Informatik-Projektentwicklung
– Lecture 3 –

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Software Component Technology

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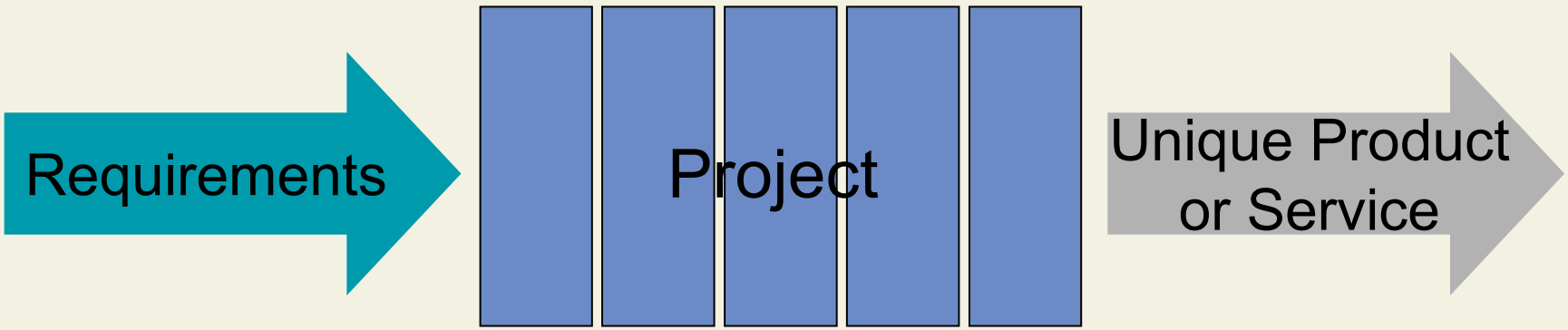
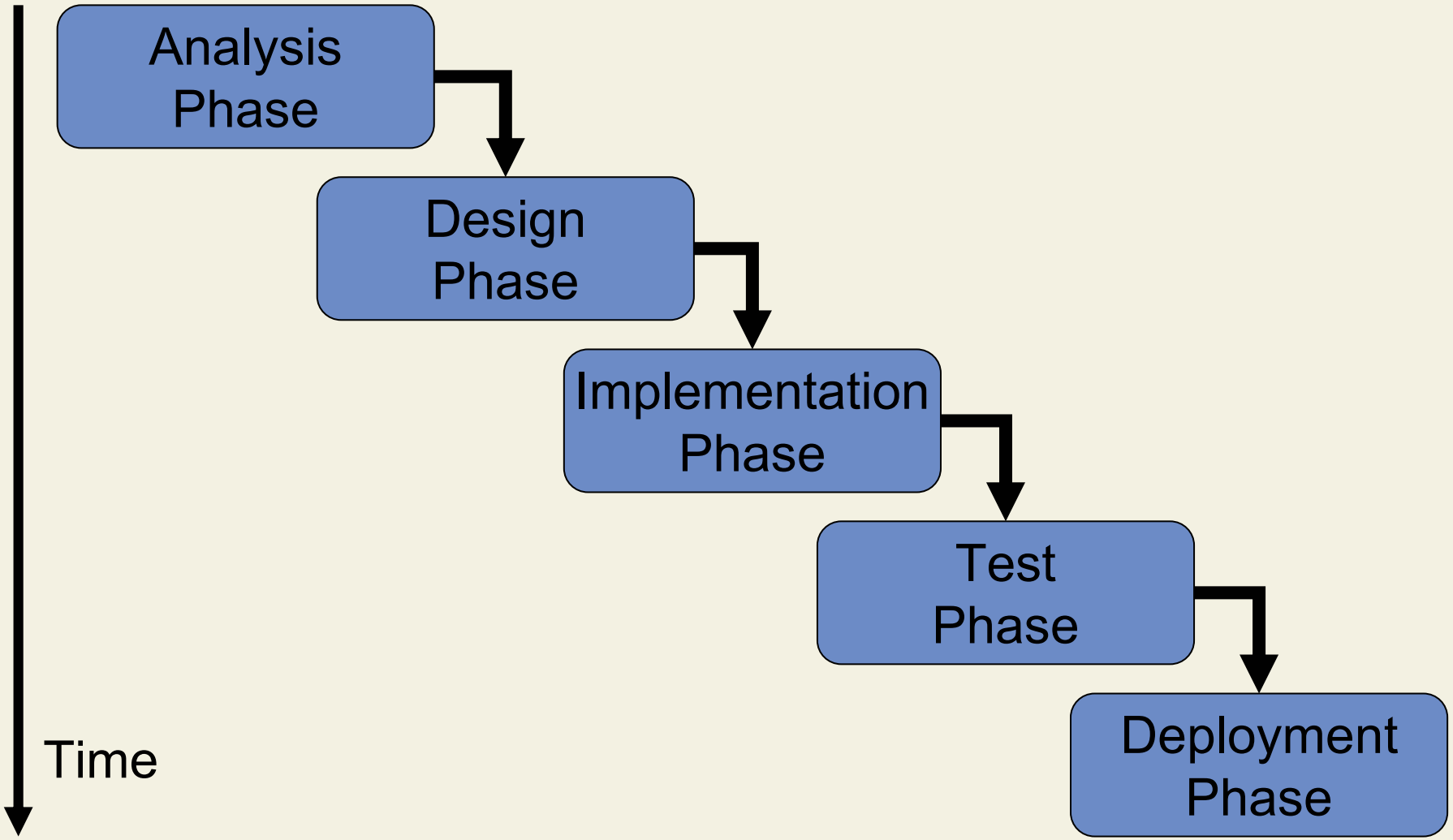
Project Phases

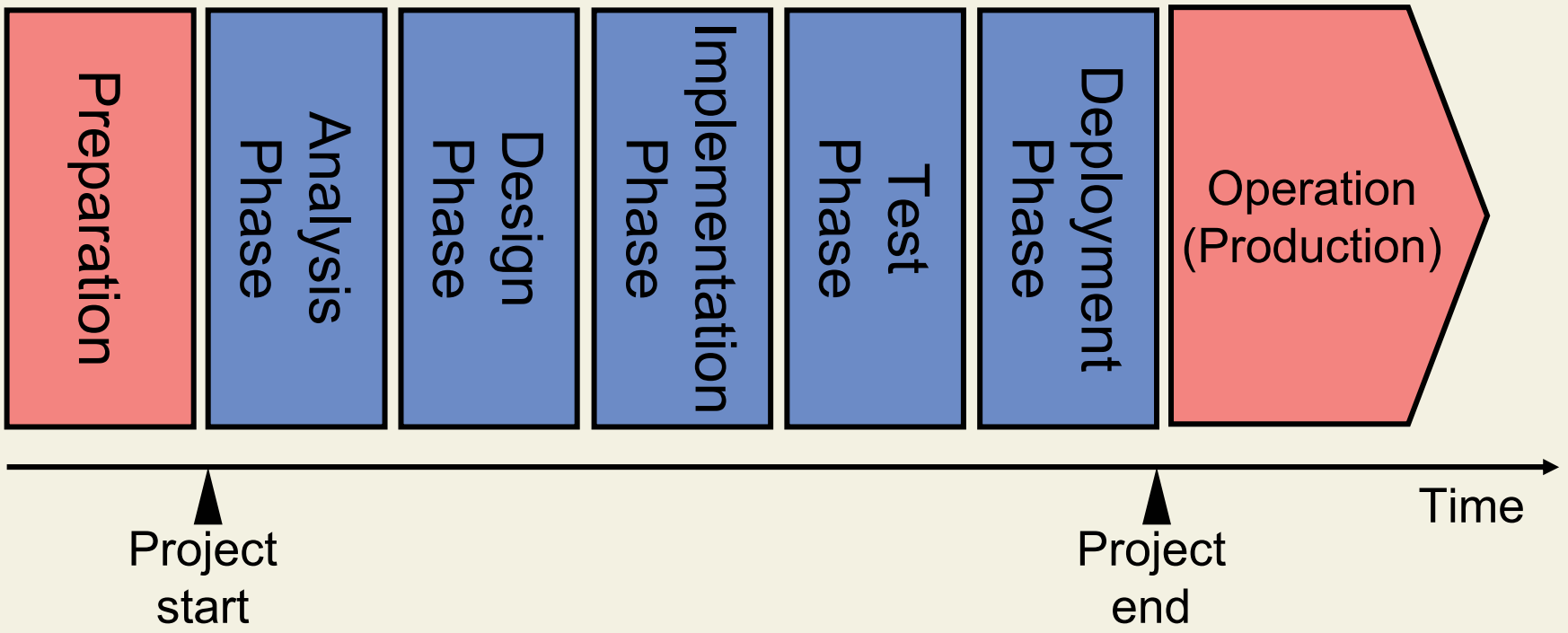
- Definition:
  A collection of logically related project activities, usually culminating in the completion of a major deliverable



Waterfall Model of Project Life Cycle

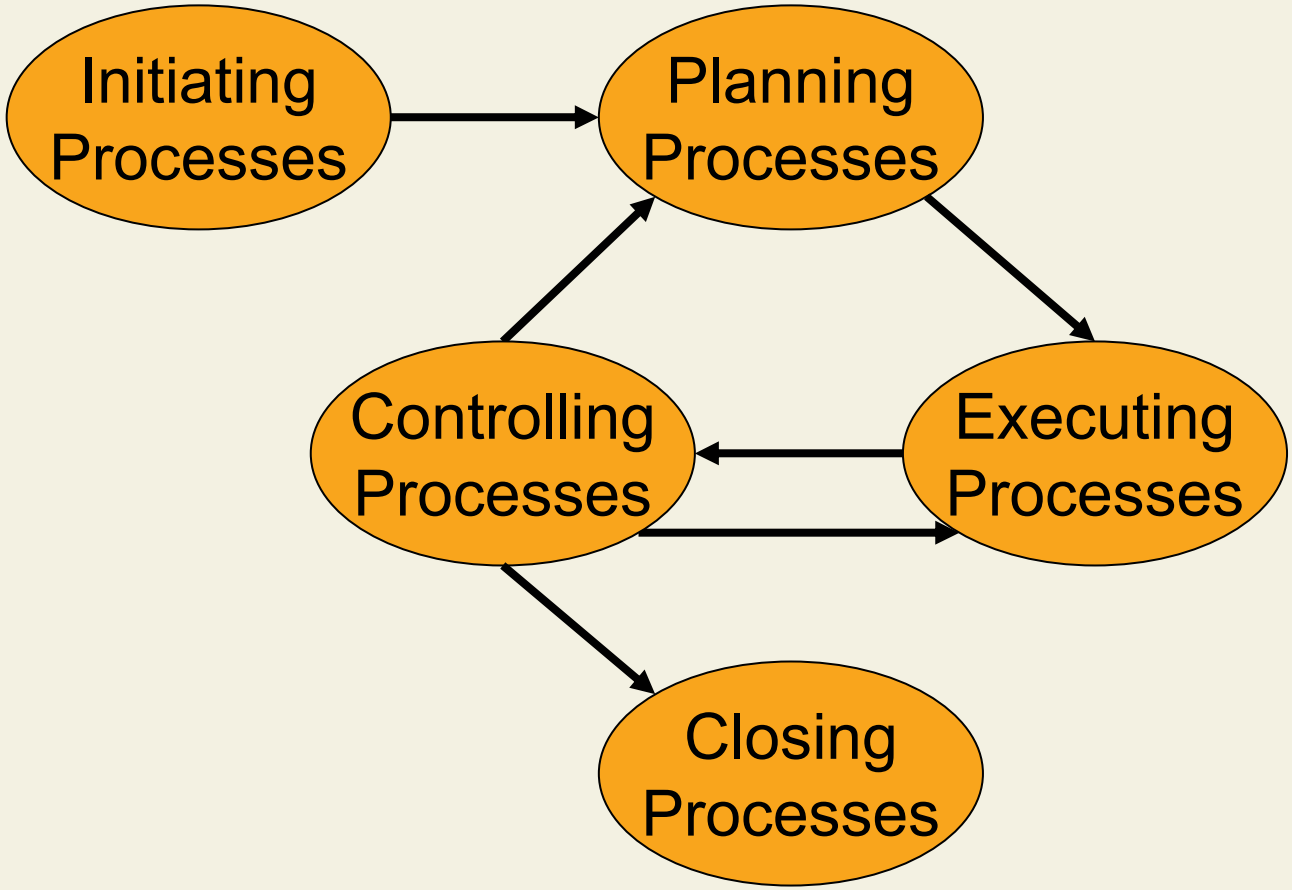


From Projects to Operations

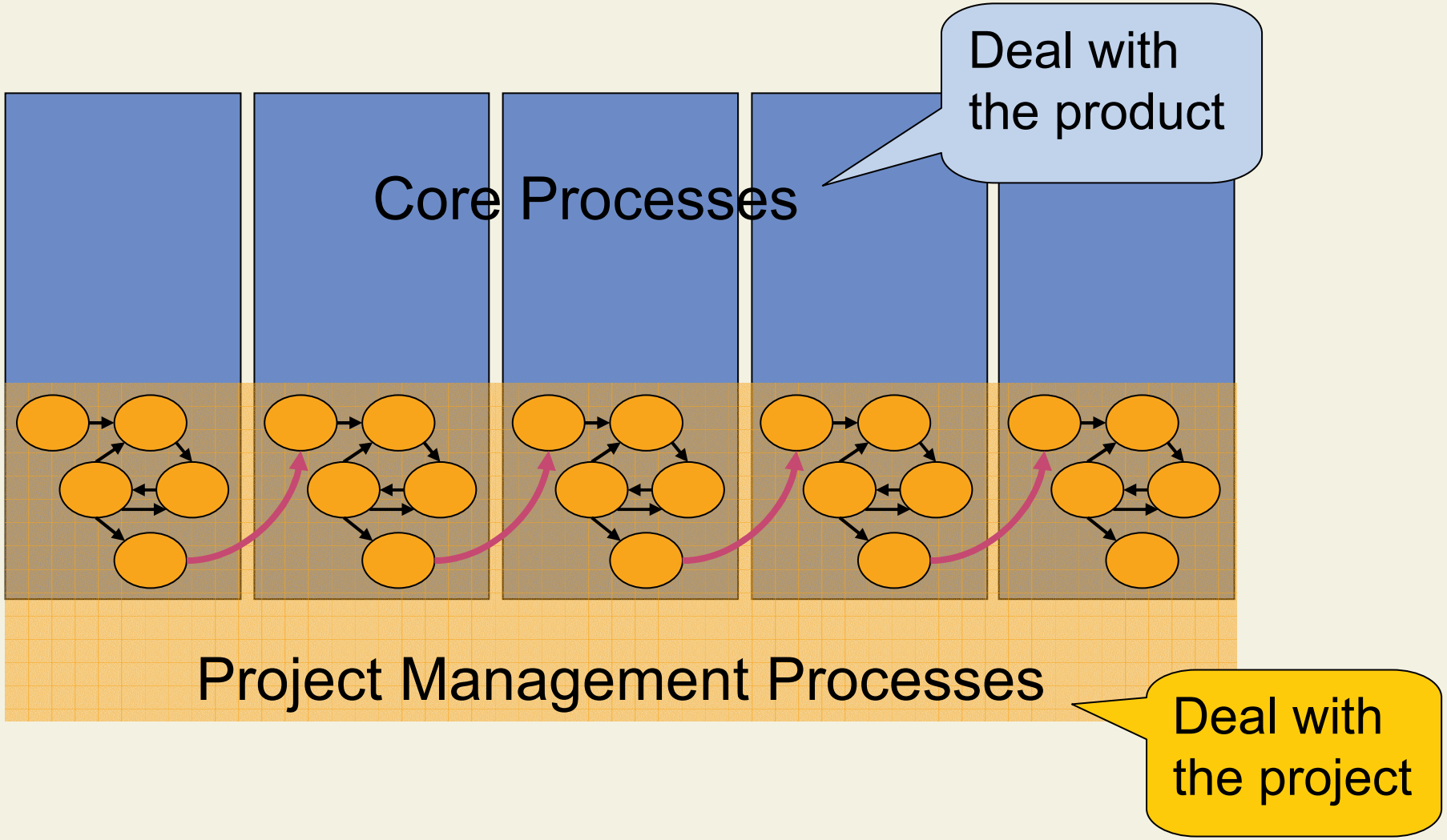


- Project phases are surrounded by related activities that are not part of the project

Project Management Life Cycle



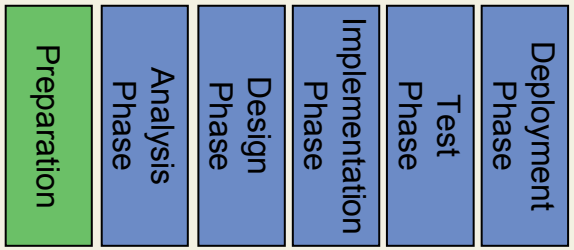
Core and Project Management Processes



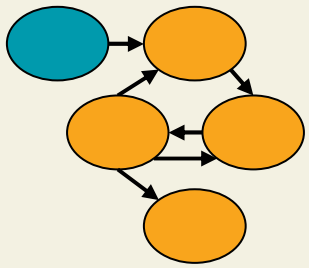
Agenda for Today

3. Project Initiation and Analysis Phase

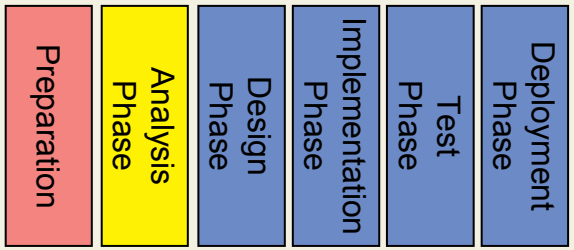
- Practice Projects: Project Orders
- Preparation



- Project Initiation



- Analysis Phase



3. Project Initiation and Analysis Phase

Getting the Projects Started

- Assignment of participants to projects is published: se.inf.ethz.ch/teaching/ws2003/37-801/index.html
  - Contact your supervisor if changes are necessary

- Project orders with product sketches are available online

Next Steps

- Read project order
- Develop project definition (perform project initiation)
- Develop product definition (perform analysis phase)
- Develop work breakdown structure and initial schedule (described next week)

- Deadline: November 20, 2003
- All documents have to be prepared in English
- Think of progressive elaboration, use assumptions!

Communication

- Only the current two project managers should interact with the supervisor and client

- Please send email
  - to make an appointment with internal supervisors
  - to arrange a phone call with external client, if necessary

Presentations

- Each group has to present a management summary of their documents
  - 4 (four) minutes for the presentation plus 3 for questions
  - No own computers
  - Both managers should be involved
- Topics to be covered
  - Essentials of developed deliverables
  - Project status
- Presentations for “Publications Viewer” have to be in English
- Date: November 24, 2003

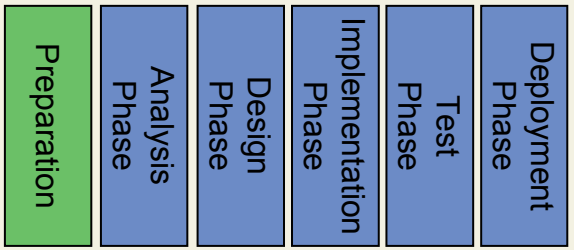
3. Project Initiation and Analysis Phase

3.1 Practice Projects: Project Orders

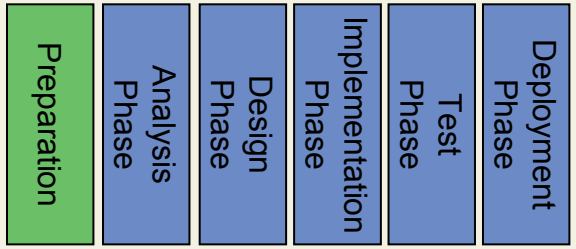
3.2 Preparation

3.3 Project Initiation

3.4 Analysis Phase

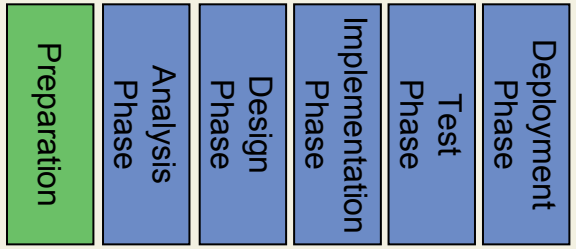


Product Sketch



- Questions to ask
  - What should the product do?
  - How should the product work?
  - Who is affected by the product and which tasks are performed by these people?
- Level of detail
  - To assess technical feasibility
  - To enable a first cost estimate
- The product sketch is written for non-specialists (management)

Preparation: Summary



- The preparation is NOT part of the project
- Purpose
  - To develop concrete objectives from vague ideas
- Major deliverables
  - Product sketch for decision paper
- Main actors
  - Clients, project manager, business analysts
- Tools and techniques
  - Communication
  - Preparatory studies, e.g., impact analyses

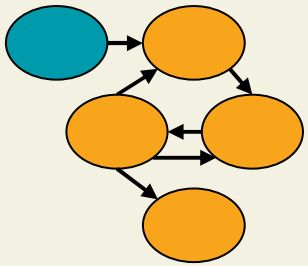
3. Project Initiation and Analysis Phase

3.1 Practice Projects: Project Orders

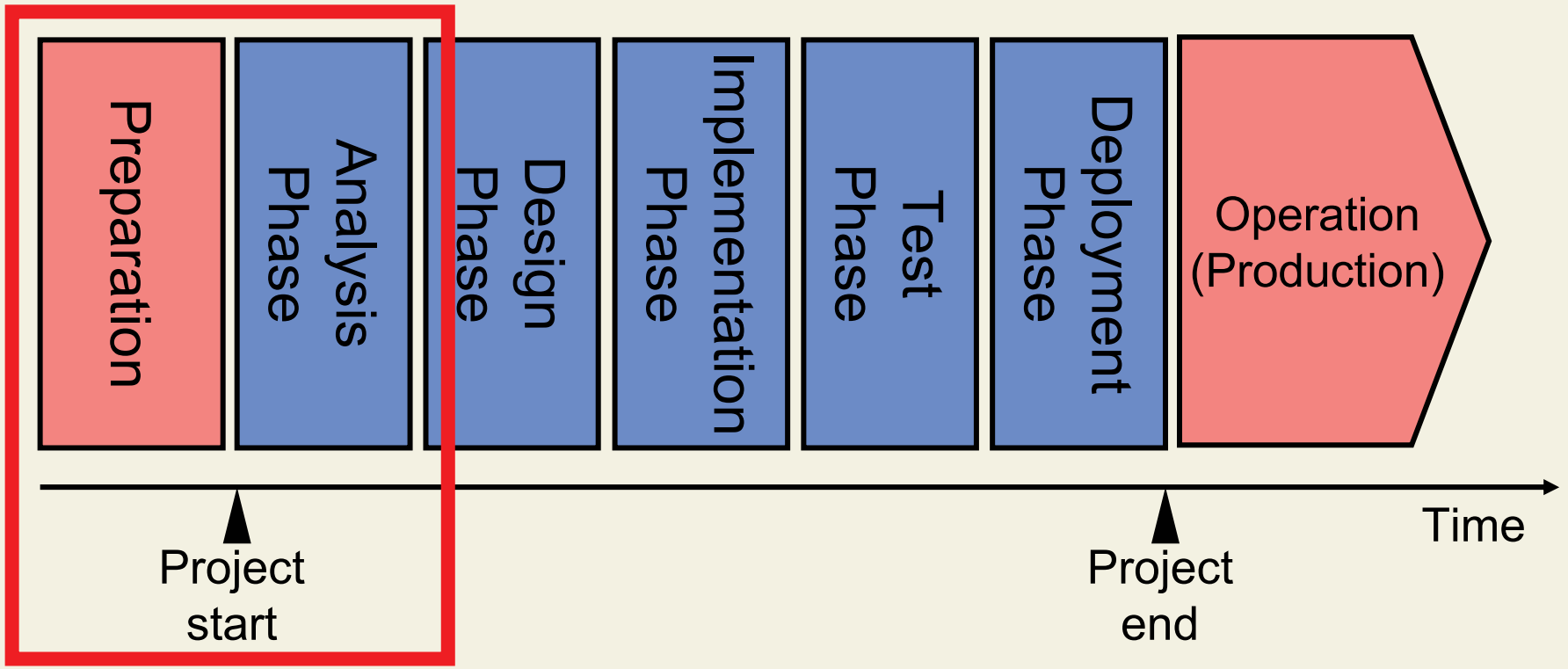
3.2 Preparation

3.3 Project Initiation

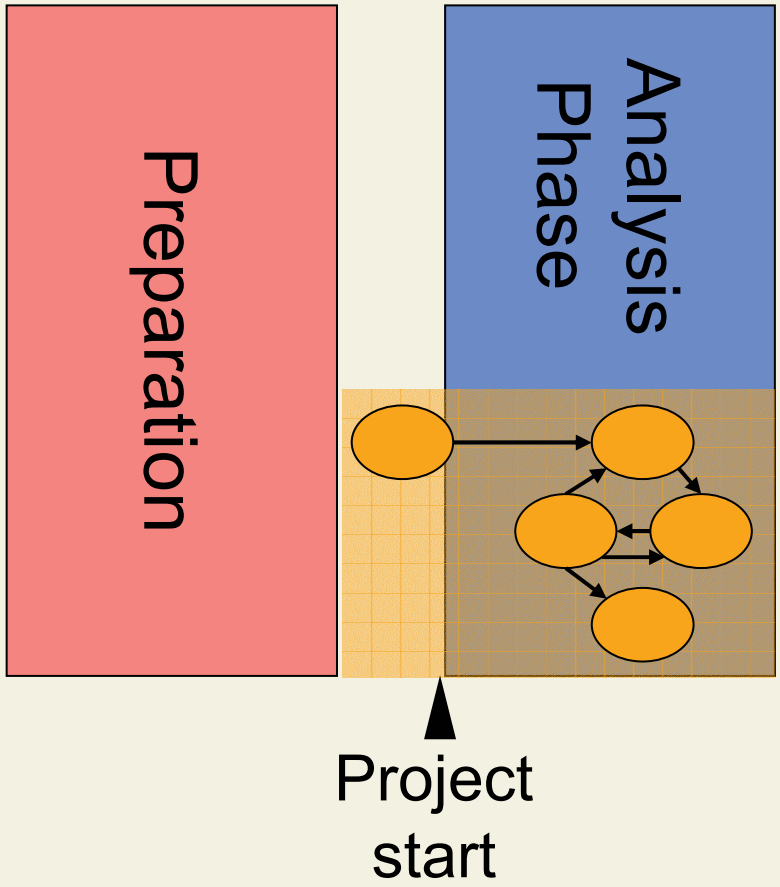
3.4 Analysis Phase



Starting a Project

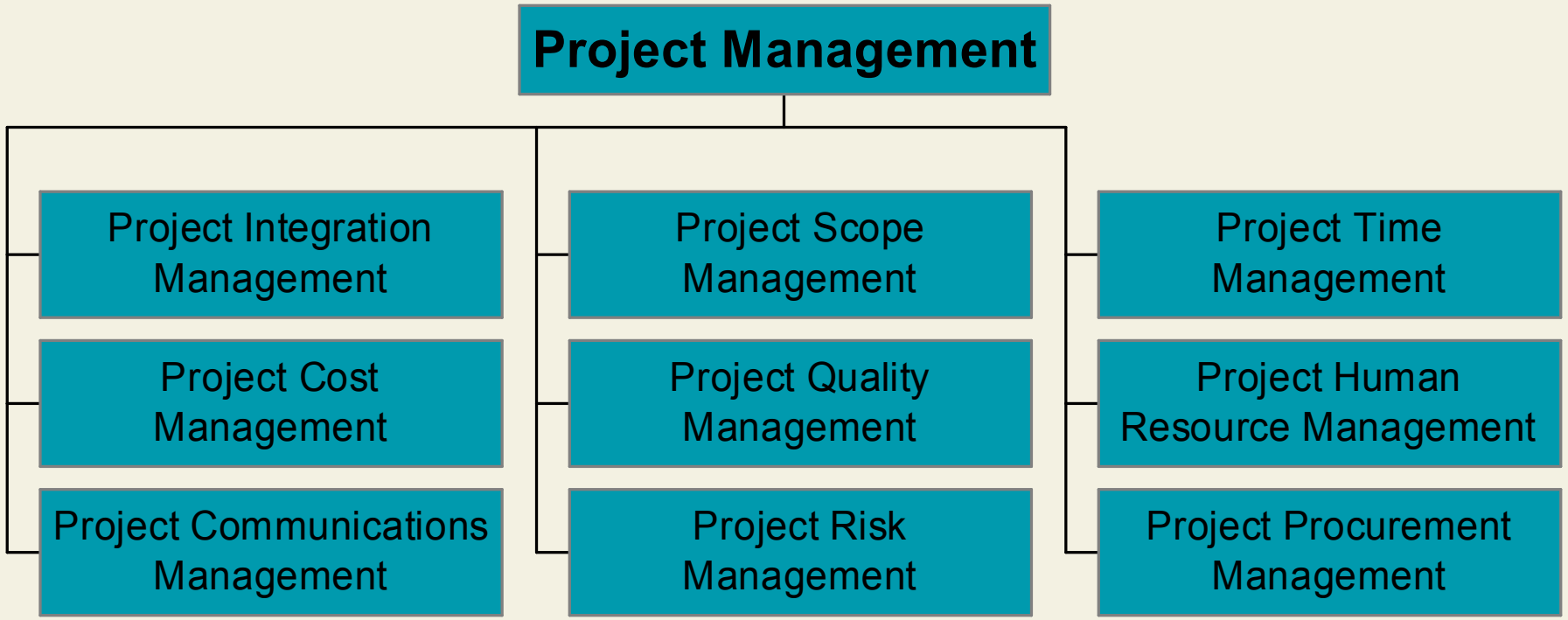


Starting a Project



- Starting a project is mainly a project management activity
- Initiation prepares a decision by clients and management

What is Necessary to Take a Decision?



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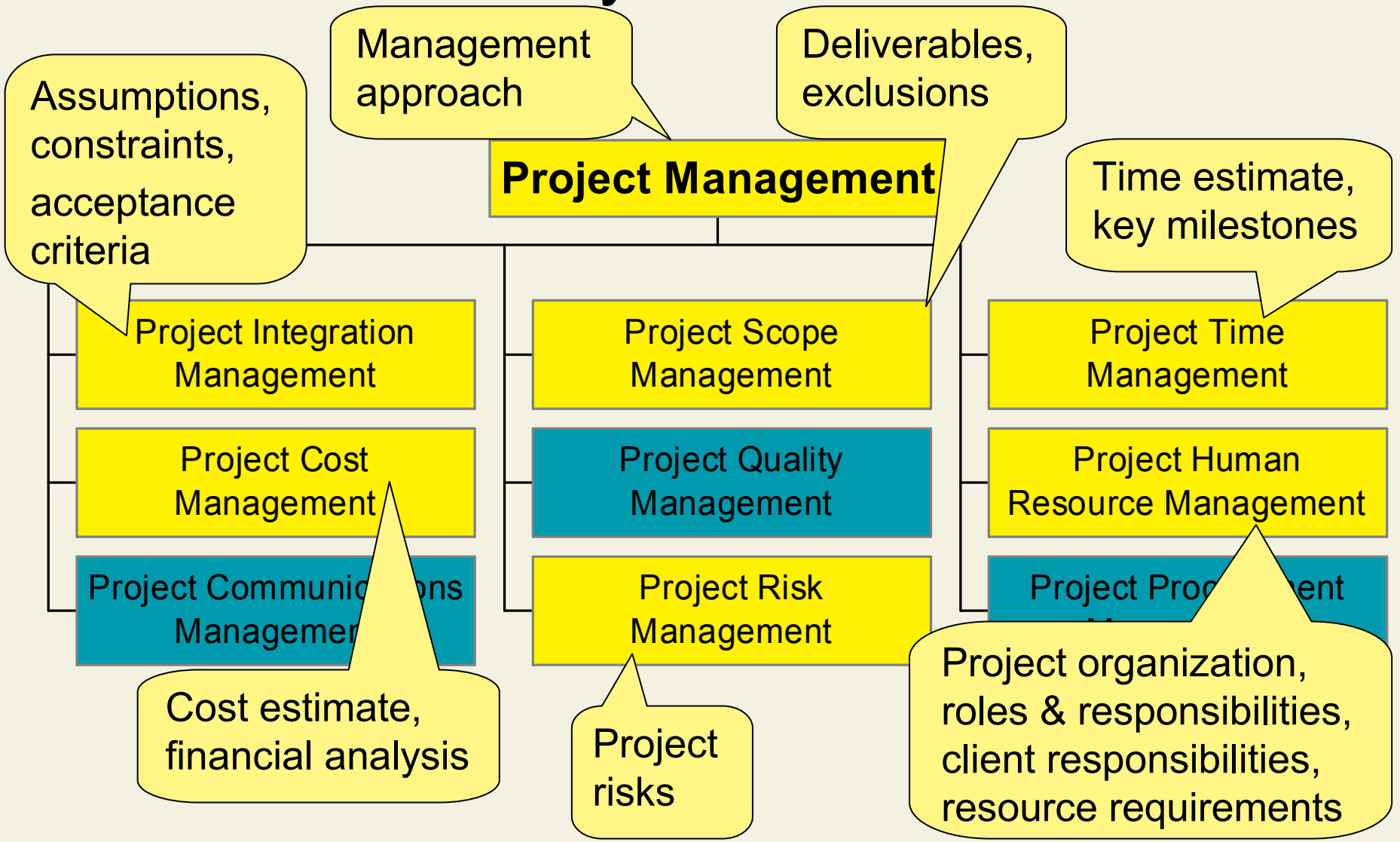
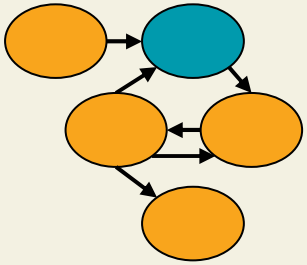


Assumptions

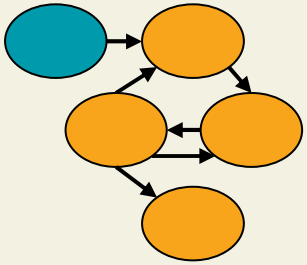


- Definition:
  Assumptions are factors that, for planning purposes, are considered to be true, real, or certain
- Assumptions affect all aspects of project planning, and are part of the progressive elaboration of the project
- Project teams frequently identify, document, and validate assumptions as part of their planning process.
- Assumptions generally involve a degree of risk

Constraints

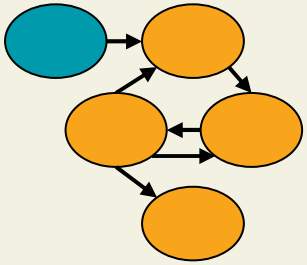
- Definition:
  Constraints are factors that limit the project team's options
- A single project may contain cost, time, human resource, technical, and other constraints
- Examples
  - External deadlines (e.g., Y2K, Euro)
  - Fixed upper limits for budget
  - Dependencies on other projects, etc.

Stakeholders



- Definition
  Individuals and organizations that are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or project completion; they may also exert influence over the project and its results
- Key stakeholders
  - Project manager
  - Customer
  - Performing organization
  - Project team members
  - Sponsor

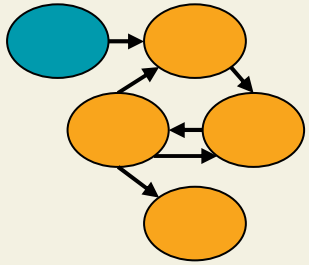
Project Definition



- The project definition is an overview document that sets the bounds of the project
- It is the basis for a decision by clients and management

- Example: ISIN03 Project Definition

Project Selection Process



Senior Manager

Project Definition

Project Charter

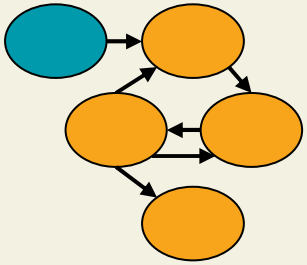
Customer

Strategic Plan

Historical Information

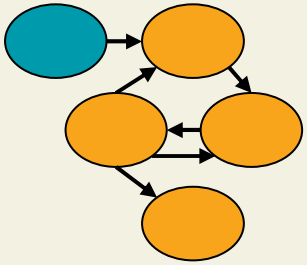
Project Selection Criteria

Project Charter



- A document issued by senior management that formally authorizes the existence of a project
- Assigns the project manager
- Gives the project manager authority
- Contains
  - Project description
  - Project objectives
  - Business case
  - Product description, high-level deliverables
- For projects under contract, the signed contract may serve as project charter

Initiation Process: Summary



- Purpose
  - To formally authorize a new project or that an existing project should continue into its next phase
  - Repeating the initiation process at the start of each phase helps to keep the project focused on the business need

Inputs	Tools & Techniques	Outputs
1. Product description 2. Strategic plan 3. Project selection criteria 4. Historical information	1. Project selection methods 2. Expert judgment	1. Project definition 2. Project charter 3. Project manager assigned

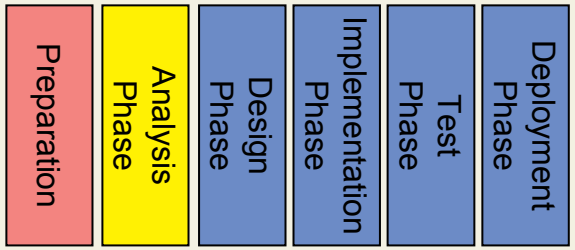
3. Project Initiation and Analysis Phase

3.1 Practice Projects: Project Orders

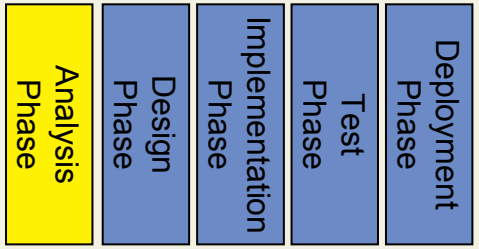
3.2 Preparation

3.3 Project Initiation

3.4 Analysis Phase

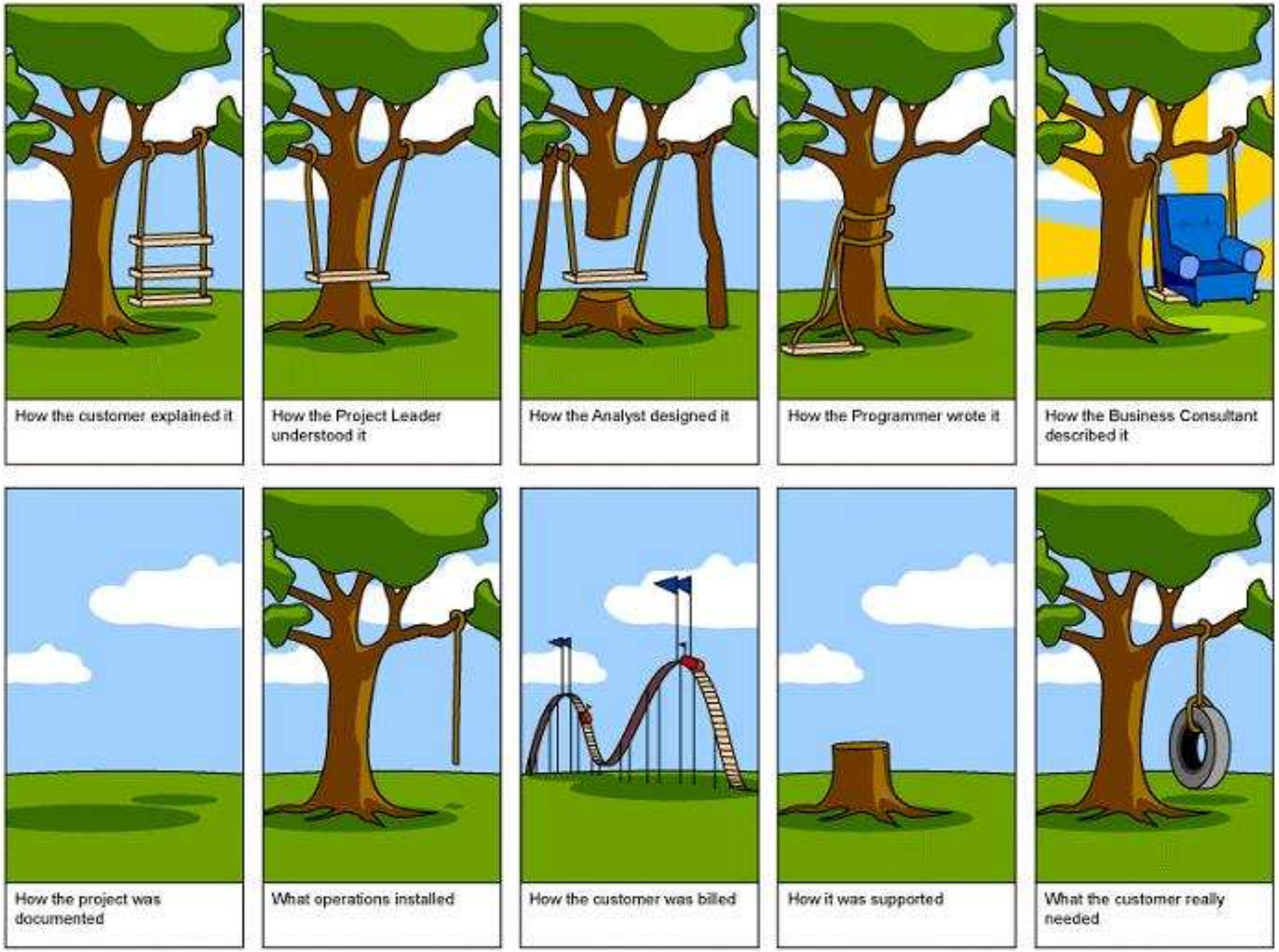


Motivation

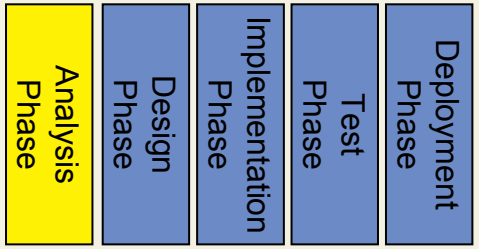


"The hardest single part of building a software system is deciding precisely what to build. No other part of the conceptual work is as difficult as establishing the detailed technical requirements [..]. No other part of the work so cripples the resulting system if done wrong. No other part is more difficult to rectify later."

[Brooks, 1987]

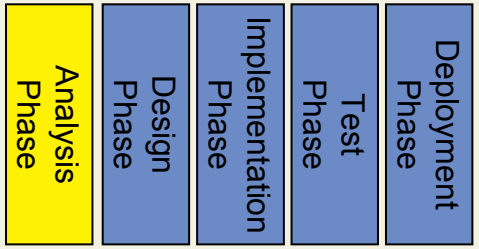

How the customer explained it
How the Project Leader understood it
How the Analyst designed it
How the Programmer wrote it
How the Business Consultant described it
How the project was documented
What operations installed
How the customer was billed
How it was supported
What the customer really needed

Requirements



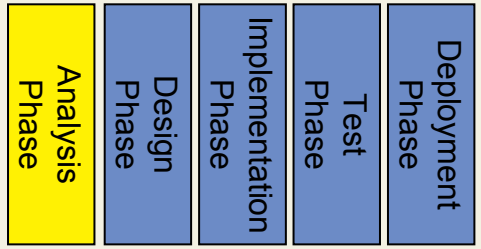
- Functional requirements
  - Functionality, interfaces, data, exception handling, etc.
- Quality requirements
  - Reliability, maintainability, ergonomics, etc.
- Technical requirements
  - Hardware, system interfaces, programming language, etc.
- Validity and maintenance requirements
  - Warranties, maintenance conditions, training, etc.
- Realization requirements
  - Lifecycle model, documentation, constraints, etc.

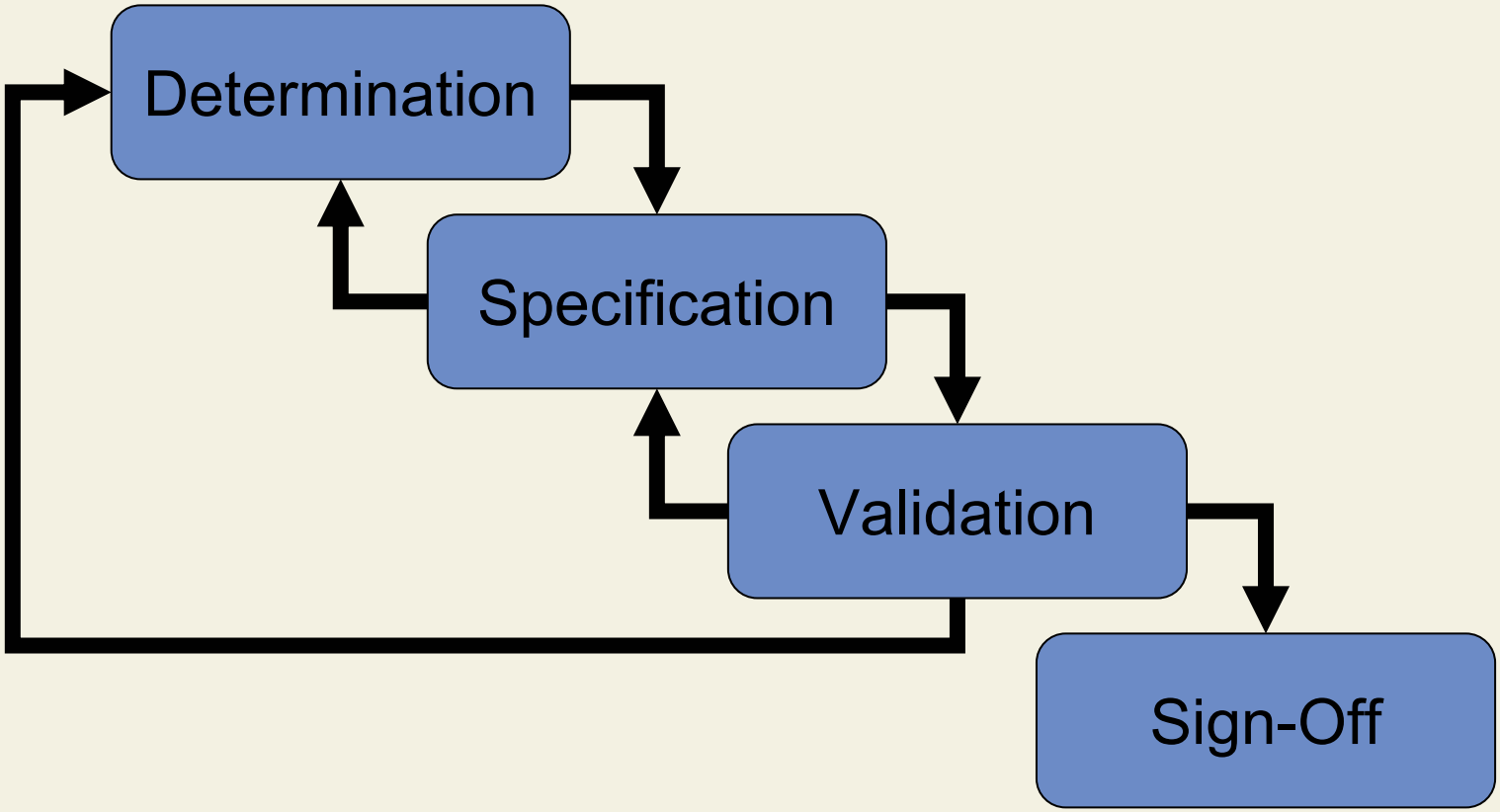
Analysis



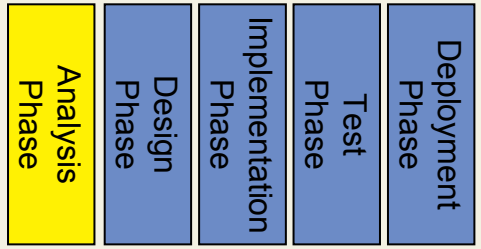
- Definition:
  Analysis is the study of a problem domain, leading to a specification of externally observable behavior; a complete, consistent, and feasible statement of what is needed; a coverage of both functional and quantified operational characteristics (e.g., reliability, availability, performance)
- Synonyms
  - Requirements analysis and specification
  - Requirements engineering

Analysis Subphases





Modeling the Real World



Problem domain

Abstraction

Model view of problem

Modeling Method

Representation of model

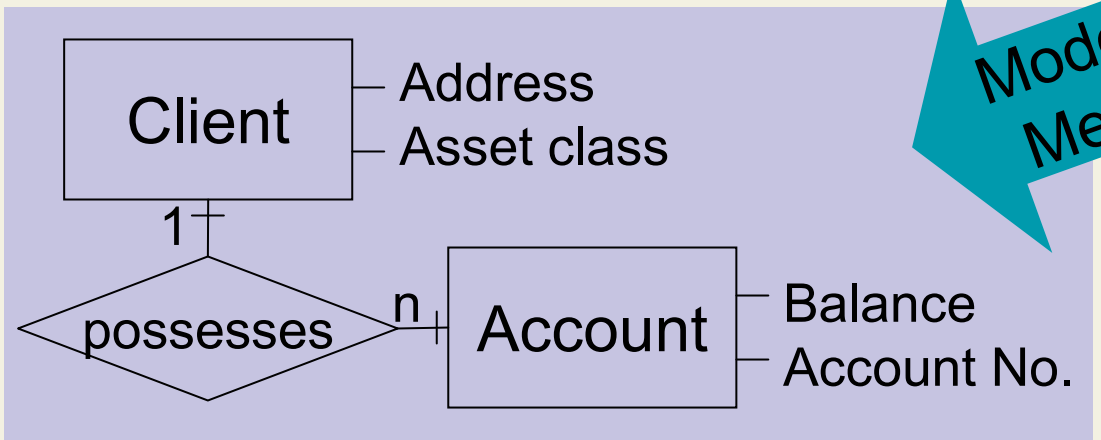
Modeling Example

Bank client

Abstraction

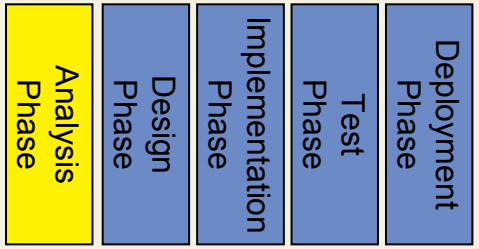
Tuple of
- Address
- Asset class
- At least one account

Modeling Method



ER-Diagram

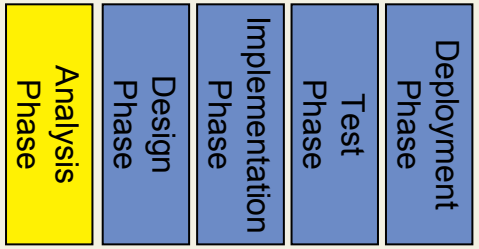
The 80-20-Rule



- Pareto's Principle, the 80-20-rule, or the "Vital Few and Trivial Many Rule“:
  A small number of causes is responsible for a large percentage of the effect, in a ratio of about 20:80

- Applications
  - For IT-projects in general: 80% of the effort is spent on automating the 20% most complex of all cases
  - For the analysis phase: Spend 80% of the effort on the main course (detailed description of normal behavior), the rest on alternate courses (exceptions, error handling)

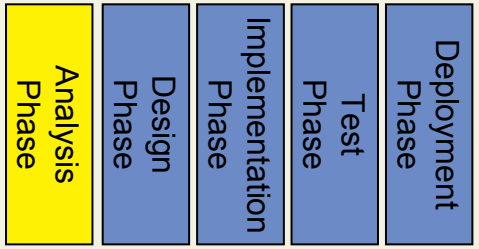
Functional Requirements



- Operations
  - Dynamic properties
- Data and their relations
  - Static properties
- Temporal properties
  - system states

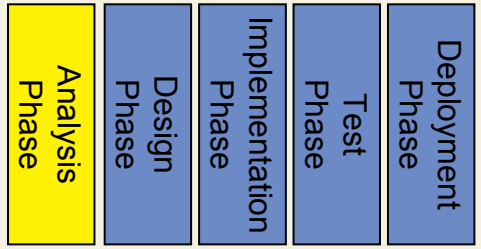
- Description of functional requirements is often called *functional design*

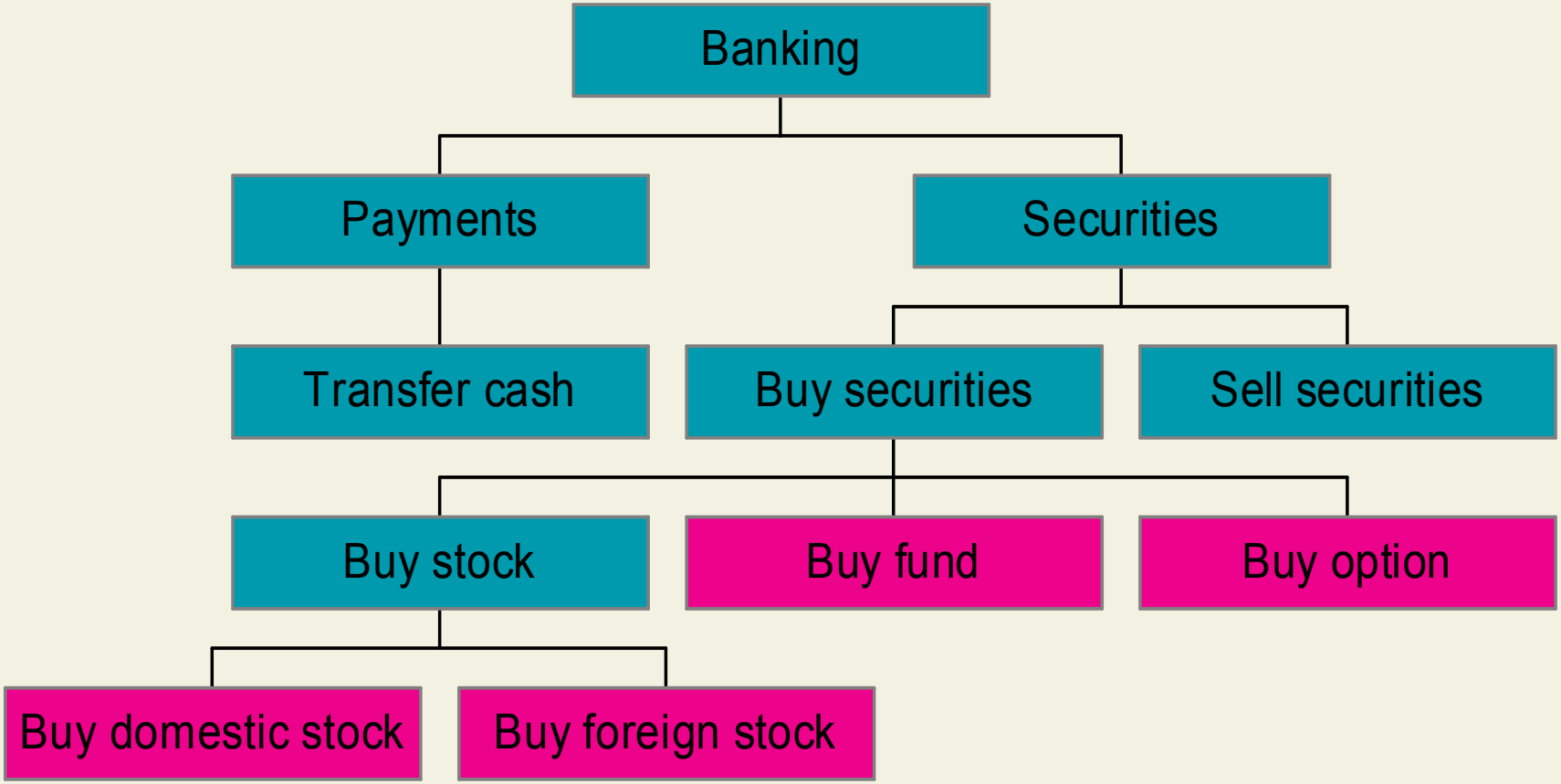
Modeling Data Flows



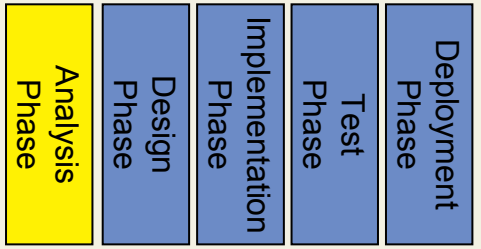
- Method
  - Identification of business processes
  - External communication of the system (input-output behavior)
  - Step-by-step refinement
- Results
  - Process hierarchies
  - Process flows
  - Process specifications (control and data flow diagrams)

Example: Process Hierarchy

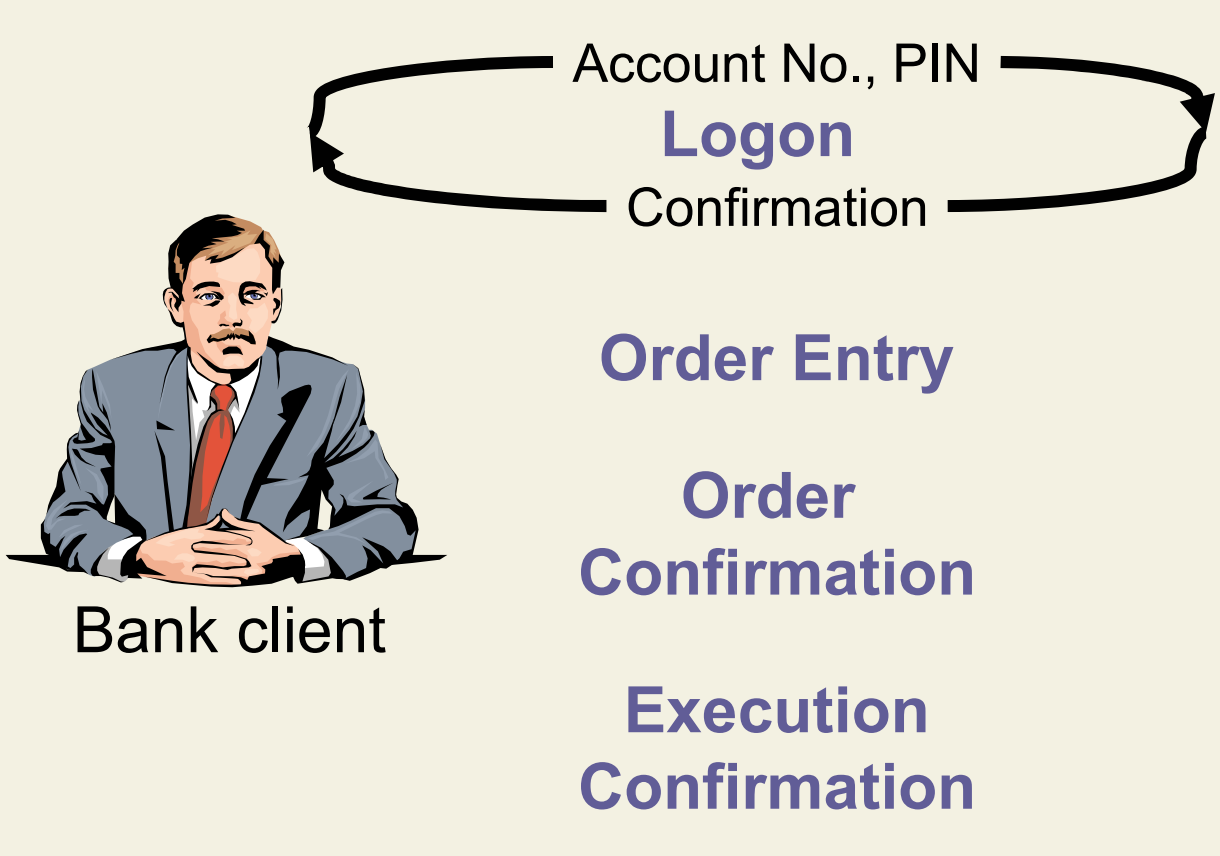




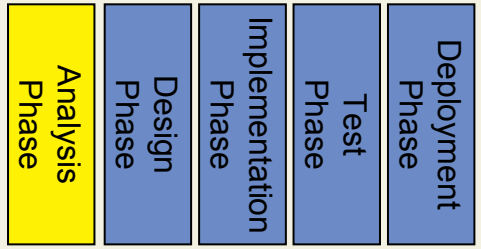
External Communication



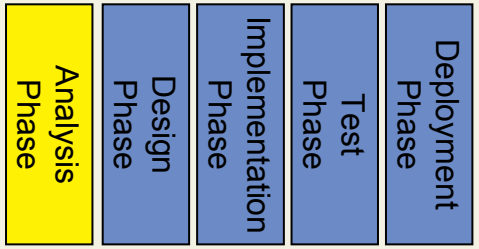
- Often specified by Use Cases and Actor Interaction Diagrams



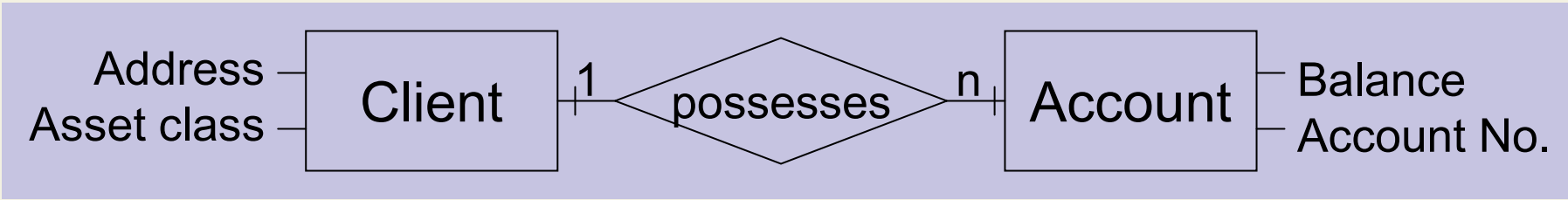
Example: Process Flow



Modeling Data

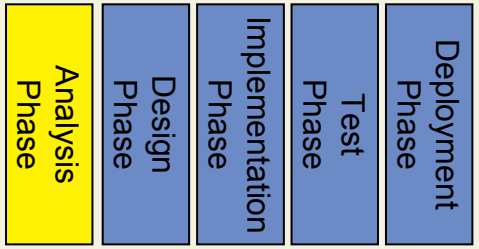


- Data modeling addresses data (types) and their relations
- Often modeled with Entity-Relationship Diagrams
  - Entities
  - Attributes
  - Relations (type, cardinality)



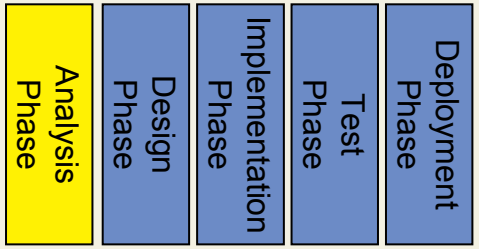
- Excellent basis for relational databases

Modeling System States



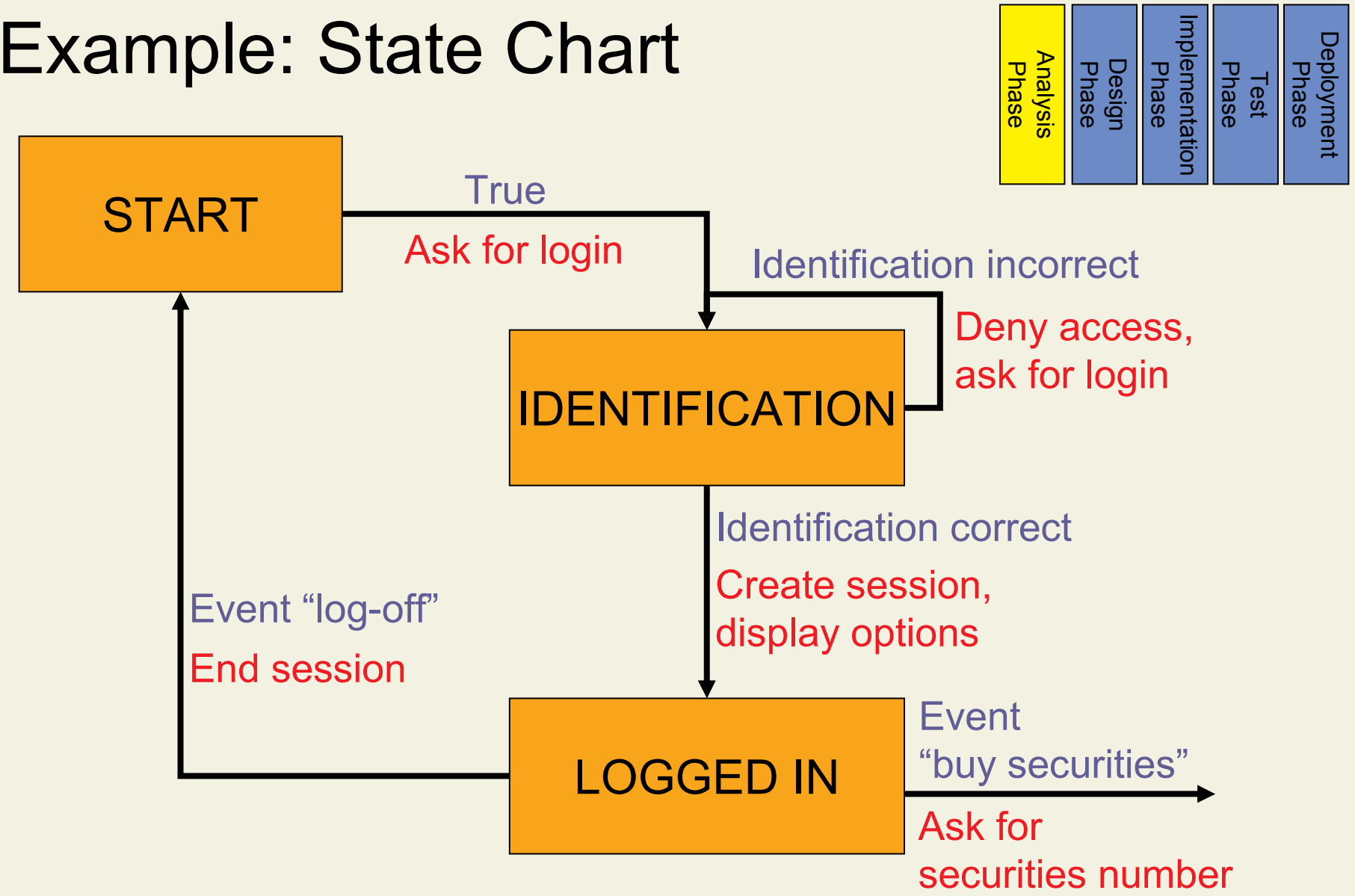
- System behavior may depend on history of interactions
  - Different outputs for same input
  - Systems have a state
- Examples
  - Graphical user interfaces
  - Touchtone applications
- Temporal properties are
  - Specified by event models
  - Represented by state charts

Event Models

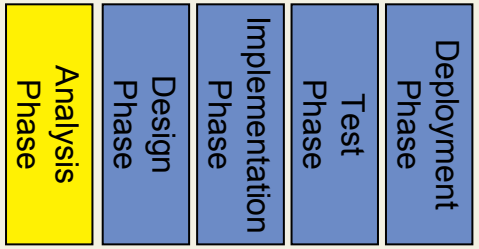


- States
  - System is in exactly one well-defined state at any time
  - State may be idle (“waiting for message”) or active (“process data”)
  - Exactly one start state
  - End states mark termination
- Transitions
  - Condition (e.g., receipt of a message)
  - Action (e.g., computation, output)
  - Successor state

Example: State Chart

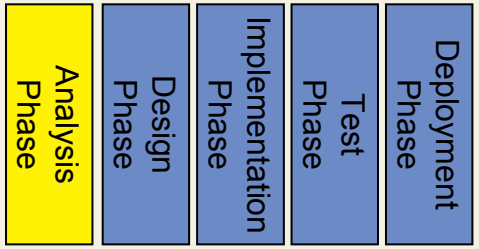


Discussion



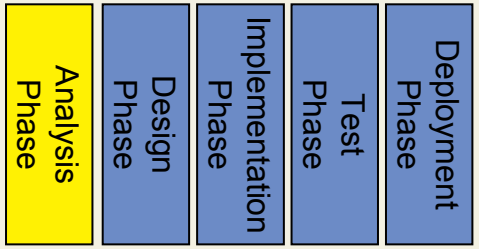
- Problem
  - Separate modeling of data flow, data, and states
- Modern Structured Analysis
  - Combines different models
  - Balancing: Ensure consistency between models
  - Example: One process in data flow model for each transition in state model and vice versa
- Object-Oriented Analysis
  - Real integration of different models
  - Very natural modeling of problem domain by objects with attributes and services, classes, and inheritance
  - Enables seamless development

Product Definition



- Complete, consistent, non-ambiguous specification of the externally observable system behavior
- Contents
  - Description of the status-quo (business processes, company organization structure, quantity structure)
  - Functional and non-functional requirements with priorities
- Must be approved by customer (sign-off)
- Basis for requests for proposal and contracts in external projects

Analysis Phase: Summary



- Purpose
  - To extract the “needs” of a system – what the system must do to satisfy the client, not how the system will be implemented
- Main Deliverables
  - Approved product definition
- Main actors
  - Business experts, business analysts
- Tools and techniques
  - Modern structured analysis (MSA)
  - Object-oriented analysis (OOA)