Software Architecture and Engineering

Introduction to Project Management

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Chair of Programming Methodology

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How to Avoid Troubled Projects

- Apply proper engineering
  - ⇨ Characteristics of IT-projects
  - ⇨ Phases of IT-projects with their purpose, methods, and deliverables
- Apply proper project management
  - ⇨ Main processes of project management with their inputs, techniques, tools, and outputs
  - ⇨ Main areas of project management (scope, time, cost, quality, risk, etc.)
- Recognize the importance of non-technical aspects
  - ⇨ Some basic rules of successful project management

10. Introduction to Project Management

10.1 Project Integration Management

10.2 Project Lifecycles

What is a Project?

Every project has a definite beginning and a definite end

- Definition:
  A project is a temporary endeavor undertaken to create a unique product or service

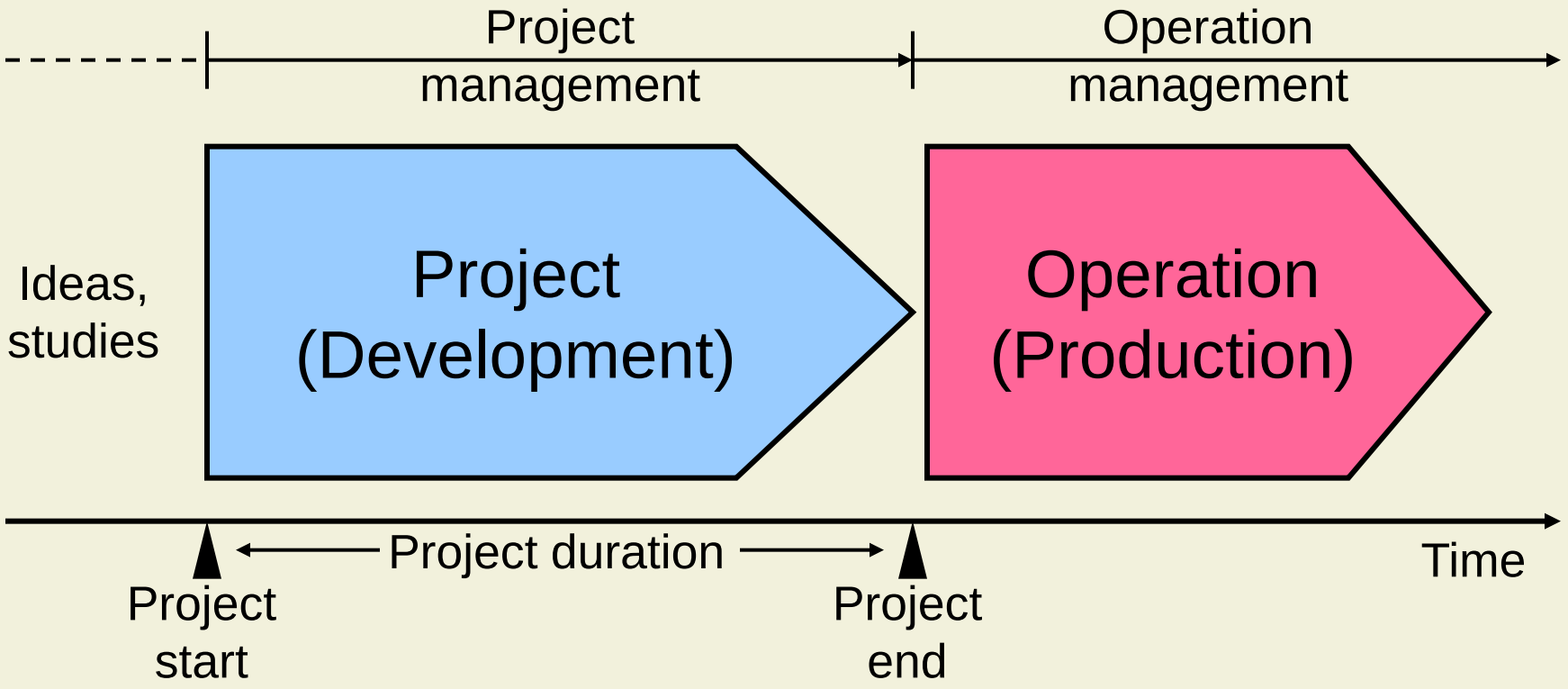
The product or service is different in some distinguishing way from all similar products and services

- In contrast: *Operations* are ongoing and repetitive

Examples for Projects and Operations

- Projects
  - Developing a new software application
  - Implementing a new business procedure
  - Adding functionality to an IT system
- Operations
  - Bugfixing of an existing software application
  - Selling train tickets
  - Running a car factory

From Projects to Operations

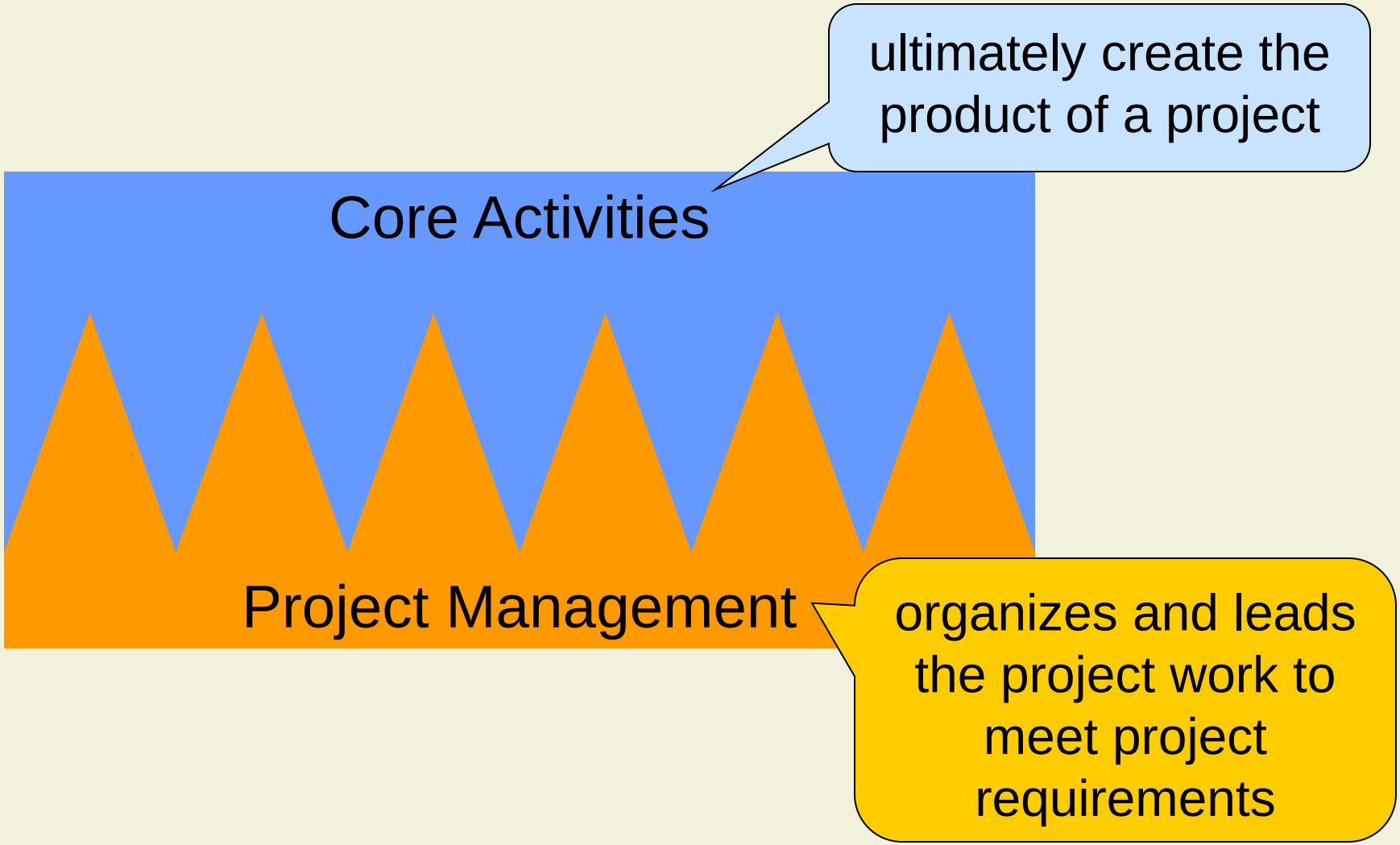


- Applications are neither projects nor operations, but products

Characteristics of Projects

- **Temporary** endeavor
- **Unique** product or service
- Performed by **people**
- **Constrained** by limited resources
  - Budget, time, staff
- **Planned**, **executed**, and **controlled**
- Have their own **organization**

Core Activities and Project Management



Project Management

- Definition of Project Management (PM):
  Project Management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements.

Typical Core Activities in IT-Projects

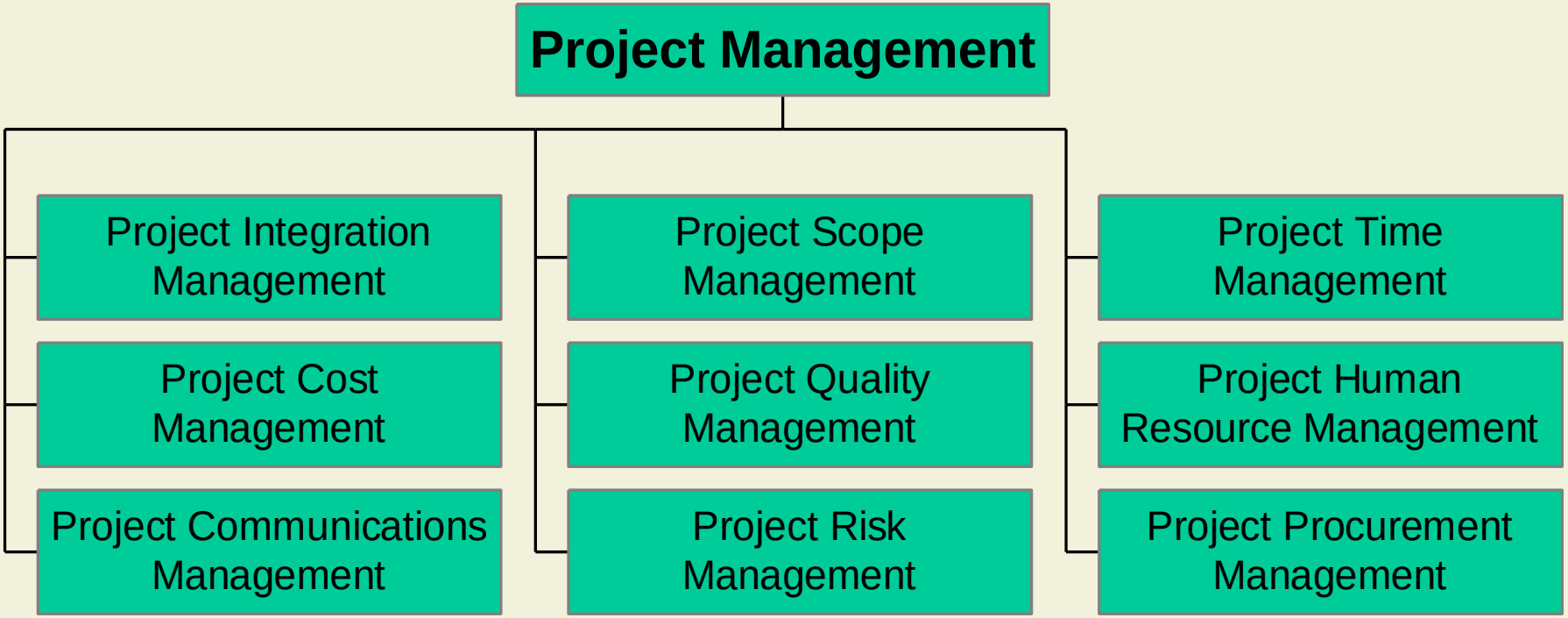
- Design of a graphical user interface
- Installation of a local area network
- Integration test of all system components
- Training of users on a new application
- Implementation of a set of Java classes
- Documentation of design decisions and code

Typical Project Management Activities

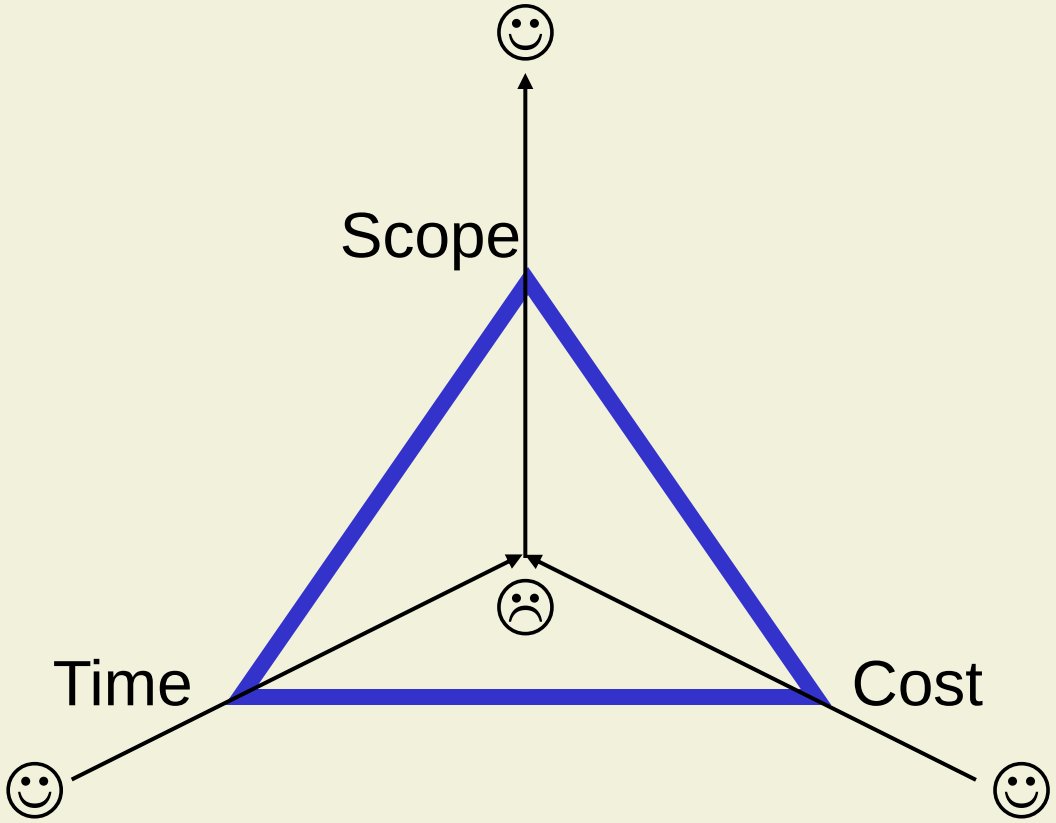
- Communication with team, clients, management
- Effort estimations
- Planning activities and assigning resources
- Comparing actual performance to plan
- Risk analysis
- Negotiation with subcontractors
- Staff acquisition

PM Knowledge Areas

PM activities fall into nine Knowledge Areas

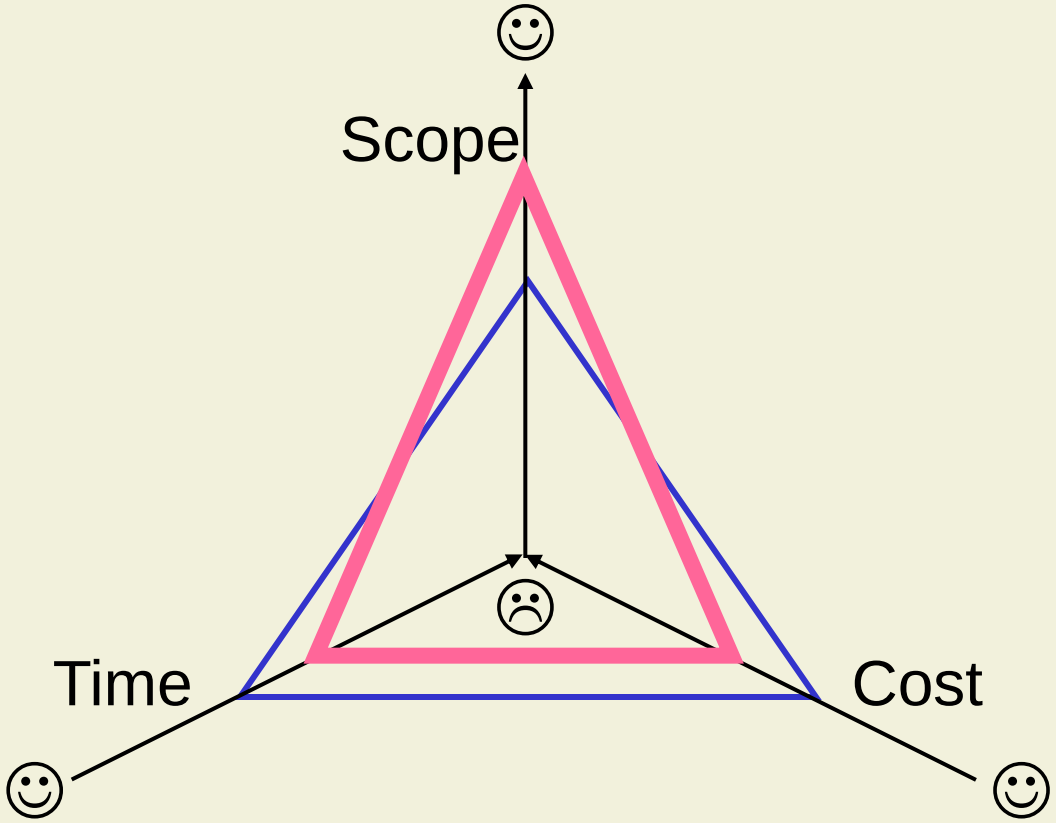


The Triple Constraint



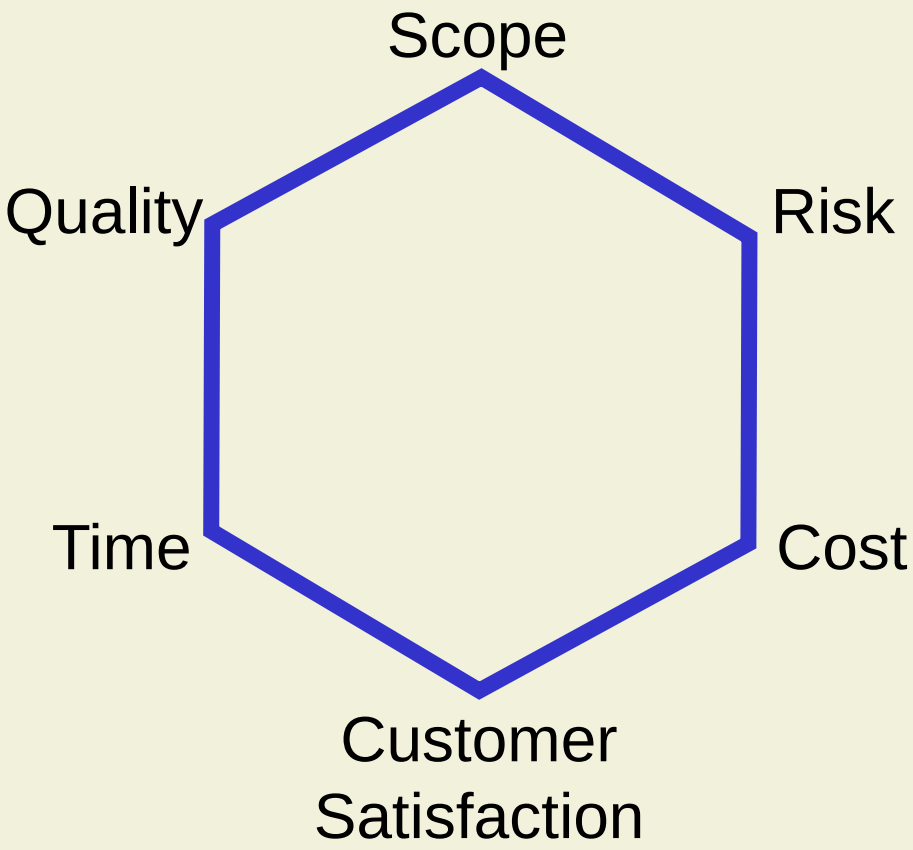
- Project objectives are **equally important**
- Actions in one project area usually affect other areas

The Triple Constraint



- **Tradeoffs** among objectives must be **managed**
- **Priorities** are set by customers and management

More Competing Objectives



Project Success

- Definition:
  A project is successful if the specified results are delivered in the required quality and within the predetermined time and resource limits.
- Computer scientists tend to focus on scope and quality only
  - The development of a technically perfect application is not a success if the cost exceeds the price clients are willing to pay
  - Excellent project results often are worthless if they come too late (temporary market windows, external deadlines)

Project Integration Management

- Ensure that various elements of the project are **properly coordinated**
  - Estimate cost of staffing alternatives
  - Determine effects of a scope change on schedule
- Make **tradeoffs** among competing objectives and alternatives
- Primarily task of project manager since he / she is responsible for seeing the overall "**big picture**"

Integration Management Processes

- Project plan development
  - Integrates various planning outputs (time, cost, risk, etc.)
  - Produces a formal, consistent document to manage project execution
- Project plan execution
  - Produces actual work results
- Integrated change control
  - Determines that a change has occurred
  - Manages the changes as they occur
  - Results in corrective actions and project plan updates

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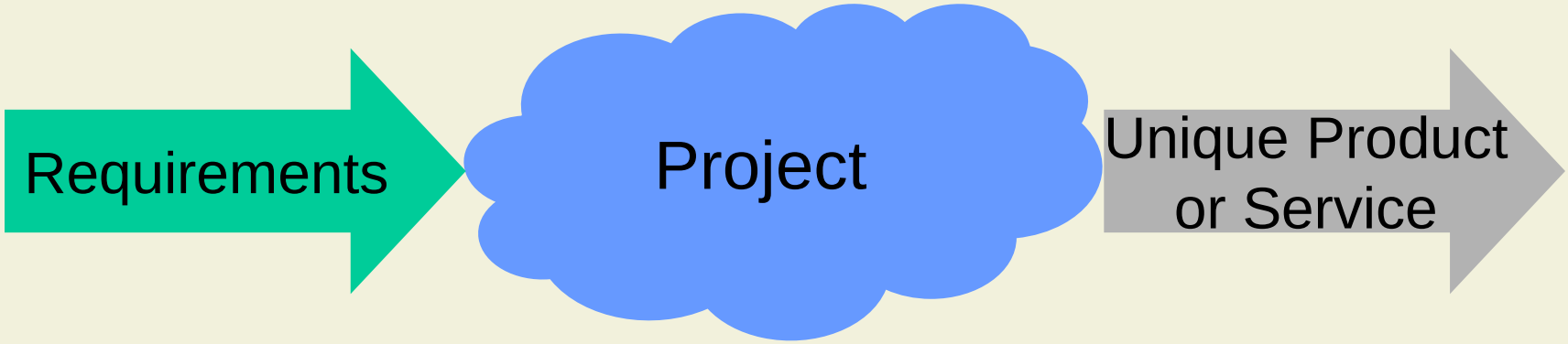
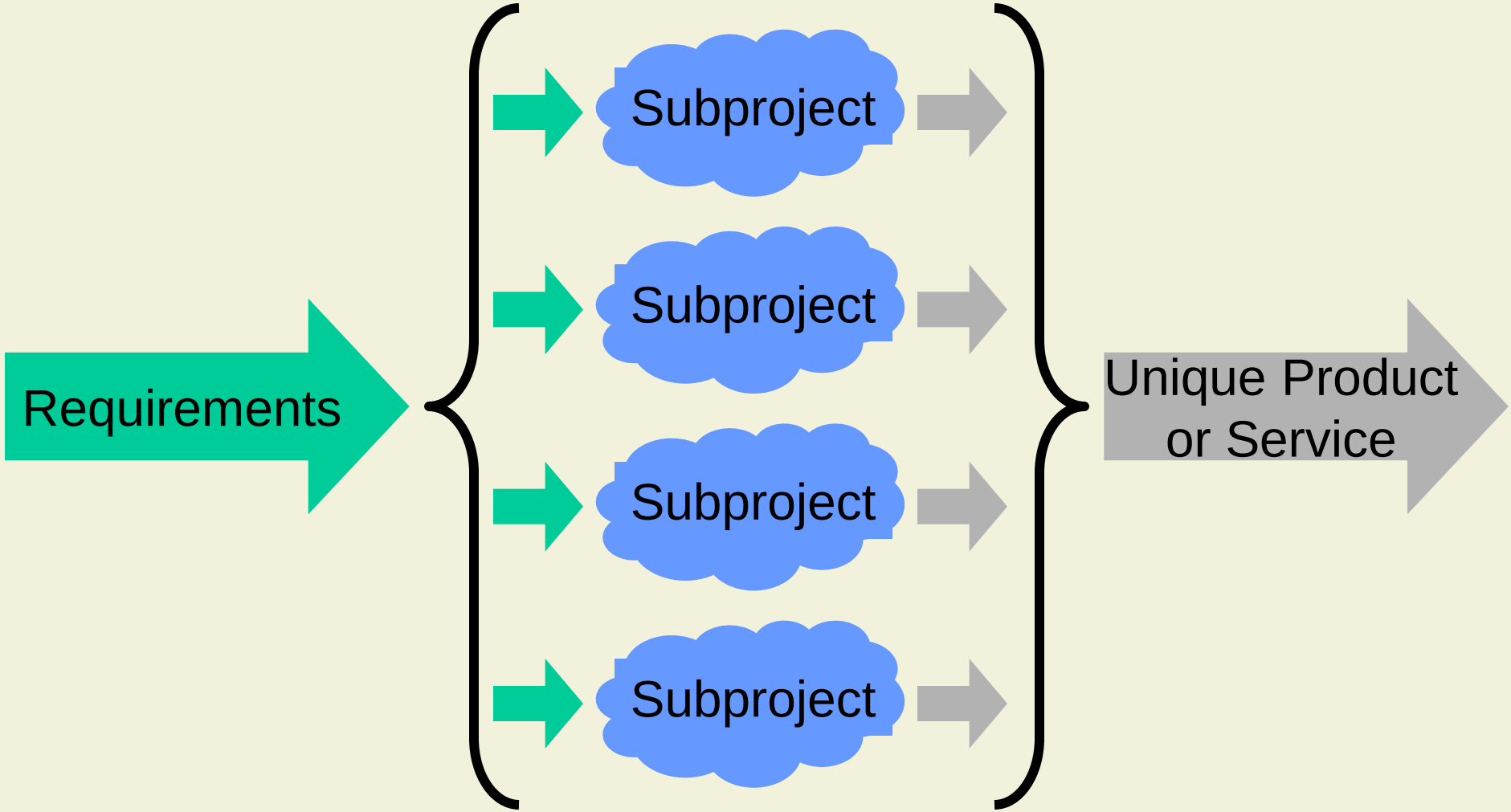
Projects are Complex



- At project start, only broad information about characteristics of product are available
- Average size of IT projects is 500-2000 person days
- Different tasks have to be performed such as designing a GUI, testing a module, installing hardware, training users, or negotiating with customers

➔ **How can we handle this complexity?**

Decomposition According to Product



Subprojects

- Decomposition usually follows structure of product
- Subprojects are **easier to manage**
- Subprojects enable one to use **specialized staff**
- Remaining and new problems
  - Only broad information about product characteristics
  - Managing the interfaces between subprojects
  - Integrating the results of the subprojects
  - Increased need for communication
- Subprojects are **still complex**

Progressive Elaboration

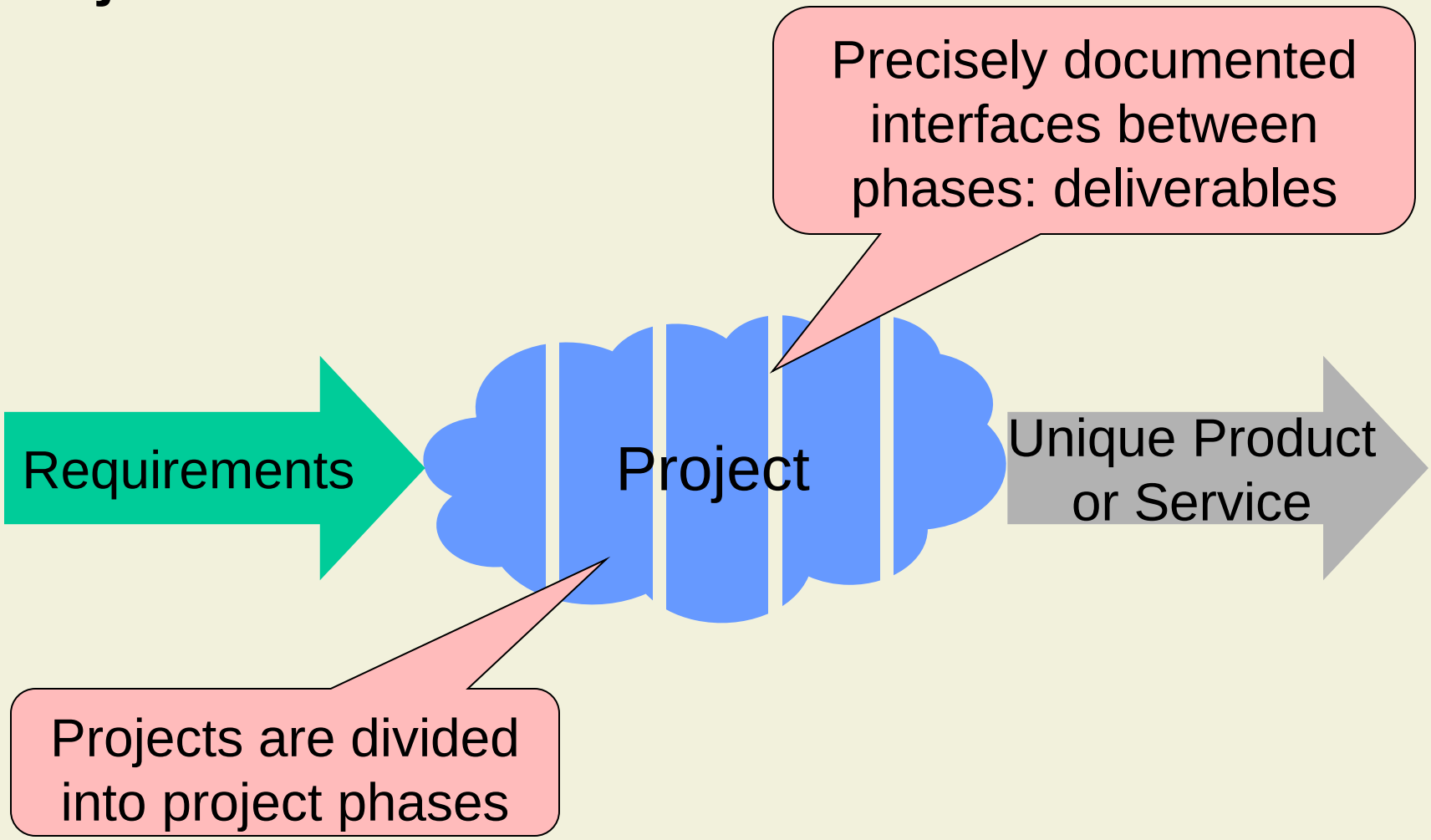
Characteristics of a unique product or service must be progressively elaborated

Continuing steadily by increments

Worked out with care and detail

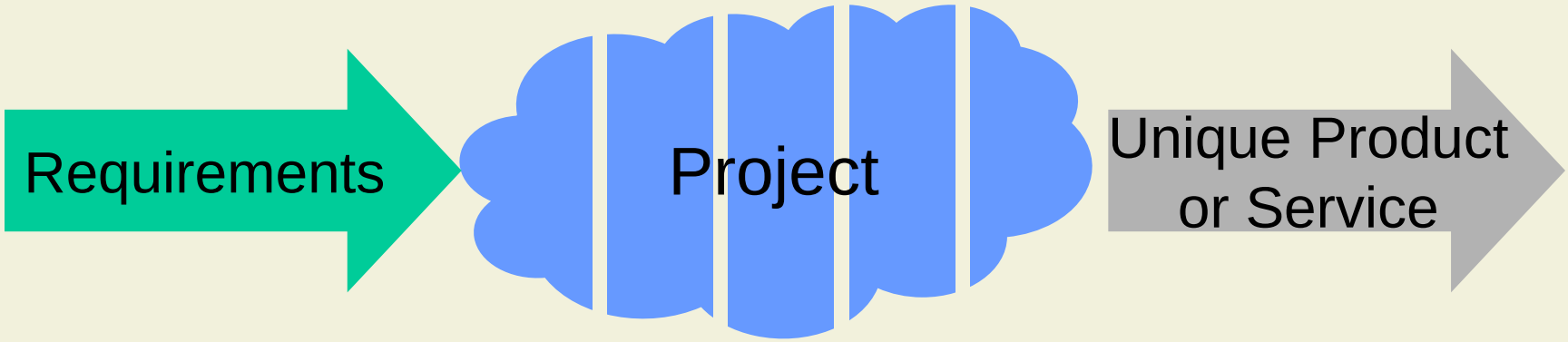
- During the project, characteristics are defined in more detail as the project team develops a better and more complete understanding of the product

Project Phases



Project Phases

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



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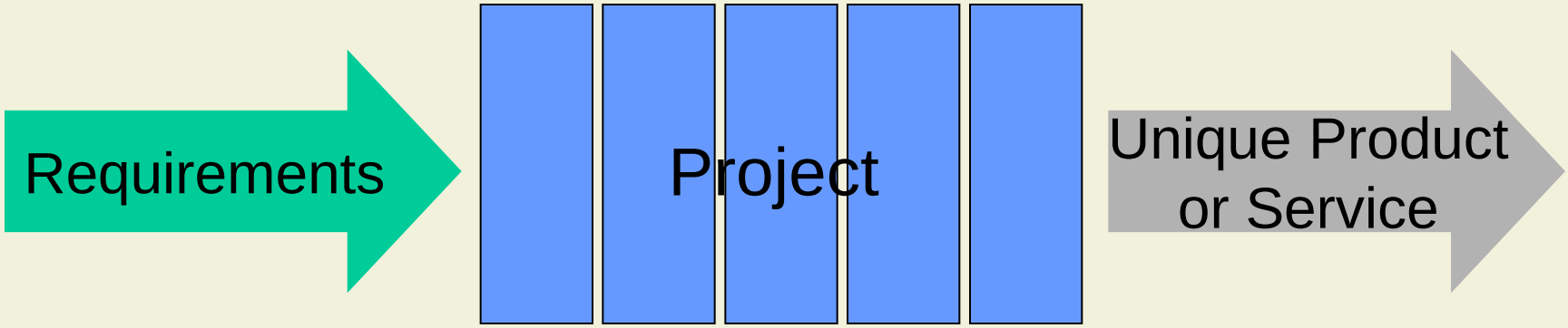
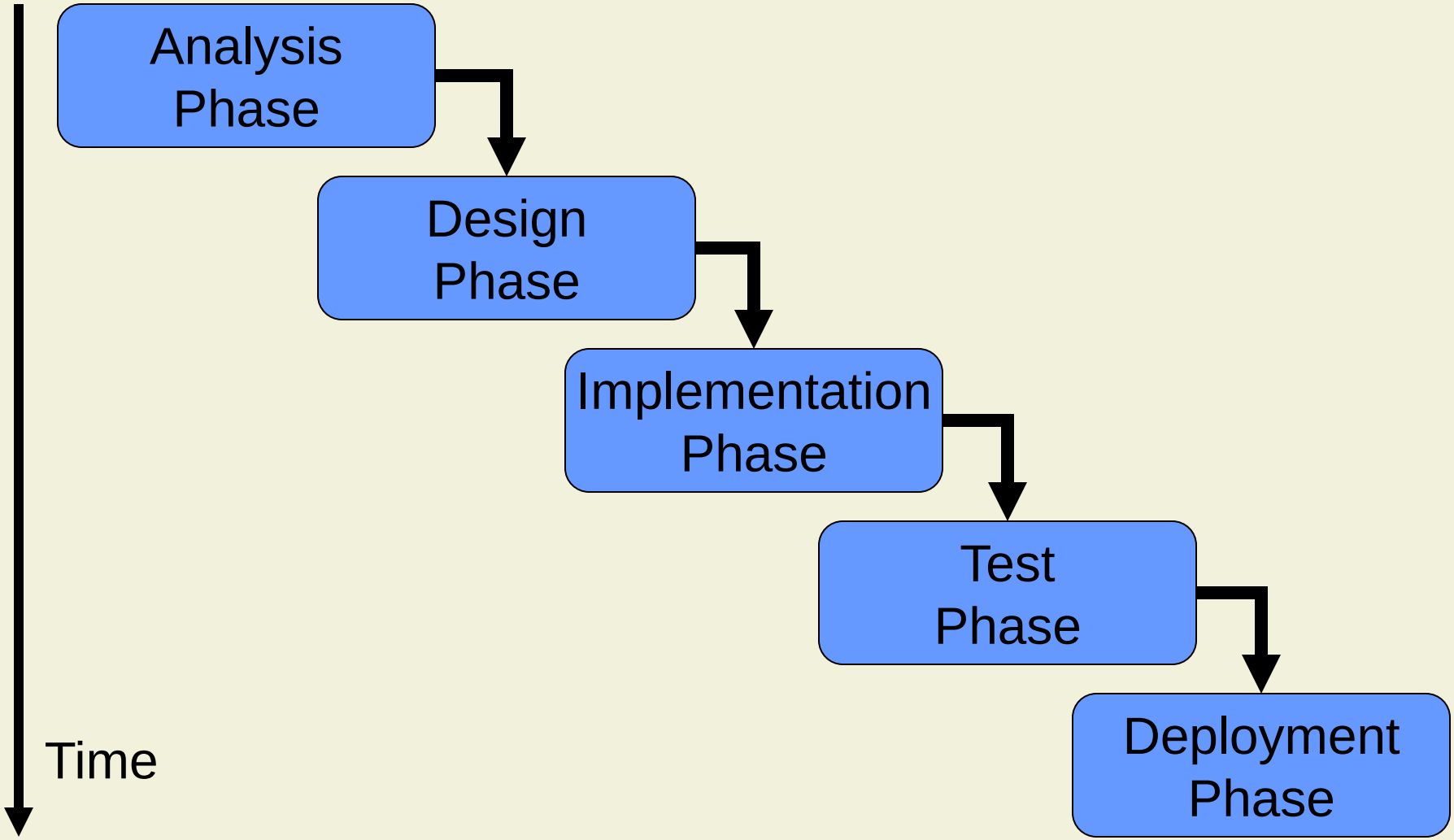
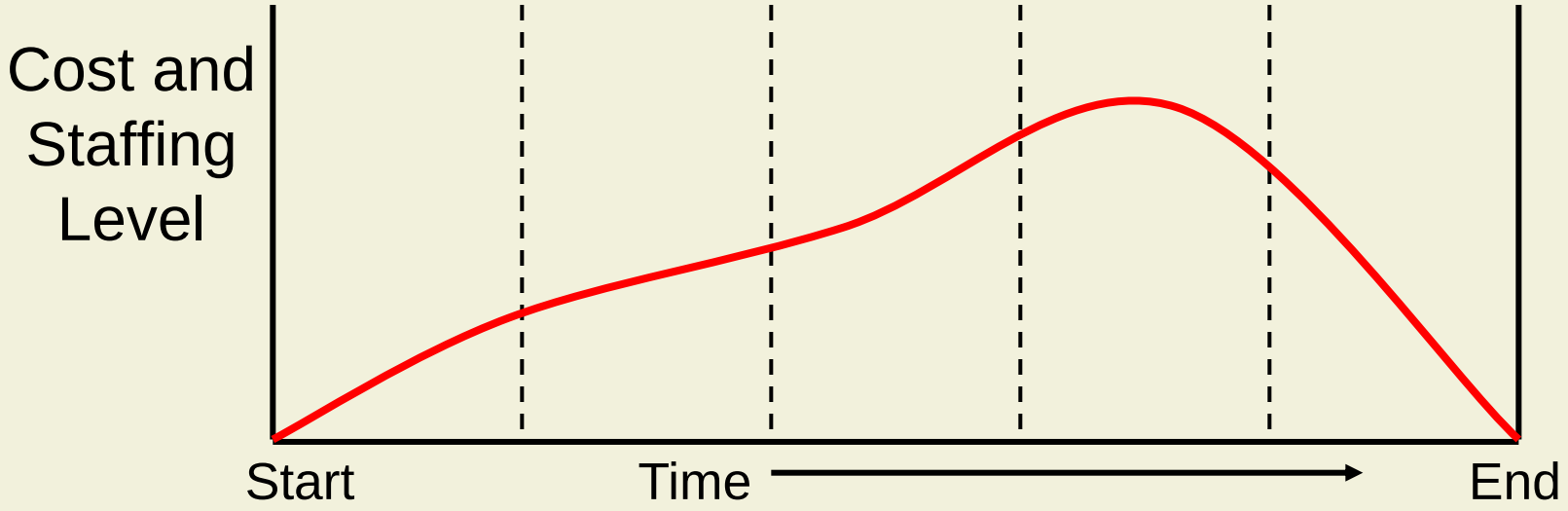


Waterfall Model of Project Life Cycle

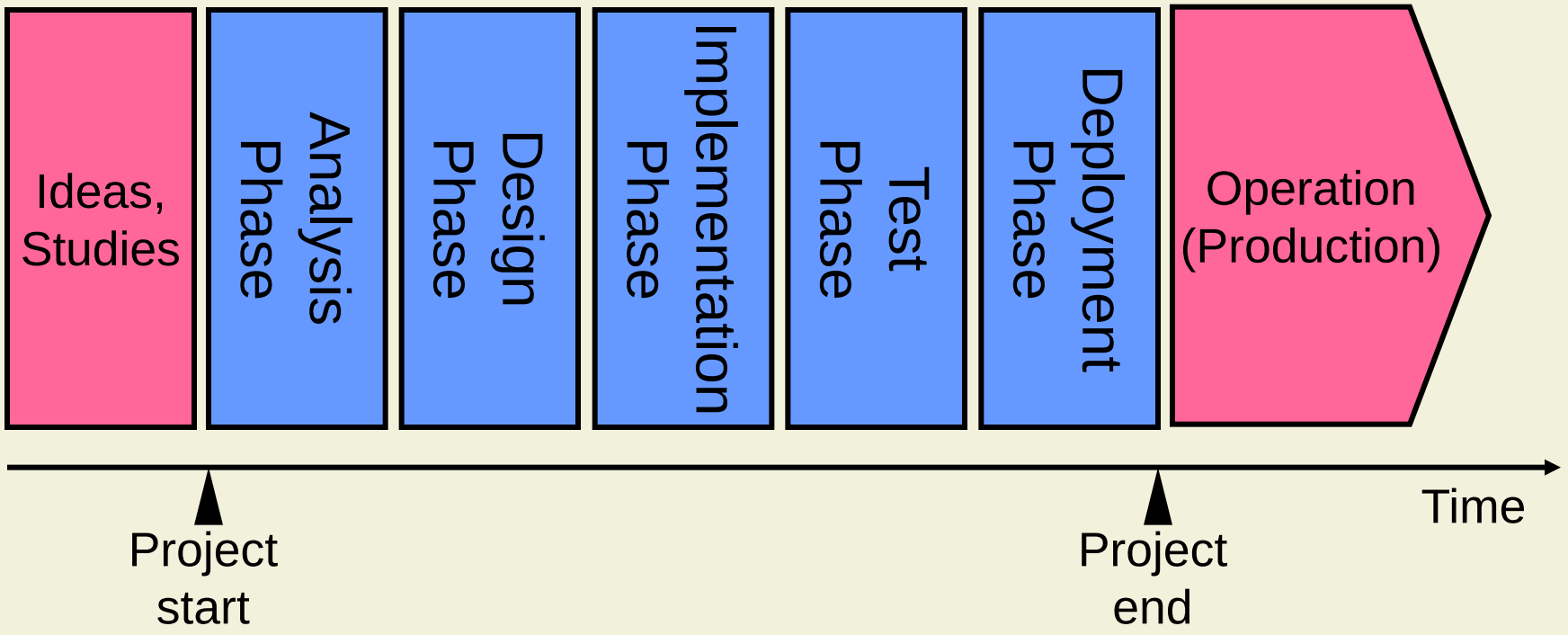


Properties of the Project Life Cycle



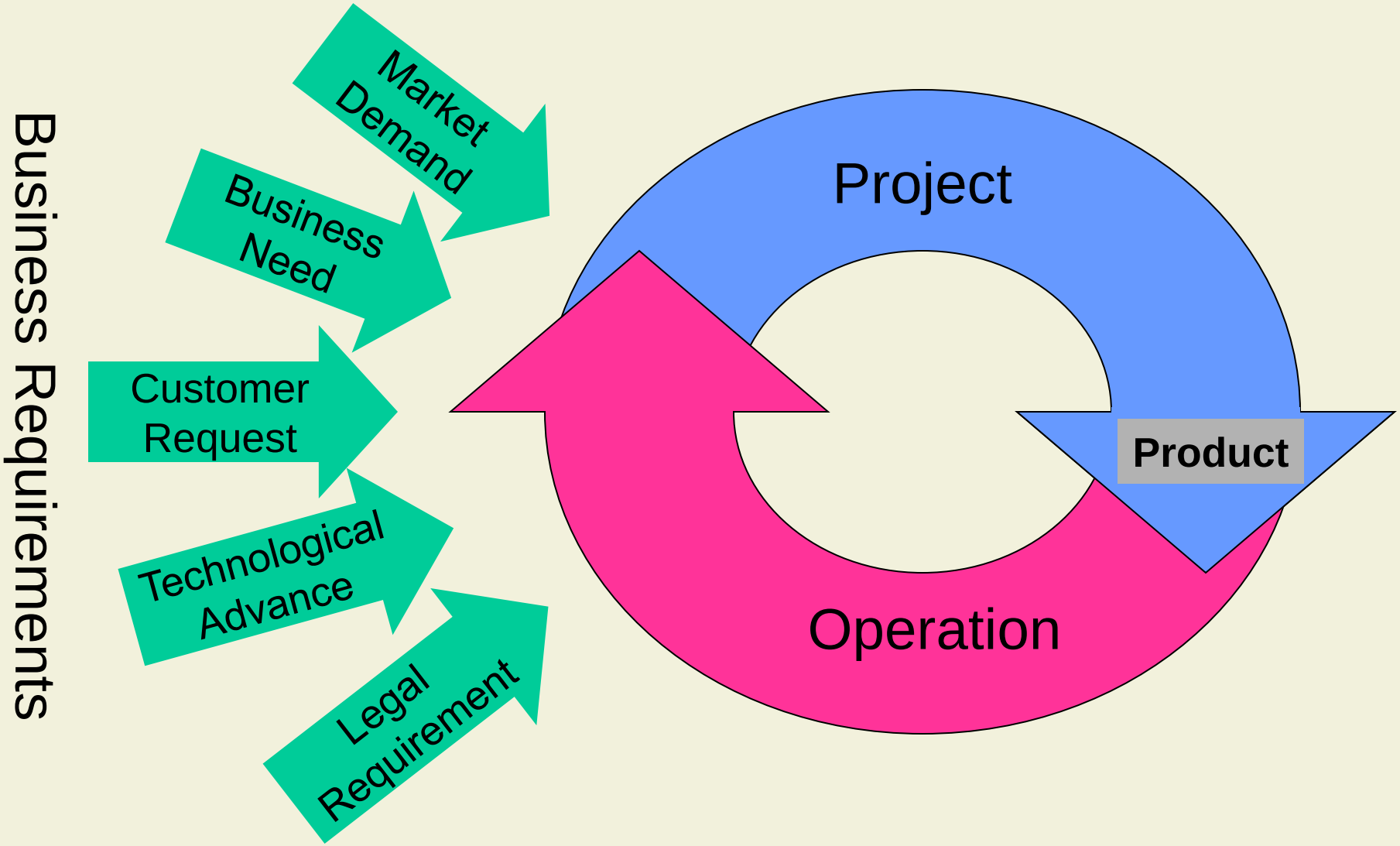
- Stakeholders' influence on product characteristics and final cost is highest at project start and decreases progressively
- Cost of changes and error correction increases during the project life cycle

From Projects to Operations

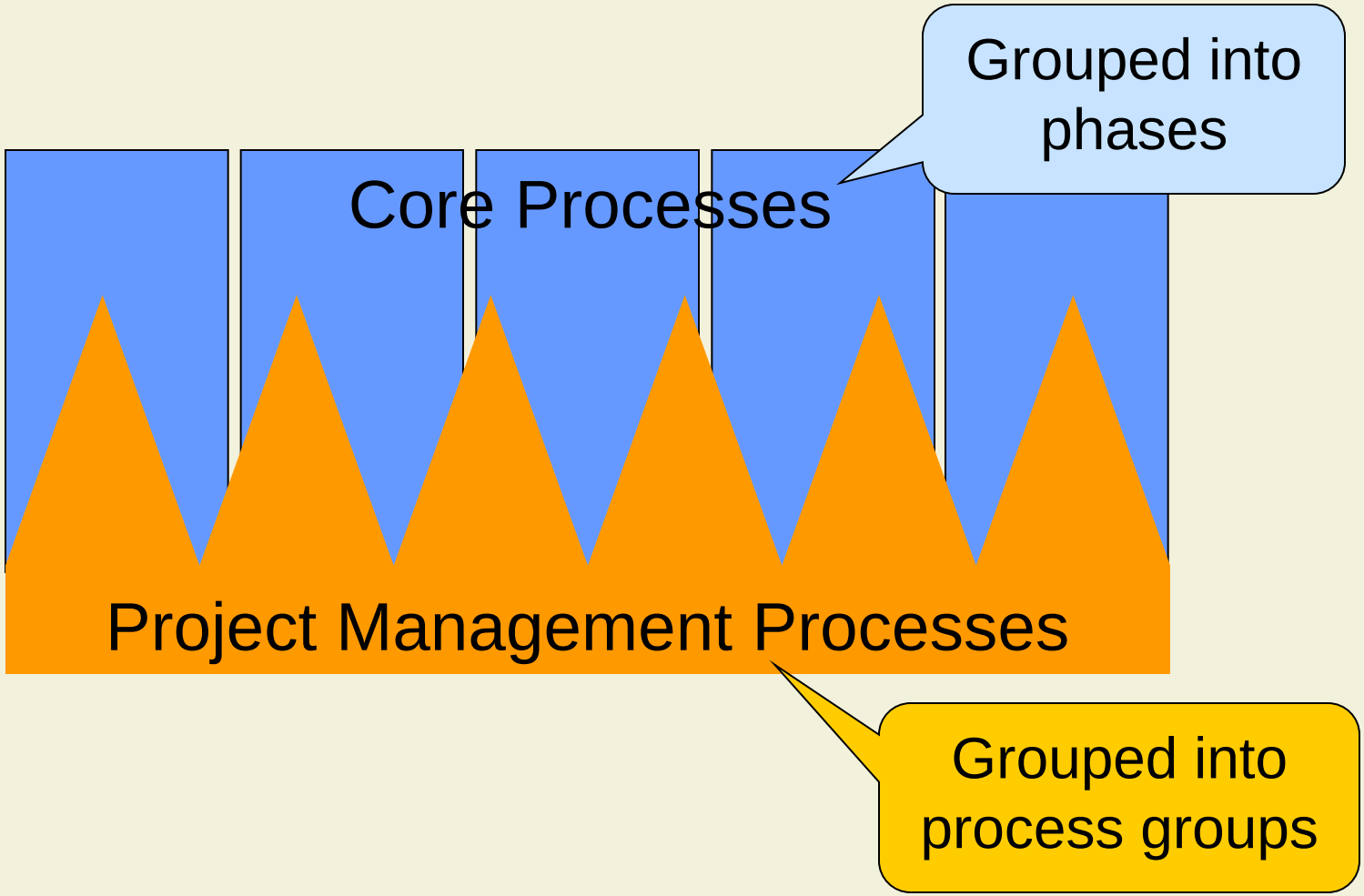


- Project phases are surrounded by related activities that are not part of the project

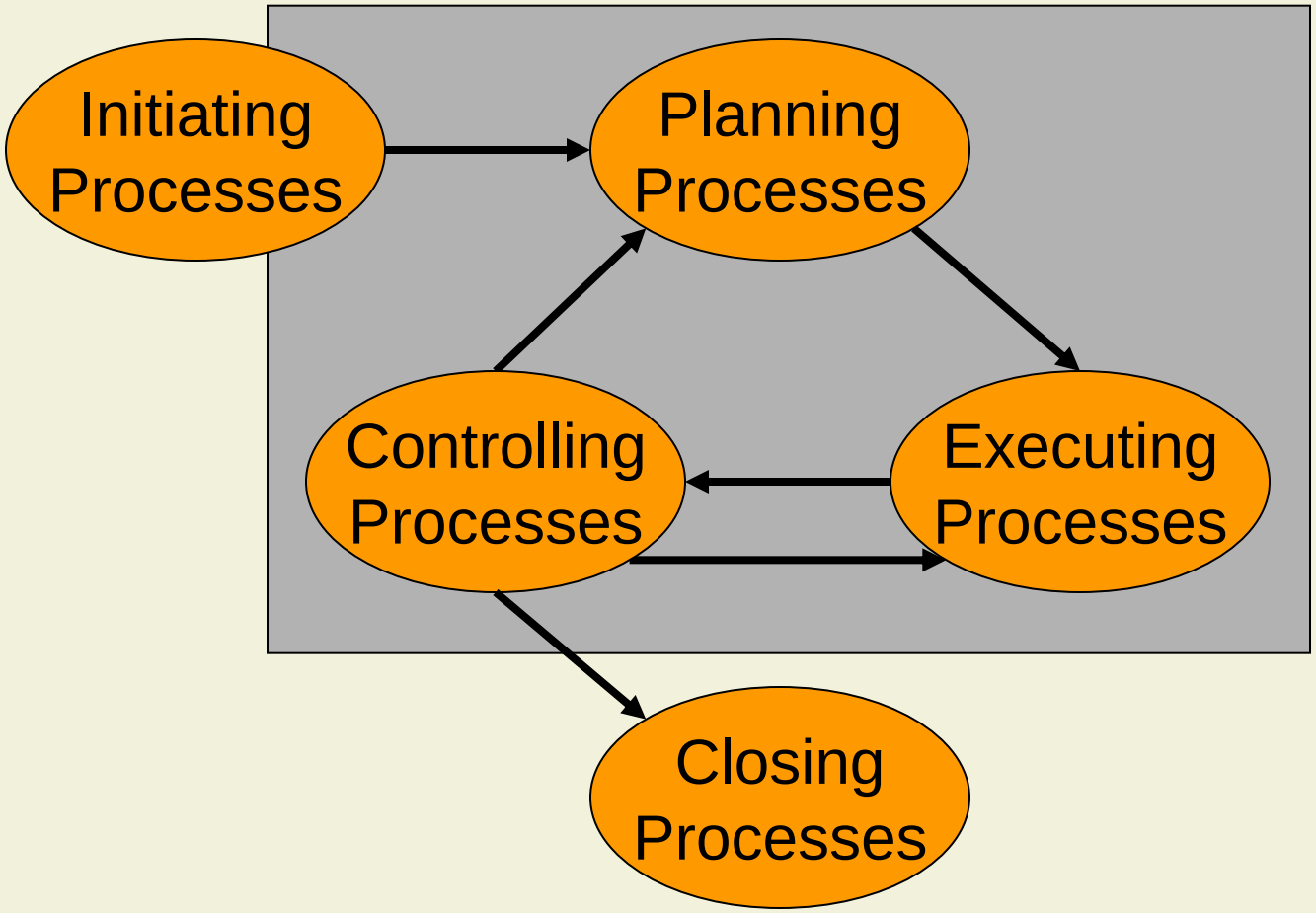
Product Life Cycle



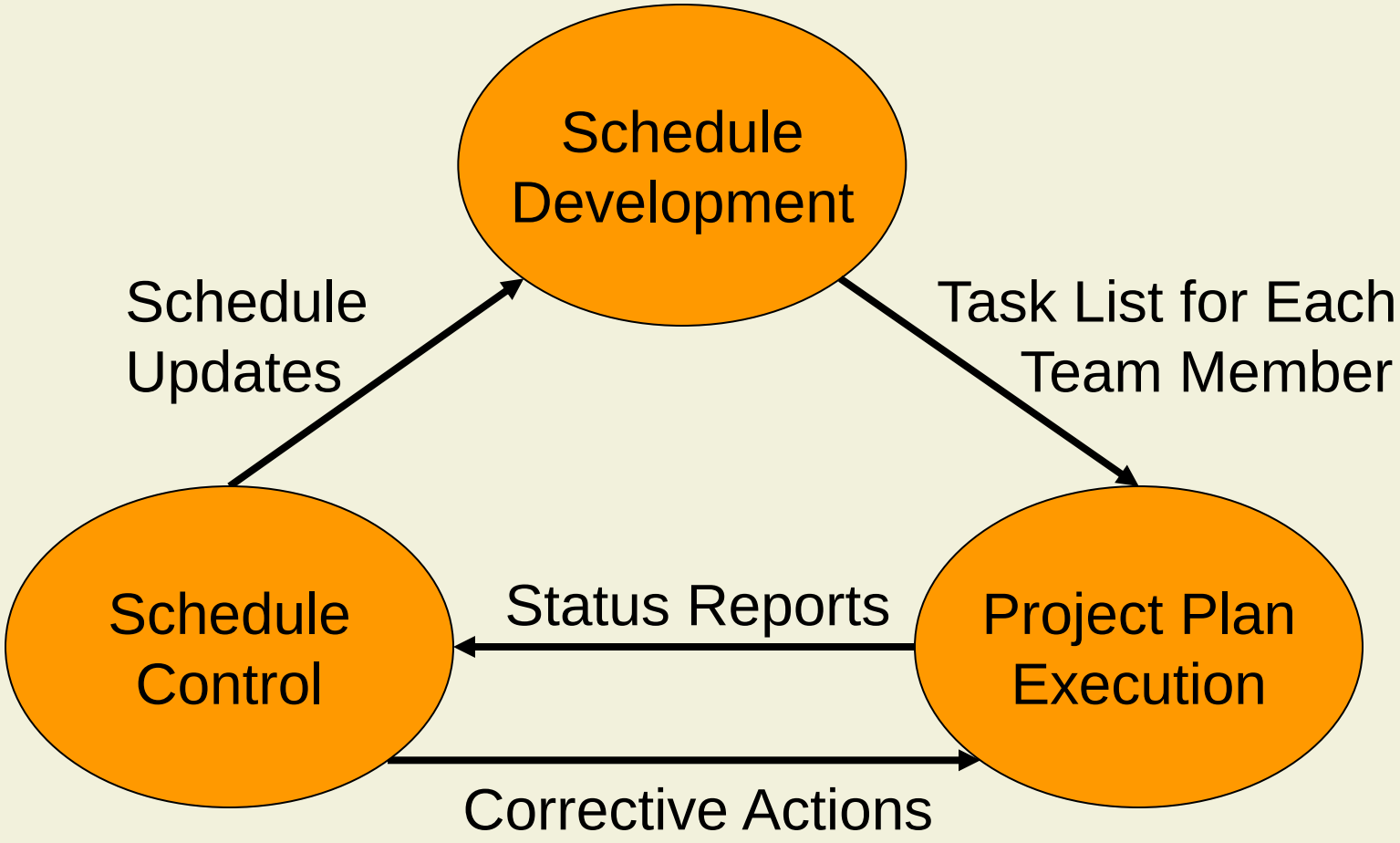
Core and Project Management Processes



Project Management Life Cycle

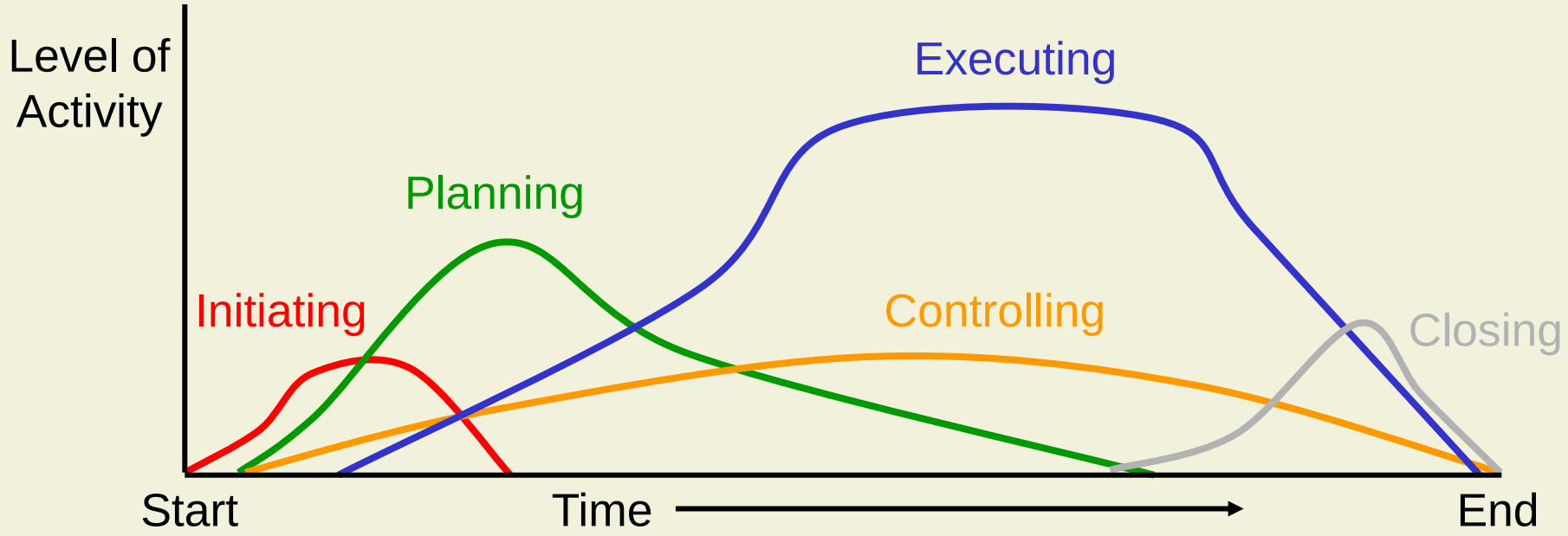


Example: Time Management

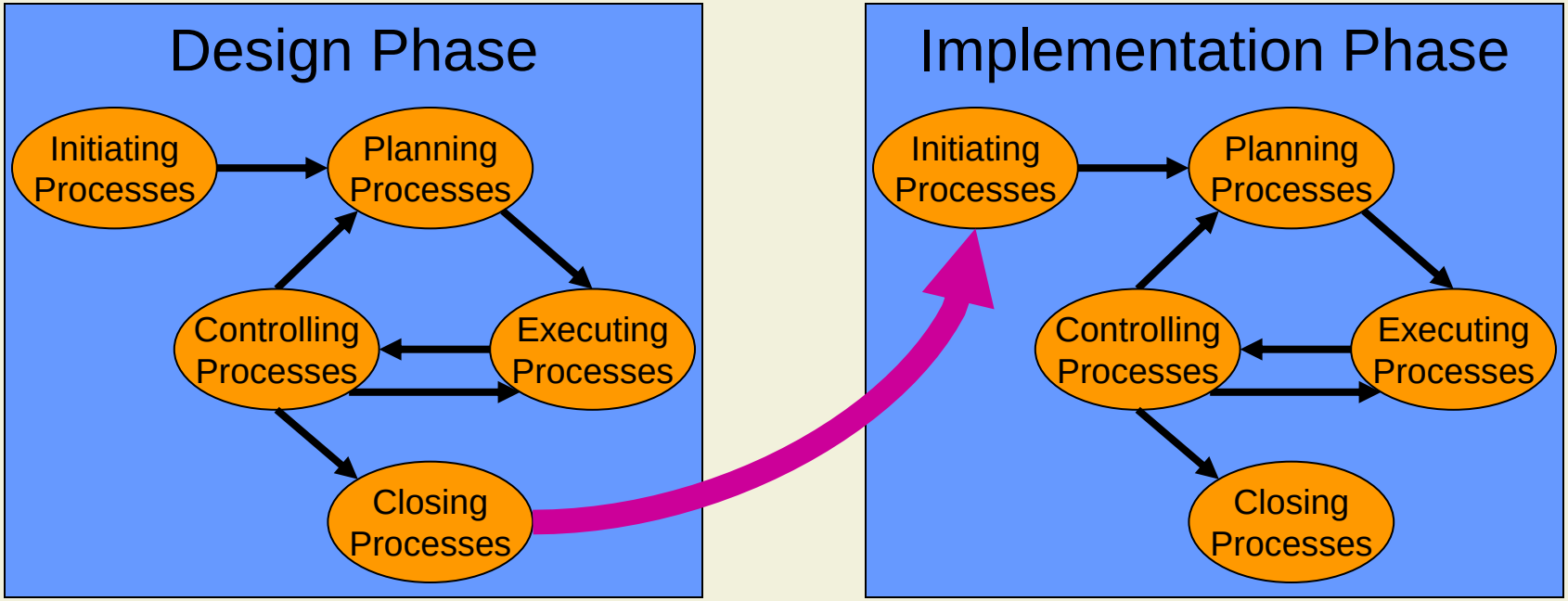


Process Groups

- Process groups are not discrete one-time events
- They overlap and occur at varying levels of intensity **within each phase of the project**

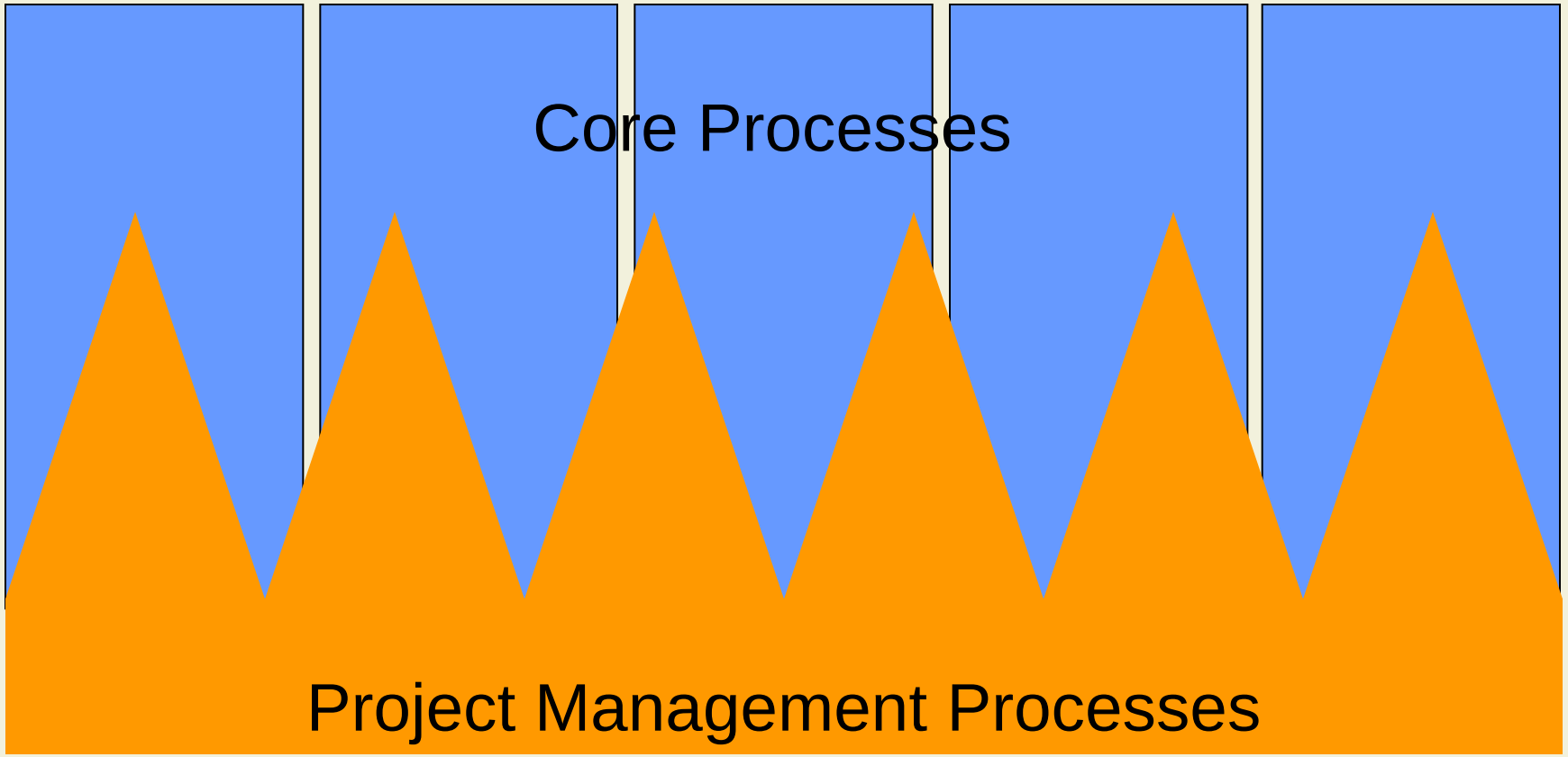


Interaction between Phases



- Input and output of the processes depend on the phase in which they are carried out
- But processes are not limited to one phase (overlaps)

Core and Project Management Processes



Core and Project Management Processes