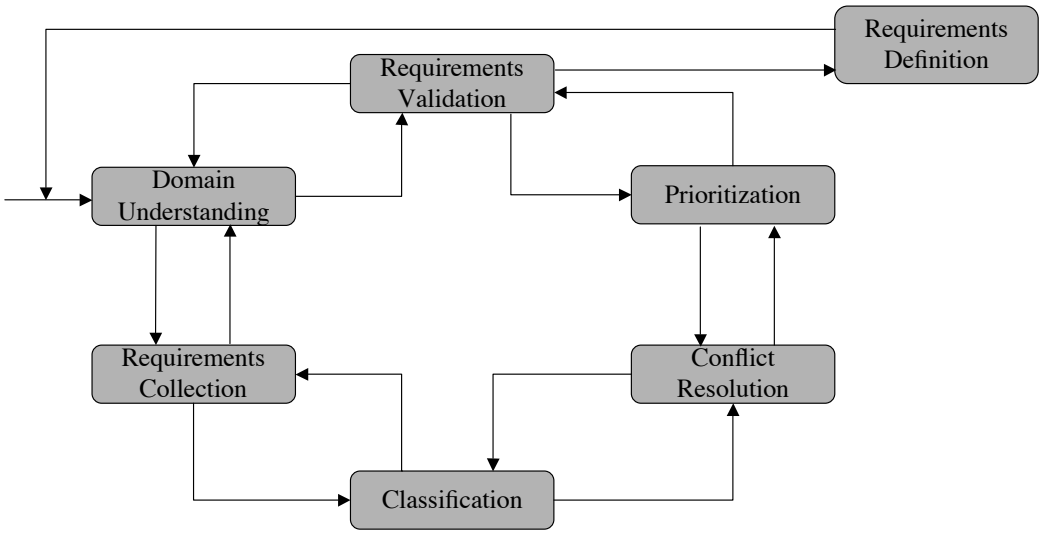
Requirements Review (formal)

- Developer "walks" customer through each requirement, explaining implications.
- Review team checks each requirement for:
  - Clarity
  - Consistency
  - Verifiability: How can the requirement be tested?
  - Traceability: What is the source of the requirement?
  - Adaptability: Can the requirement be changed without major effects on other requirements?

Requirements Evolution

- Enduring requirements
- Volatile requirements
  - Mutable requirements
    - Due to changes in the customer's environment
  - Emergent requirements
    - Due to customer's increased understanding of system
  - Consequential requirements
    - Due to introduction of the new system
  - Compatibility requirements
    - Due to changes in customer's business process or systems

Requirements Elicitation Process



Perspectives on Viewpoints

- A data source or sink
  - A viewpoint is responsible for producing or consuming data.
- A representation framework
  - A viewpoint is a particular type of system model.
- A receiver of services
  - A viewpoint is external to the system and receives services from it. Viewpoints may provide data or control signals.

The service oriented approach

- Most suitable for interactive systems.
- Natural to think of end-users as receivers of services
- Natural way to structure requirements elicitation
- Easy to decide if an entity is a valid viewpoint
- Natural way to structure non-functional requirements
  - The same service may have different non-functional requirements associated with different viewpoints.

Stakeholders

Different kinds people all have some interest in system requirements, e.g. ATM system for a bank:

- Current bank customers
- Other cooperating banks
- Branch office managers
- Tellers
- Database administrators
- Bank security managers
- Communications engineers
- Bank's marketing department
- Hardware and software maintenance engineers
- Bank's personnel department

Stakeholders (2)

- End-users, managers, engineers who develop or maintain related systems, domain experts, union representatives, etc.
- May not know what they really want, or may find it difficult to articulate
- May make unrealistic demands
- Express requirements in their own terms with implicit knowledge of their own work
- May be politically motivated

Components of Elicitation Methodologies

- Process model
  - Defines the activities in the method
- Domain modeling notations
- Rules applied to domain models
  - Within or between models, e.g. input/output items in data flow model must appear in E/R model.
- Design guidelines
- Report templates

Viewpoint Oriented Analysis

VORD (Kotonya and Sommerville, 1992)

- Viewpoint identification
  - Discover viewpoints receiving system services
  - Allocate system services to various viewpoints
- Viewpoint structuring
  - Group related viewpoints into an inheritance hierarchy
- Viewpoint documentation
  - Refine description of viewpoints and services

VORD

Viewpoint template

Reference: The viewpoint name

Attributes: Providing viewpoint information

Events: List of references to scenarios describing how the system reacts to viewpoint events

Services: List of references to service descriptions

Sub-VPs: Names of sub-viewpoints

Service template

Reference: The service name

Rationale: Reason for providing the service

Specification: List of references to service specifications (may use various notations)

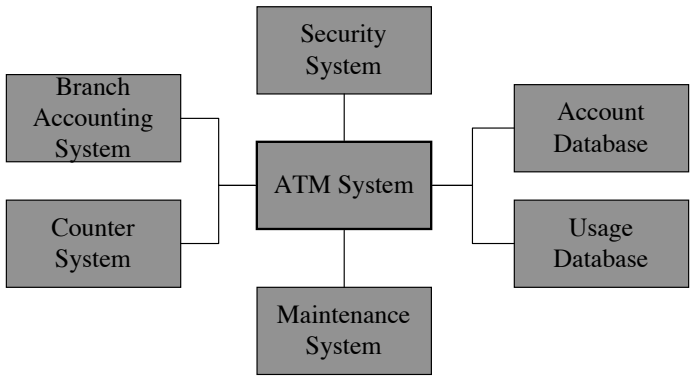
Viewpoints: List of viewpoints receiving the service

Non-functional requirements: References to constraints on the service

Provider: List of system objects ~~which provide the service~~

System Contexts

- Determining the system boundaries
  - When replacing an existing system (manual or computerized), the environment for the new system is usually the same
  - Otherwise the decision may be fairly arbitrary



Social and Organizational Issues

- Potential influence on all viewpoints
- Example: System Boundaries
  - Can analysis be carried out on one site?
  - Is it necessary to consult a particular manager?
  - Will a larger system result in an expanded development group?
- Example: Requirement Elicitation
  - Consider a system which will allow senior managers to access information directly. An organizational factor may be the intention to reduce the numbers of middle managers. The middle managers have a vested interest in seeing the system fail, but are an important source of information about requirements.

Ethnographic Analysis

- Ethnography:

  Technique whereby a sociologist spends considerable time observing in the working environment. Does not involve people *explaining* what they do.

- Problem:

  Studying existing work supported by imperfect systems may lead to erroneous conclusions concerning requirements.

  Example: Air traffic controllers may keep the audible conflict alert turned off, because they deliberately place aircraft on conflicting paths (temporarily). One might conclude that conflict alert is not a requirement, instead of requiring an improved conflict alert system.