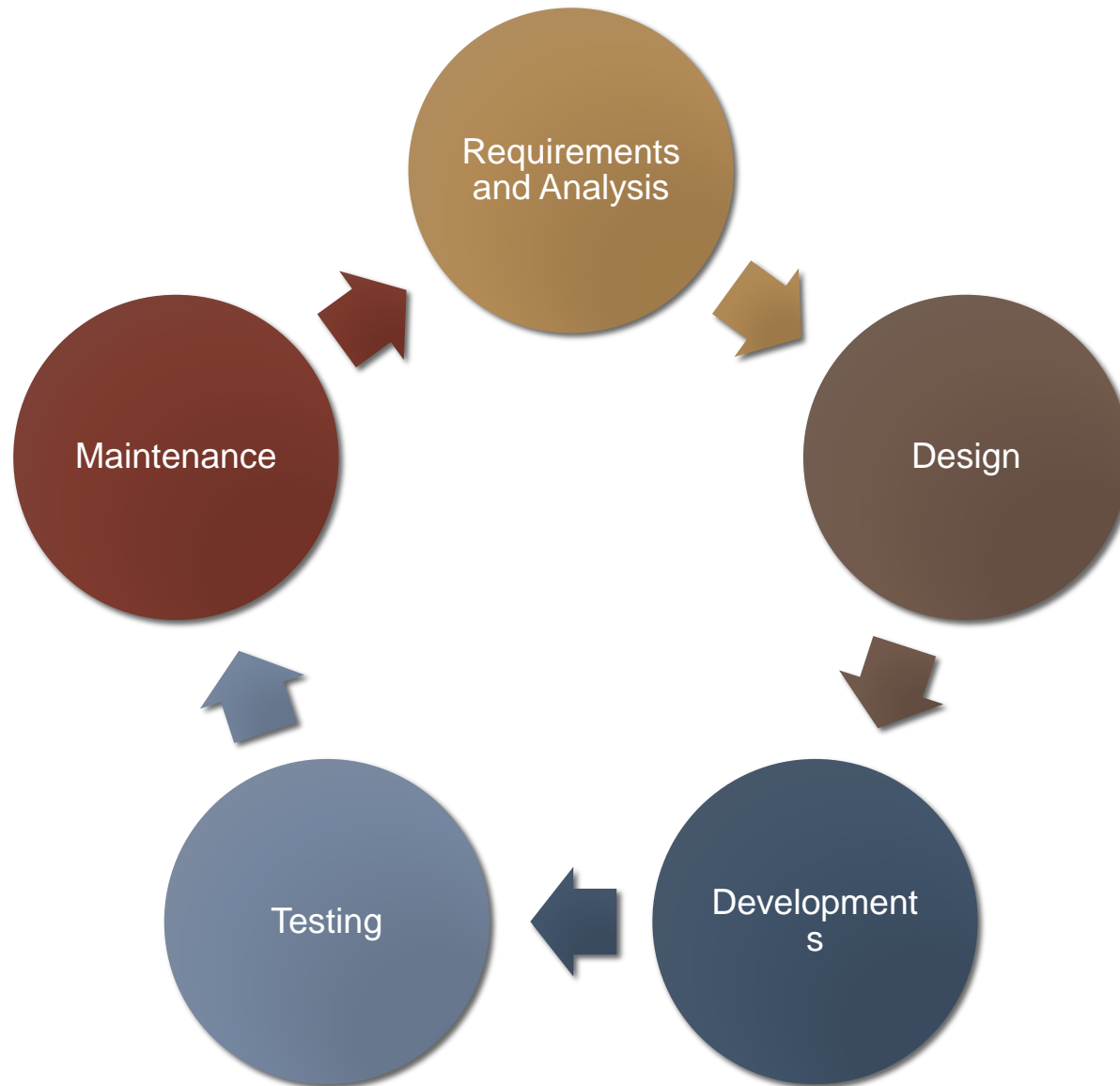# (11224) **INTRODUCTION TO SOFTWARE ENGINEERING**

**Lecture 13:** Rational Unified Process (RUP)
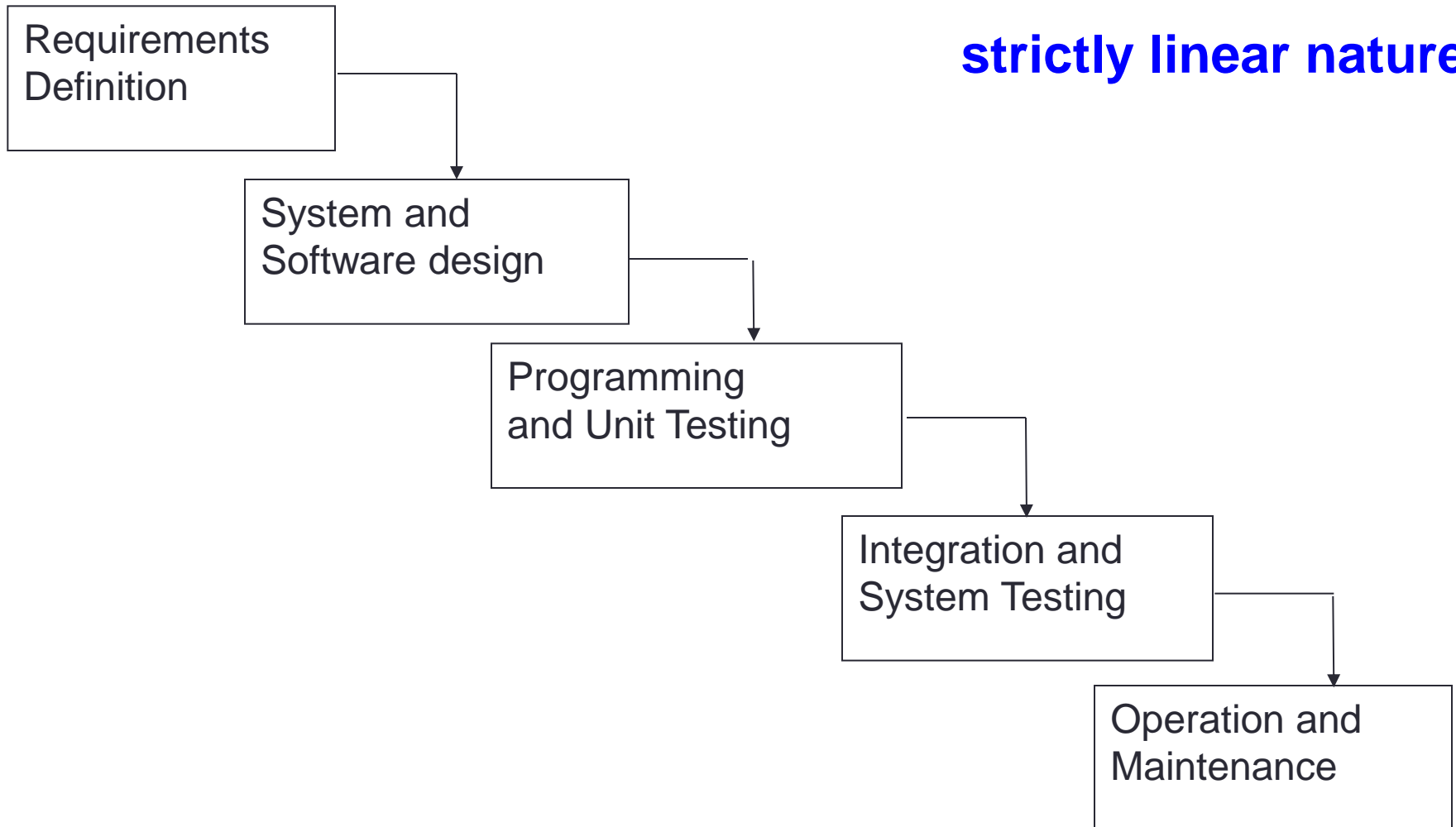
Shereen Fouad

# Announcements

- Online test on Friday the 27th of Feb. at 12 pm and will close (same day) at 10 pm
  - Counts for 5% of the entire Module Mark
  - Test will be Multiple Choice Questions (25 questions)
  - Once you begin the online test you have only 60 minutes to complete it.
  - You only have one attempt to complete the online test.
  - It will cover all concepts discussed so far including today's lecture (week 7)  **(Rational Unified Process for Software Development).**
- Monday afternoon lecture (3pm-4pm) has been cancelled

# Software Processes

# Waterfall Model

Requirements
Definition

**strictly linear nature !**

System and
Software design

Programming
and Unit Testing

Integration and
System Testing

Operation and
Maintenance

# Spiral Model

**Objective setting**
Specific objectives for the phase are identified.
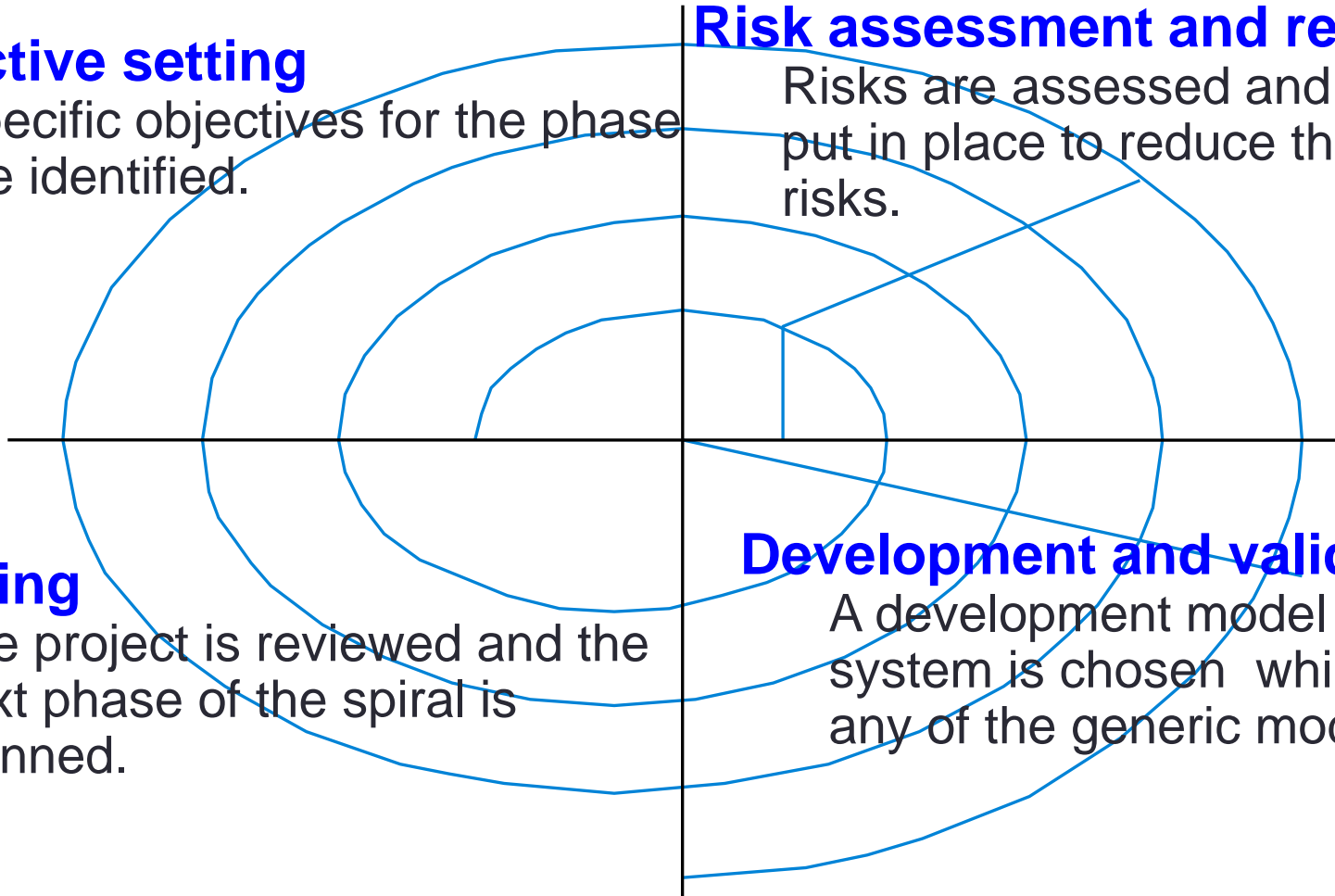
**Risk assessment and reduction**
Risks are assessed and activities put in place to reduce the key risks.

**Planning**
The project is reviewed and the next phase of the spiral is planned.

**Development and validation**
A development model for the system is chosen which can be any of the generic models.

# Rational Unified Process (RUP)

- Popular and Modern software engineering processes

- Inspired by elements of both the Waterfall and the Spiral models.

- Adaptable software development methodology

- Heavily use UML techniques

# Basic Characteristics of the Unified Process

- <u>Object-oriented</u>
  - Utilizes object oriented technologies.

- Classes are extracted during object-oriented analysis and designed during object-oriented design.

# Basic Characteristics of the Unified Process

Iteration and incrementation

- Iterations are steps in the process, and increments are growth of the product

- The result of a single iteration is an increment-- an incremental improvement of the system, yielding an evolutionary approach
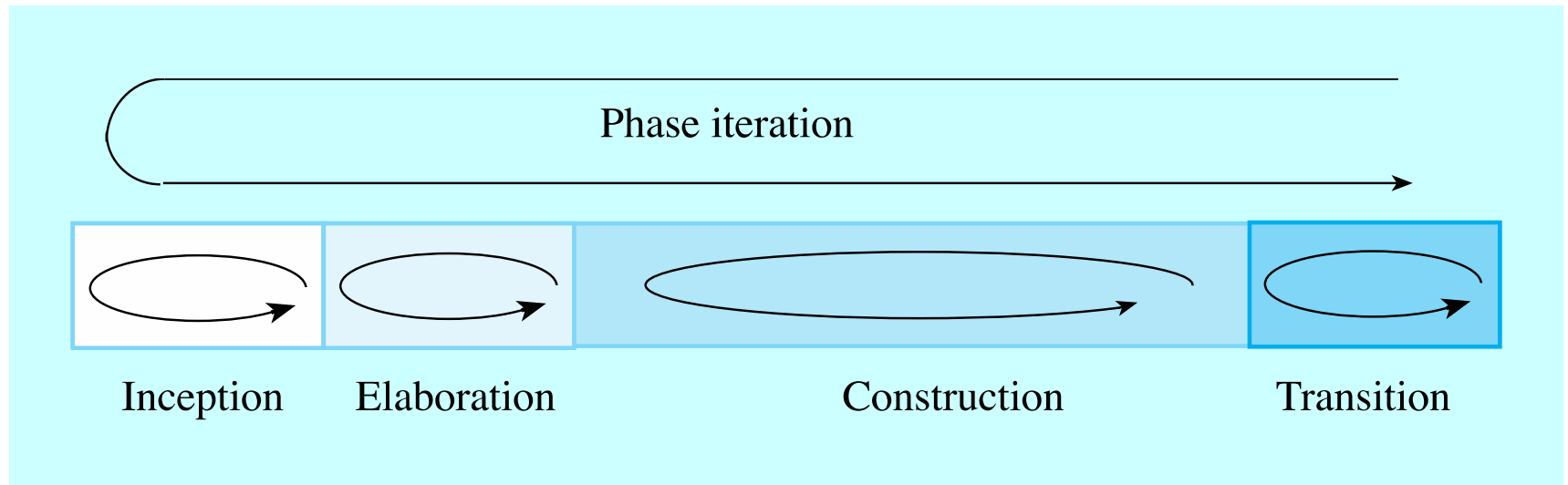
# Basic Characteristics of the Unified Process

## Use-case driven

- Utilizes use case model to describe complete functionality of the system

| Req.ts | Analysis | Design | Impl. | Test |
|--------|----------|--------|-------|------|

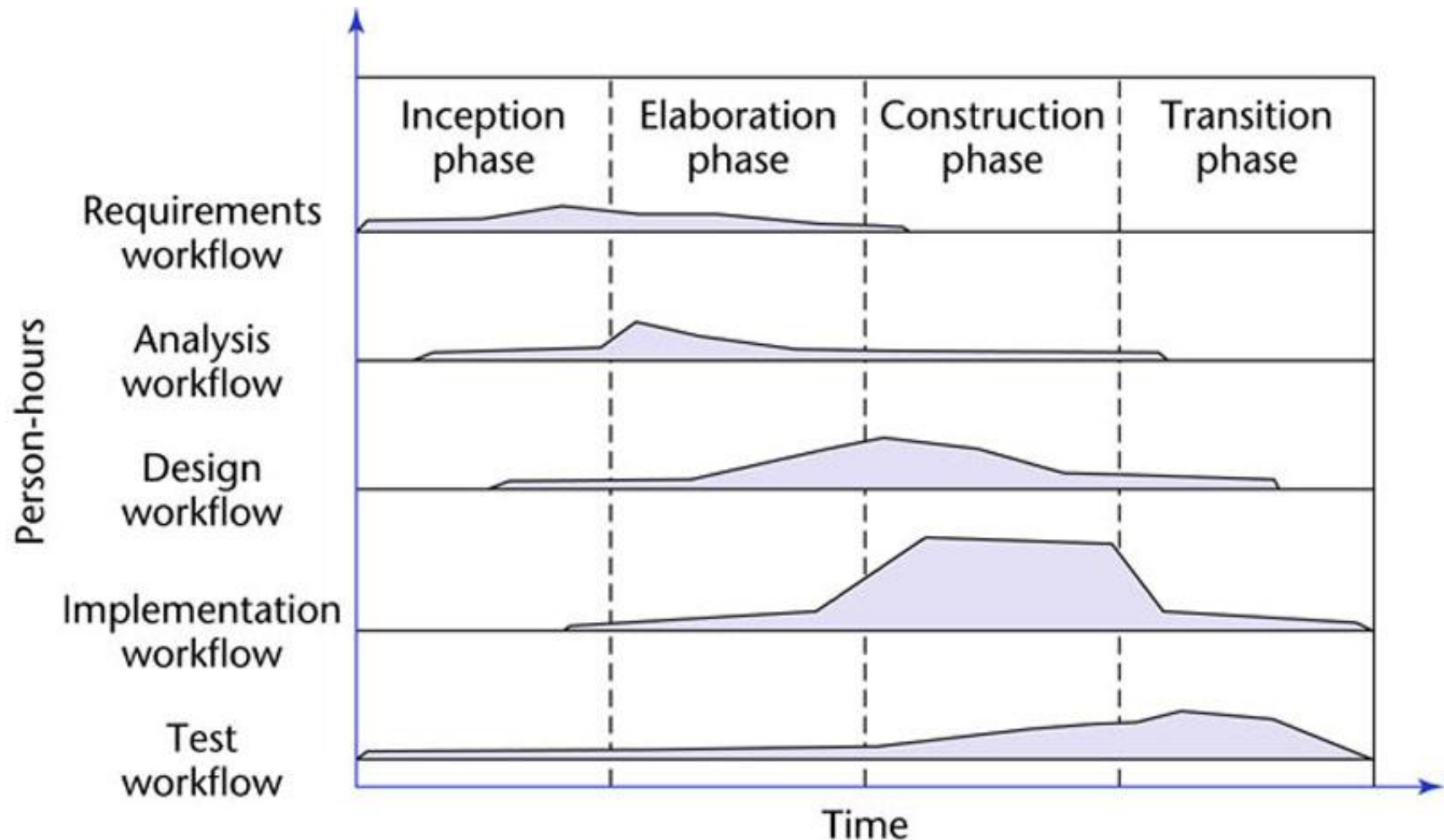**Use Cases bind these workflows together**

# Rational Unified Process Model

# Inception Phase

- The Inception Phase develops
  - the initial project description,
  - the business case for its implementation,
  - the scope of the project.

# The Phases/Workflows of the Unified Process

# Unified Process – Inception Deliverables

- Initial requirements capture

- A vision document

- Project plan, with phases and iterations with a more detailed plan for the elaboration phase.

- Cost-benefit analysis

- Project scope definition

- Initial use case diagram (10-20% complete)

# Elaboration Phase

- High level analysis and design, ending with a conceptual model and a set of use cases that together acts as a specification of the system.

- It is where you figure out precisely what it is you are going to build and how to build it.

- One of the most important ways to get a grip on these issues is to **consider the risks** that the project is open to.

# The Phases/Workflows of the Unified Process
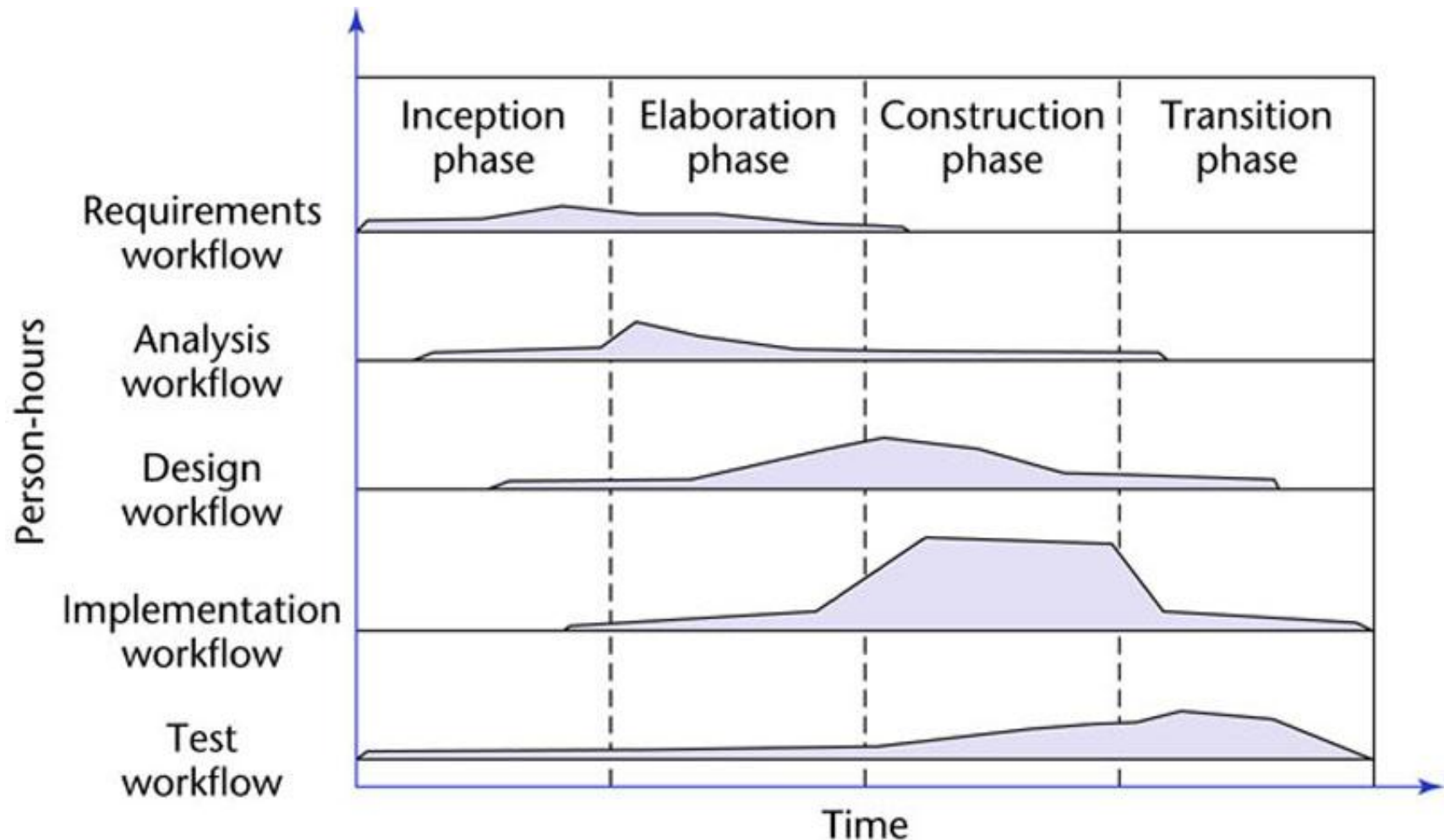
# Technical risks

- Requirements Risks
  - Can You give an example??
  - Can you propose a solution??

# Technical risks

- Requirements Risks
  - E.g. misunderstanding the requirements
  - Solution: use cases and UML diagrams
- Technological Risks
  - Can You give an example??
  - Can you propose a solution??

# Technical risks

- Requirements Risks
  - E.g. misunderstanding the requirements
  - Solution: use cases and UML diagrams
- Technological Risks
  - E.g. the technologies chosen for the project may not be capable of providing the functionality required.
  - Solution: use prototypes
- Skills Risks
  - Can You give an example??
  - Can you propose a solution??

# Technical risks

- Requirements Risks
  - E.g. misunderstanding the requirements
  - Solution: use cases and UML diagrams
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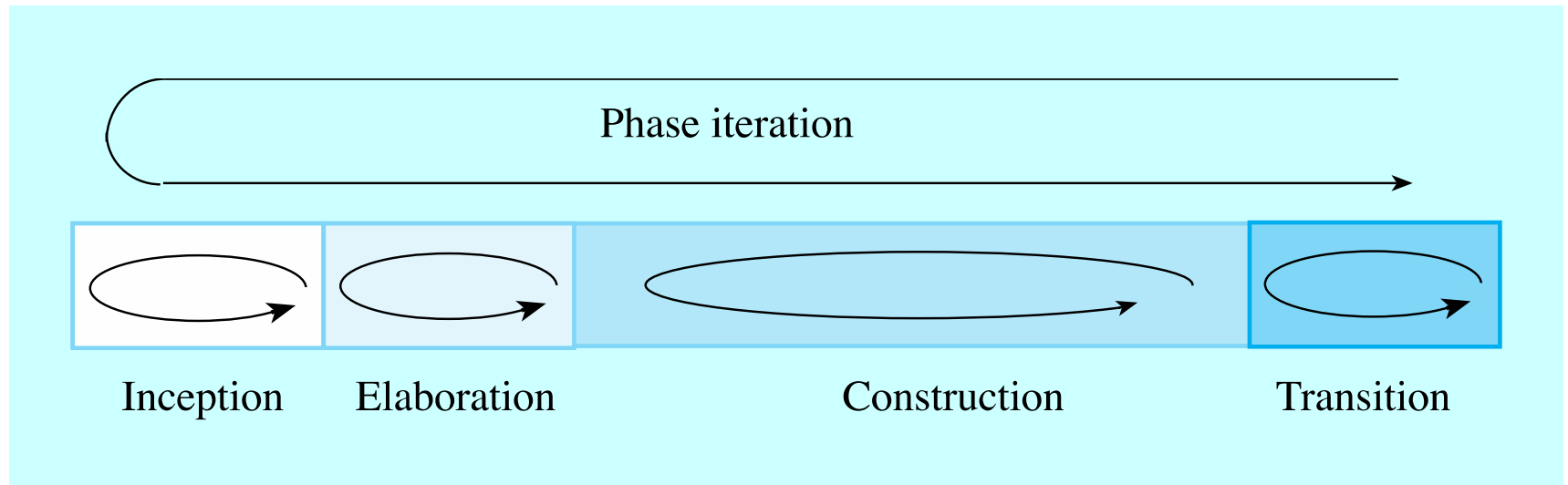  - Solution: use prototypes
- Skills Risks
  - E.g. a project may require skills that the developers do not yet have.
  - Solution: trainings and skills developments

What is the normal percentage of time the elaboration phase consumes w.r.t the entire project?

# Unified Process Model



Phase iteration

| Inception | Elaboration | Construction | Transition |

20%-30% of the time for the entire project.

# When this percentage can be larger or smaller?

# When this percentage can be larger or smaller?

- larger if there are more risks involved, e.g. safety critical systems
- Smaller if the project is routine or well understood in nature

# Unified Process – Elaboration Deliverables

Revised requirements model

The completed domain model (use cases, classes)

Give clear estimates of how long it will take to build each use case

Software architecture description.

All significant and major risks

# Quiz !!

- **Initial business model, project plan, and initial vision are deliverables of what PHASE of the unified process.**
  a) Planning
  b) Inception
  c) Elaboration

- **The primary purpose of a use case diagram is**
  a) to construct a vocabulary that is understood by both the users and analysts.
  b) to show the users interaction with the system
  c) to uncover additional details such as attributes and methods of a class

# Quiz !!

- **The primary purpose of a class diagram is**
    a) to construct a vocabulary that is understood by both the users and analysts.
    b) to show the users interaction with the system
    c) to uncover additional details such as attributes and methods of a class

- **Which of the following life cycle model can be chosen if the development team has less experience on similar projects?**
    a) Spiral
    b) Waterfall
    c) Iterative Enhancement Mode

# Construction Phase

- The system is actually built in this phase.

- Construction proceeds in a series of iterations.

- Each iteration forms some extra piece of working functionality of the full system, fully tested and integrated.

- Each iteration should be seen as a mini-project and is typically aimed at implementing one or more use cases that have been developed in the elaboration phase.

# The Phases/Workflows of the Unified Process
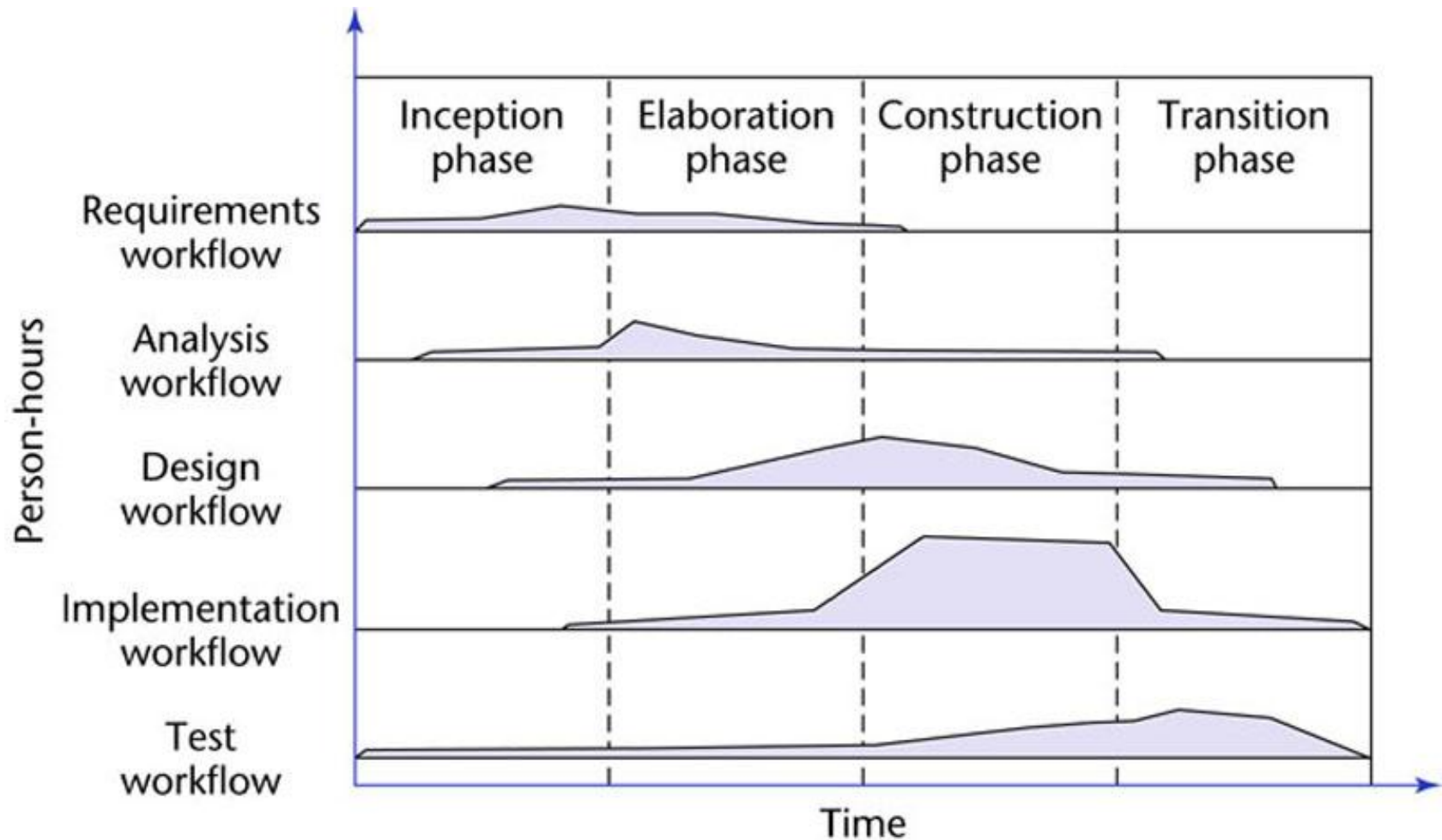
# What happens during an iteration in the construction phase?

- Each iteration is based on implementing use cases.

- Each iteration builds on and rewrites some code that was developed in previous iterations.

- Testing and integration is carried out regularly throughout each iteration

# Each iteration includes:

- Analysis
- Design
- Coding
- Testing
- Integration
- Documentation

# Unified Process – Construction Outcomes

A product ready to put into the hands of end users.

The software product integrated on the adequate platforms.

The user manuals.

A description of the current release.

# Transition Phase

- Transfer the system in its operating environment

- Includes the manufacturing, shipping, installation, training, technical support and maintenance

- Integration with existing systems (legacy systems)

- Full testing

- Performance tuning and user documentation and training.

# The Phases/Workflows of the Unified Process
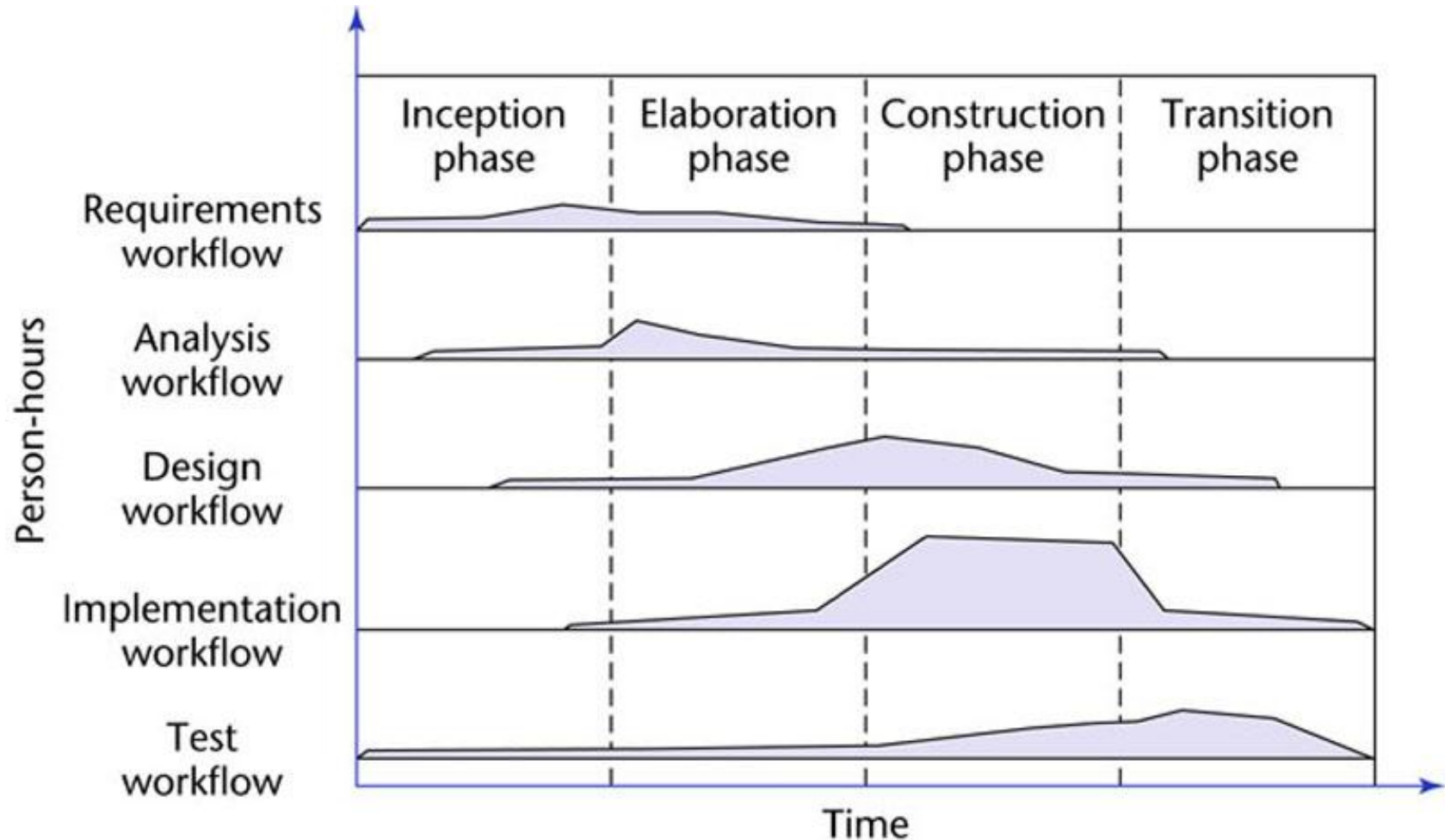
# References

- A number of slides in this talk is based on:
  - Alan P. Sexton hand-outs (Introduction to Software Engineering. The University of Birmingham. Spring Semester 2014)

Thank YOU ☺