COMP6115
Object Oriented Analysis and Design

Session #1

Introduction to Object Databases

Learning Outcomes

LO1:

Identify the basic concept of advance topic in Object Oriented Analysis and Design

Chapter 1: Introduction to Systems Analysis and Design

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Learning Objectives

- Systems development life cycle
  - Identify the four phases
  - How it came about
  - Methodology alternatives
- Team roles & skill sets
- Object-oriented systems characteristics
- Object-oriented systems analysis & design
- The Unified Process & its extensions
- The Unified Modeling Language (UML)

Introduction

- Why do we need a formal process?
  - Failures occur (too) often
  - Creating systems is not intuitive
  - Projects are late, over budget or delivered with fewer features than planned
- The System Analyst is the key person
  - Designs a system to add value
  - Must understand the business processes
  - Job is rewarding, yet challenging
  - Requires specific skill sets
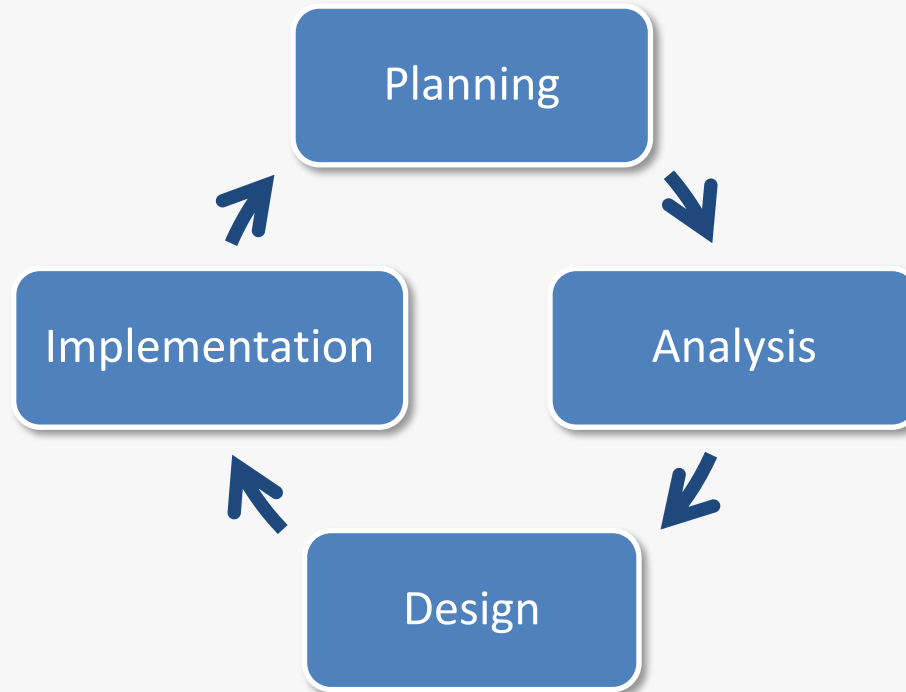
The SDLC Process

- The process consists of four phases
- Each phase consists of a series of steps
- Each phase is documented (deliverables)
- Phases are executed sequentially, incrementally, iteratively or in some other pattern

Questions to be Answered

- Planning phase
  - Why should we build this system?
  - What value does it provide?
  - How long will it take to build?
- Analysis phase
  - Who will use it?
  - What should the system do for us?
  - Where & when will it be used?
- Design phase
  - How should we build it?

SDLC: The Planning Phase

1. Project Initiation
   – Develop/receive a system request
   – Conduct a feasibility analysis
2. Project Management
   – Develop the work plan
   – Staff the project
   – Monitor & control the project

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SDLC: The Analysis Phase

1. Develop an analysis strategy
   - Model the current system
   - Formulate the new system
2. Gather the requirements
   - Develop a system concept
   - Create a business model to represent:
     - Business data
     - Business processes
3. Develop a system proposal

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SDLC: The Design Phase

1. Develop a design strategy
2. Design architecture and interfaces
3. Develop databases and file specifications
4. Develop the program design to specify:
   – What programs to write
   – What each program will do

SDLC: The Implementation Phase

1. Construct the system
   - Build it (write the programming code)
   - Test it
2. Install system
   - Train the users
3. Support the system (maintenance)

SDLC: Methodologies

- Methodology: a formalized approach to implementing the SDLC
- Categories
  - Process oriented
  - Data centered
  - Object-oriented
  - Structured
  - Rapid action development
  - Agile development

Classes of Methodologies

- Structured Development
  - Waterfall Development
  - Parallel Development
- Rapid Application Development
  - Phased
  - Prototyping
- Agile Development
  - eXtreme Programming
  - SCRUM

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Which Methodology to Use?

Ability to Develop Systems	Structured Methodologies		RAD Methodologies			Agile Methodologies	
	Waterfall	Parallel	Phased	Prototyping	Throwaway Prototyping	XP	SCRUM
With Unclear User Requirements	Poor	Poor	Good	Excellent	Excellent	Excellent	Excellent
With Unfamiliar Technology	Poor	Poor	Good	Poor	Excellent	Good	Good
That Are Complex	Good	Good	Good	Poor	Excellent	Good	Good
That Are Reliable	Good	Good	Good	Poor	Excellent	Excellent	Excellent
With a Short Time Schedule	Poor	Good	Excellent	Excellent	Good	Excellent	Excellent
With Schedule Visibility	Poor	Poor	Excellent	Excellent	Good	Excellent	Excellent

The Systems Analyst: Skills

- Agents of change
  - Identify ways to improve the organization
  - Motivate & train others
- Skills needed:
  - Technical: must understand the technology
  - Business: must know the business processes
  - Analytical: must be able to solve problems
  - Communications: technical & non-technical audiences
  - Interpersonal: leadership & management
  - Ethics: deal fairly and protect confidential information

The Systems Analyst: Roles

- Business Analyst
  - Focuses on the business issues
- Systems Analyst
  - Focuses on the IS issues
- Infrastructure Analyst
  - Focuses on the technical issues
- Change Management Analyst
  - Focuses on the people and management issues
- Project Manager
  - Ensures that the project is completed on time and within budget

Object-Oriented Systems Analysis & Design

- Attempts to balance data and process
- Utilizes the Unified Modeling Language (UML) and the Unified Process
- Characteristics of OOAD:
  - Use-case Driven
  - Architecture Centric
  - Iterative and Incremental

Characteristics of Object-Oriented Systems

- Classes & Objects
  - Object (instance): instantiation of a class
  - Attributes: information that describes the class
  - State: describes its values and relationships at a point in time
- Methods & Messages
  - Methods: the behavior of a class
  - Messages: information sent to an object to trigger a method (procedure call)

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Characteristics of Object-Oriented Systems (cont.)

- Encapsulation & information hiding
  - Encapsulation: combination of process & data
  - Information hiding: functionality is hidden
- Inheritance
  - General classes are created (superclasses)
  - Subclasses can inherit data and methods from a superclass

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Characteristics of Object-Oriented Systems (cont.)

- Polymorphism & dynamic binding
    - Polymorphism: the same message can have different meanings
    - Dynamic binding: type of object is not determined until run-time
    - Contrast with static binding

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Object-Oriented Systems Analysis & Design

- Use-case driven
  - Use-cases define the behavior of a system
  - Each use-case focuses on one business process
- Architecture centric
  - Functional (external) view: focuses on the user's perspective
  - Static (structural) view: focuses on attributes, methods, classes & relationships
  - Dynamic (behavioral) view: focuses on messages between classes and resulting behaviors

# Object-Oriented Systems Analysis & Design (cont.)

- Iterative & incremental
  - Undergoes continuous testing & refinement
  - The analyst understands the system better over time
- Benefits of OOSAD
  - Break a complex system into smaller, more manageable modules
  - Work on modules individually

The Unified Process

- A specific methodology that maps out when and how to use the various UML techniques for object-oriented analysis and design
- A two-dimensional process consisting of phases and workflows
  - Phases are time periods in development
  - Workflows are the tasks that occur in each phase
  - Activities in both phases & workflows will overlap

The Unified Process
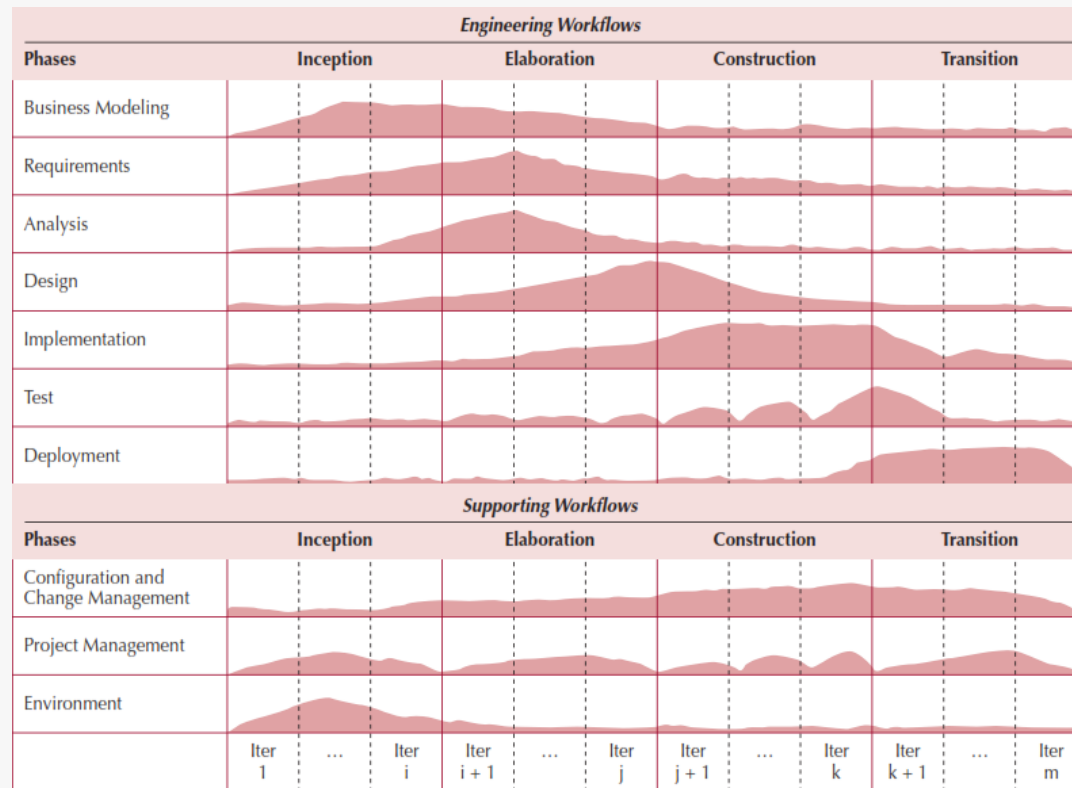
Unified Process Phases

- Inception
  - Feasibility analyses performed
  - Workflows vary but focus is on business modeling & requirements gathering
- Elaboration
  - Heavy focus on analysis & design
  - Other workflows may be included
- Construction: Focus on programming (implementation)
- Transition--Focus on testing & deployment

Engineering Workflows

- Business modeling
- Requirements
- Analysis
- Design
- Implementation
- Testing
- Deployment

Supporting Workflows

- Project management
- Configuration and change management
- Environment
- Operations and support*
- Infrastructure management*

* Part of the *enhanced* unified process

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Extensions to the Unified Process

- The Unified Process does not include:
  - Staffing
  - Budgeting
  - Contract management
  - Maintenance
  - Operations
  - Support
  - Cross- or inter-project issues

Extensions to the Unified Process (cont.)

- Add a Production Phase to address issues after the product has been deployed
- New Workflows:
  - Operations & Support
  - Infrastructure management
- Modifications to existing workflows:
  - Test workflow
  - Deployment workflow
  - Environment workflow
  - Project Management workflow
  - Configuration & change management workflow

Unified Modeling Language

- Provides a common vocabulary of object-oriented terms and diagramming techniques rich enough to model any systems development project from analysis through implementation
- Version 2.5 has 15 diagrams in 2 major groups:
  - Structure diagrams
  - Behavior diagrams

UML Structure Diagrams

- Represent the data and static relationships in an information system
  - Class
  - Object
  - Package
  - Deployment
  - Component
  - Composite structure

UML Behavior Diagrams

- Depict the dynamic relationships among the instances or objects that represent the business information system

  - Activity
  - Sequence
  - Communication
  - Interaction overview
  - Timing
  - Behavior state machine
  - Protocol state machine,
  - Use-case diagrams

Summary

- All systems development projects follow essentially the same process, called the system development life cycle (SDLC)
- System development methodologies are formalized approaches to implementing SDLCs
- The systems analyst needs a variety of skills and plays a number of different roles
- Object-oriented systems differ from traditional systems

Summary (cont'd)

- Object-Oriented Systems Analysis and Design (OOSAD) uses a use-case-driven, architecture-centric, iterative, and incremental information systems development approach

- The Unified Process is a two-dimensional systems development process described with a set of phases and workflows

- The Unified Modeling Language, or UML, is a standard set of diagramming techniques

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References

Denis, Wixom,Tegarden. (2015). Systems Analysis and Design: An Object-Oriented Approach with UML. 5th edition. ISBN: 978-1-118-80467-4, John Wiley & Sons, Inc, Denver (USA)

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Important Notes

Some important notes in developing presentation file for online resources:

- Please complete each presentation files with Learning Objectives information.
- Please make sure to make Acknowledgement slide if you are using PowerPoint slides from textbook or the content of the slides are mainly adopted from the textbook.
- If you are adding picture or information from other sources, please give reference footnote on the slide.
- URL of the reference must be written in complete format, e.g. http://www.cocktailsoftheworld.com/uploads/pics/Jtho.jpeg
- References slide must contain all references that have been used in the slides.