CSC 304: SYSTEM ANALYSIS & DESIGN

Recommended Reading

- System Analysis and design, 8/e, Shelly & Rosenblatt
- Systems Analysis and Design, 5/e, Kendall & Kendall
- Systems Analysis and Design, 2/e, Marakas

INTRODUCTION

- Companies use information as a weapon in the battle to increase productivity, deliver quality products and services, maintain customer loyalty, and make sound decisions.

- In this global economy where competition is intense, information technology (IT) can mean the difference between success and failure.

The Impact of IT

- Information Technology
  - Combination of hardware and software products and services that companies use to manage, access, communicate, and share information
- Successful firms treat information as a vital asset that must be used effectively, updated constantly, and safeguarded carefully.

The Impact of IT (cont'd)

- The Future of IT
  - Will see robust growth for at least a decade
  - The greatest need will be for systems analysts, network administrators, data communications analysts, and software engineers

The Impact of IT (cont'd)

- The Role of Systems Analysis and Design
  - **System Analysis and Design (SAD)** is a step-by-step process for developing high-quality information systems.
    - An **information system (IS)** combines information technology, people, and data to support business requirements.
  - Systems Analysts
    - Plan, develop, and maintain information systems

The Impact of IT (cont'd)

- Who develops Information Systems?
  - Traditionally, a company either develops its own IS, called **in-house applications**, or purchases systems called **software packages** from outside vendors.
  - How versus What
    - Launching a new IS involves risks as well as benefits. The greatest risk occurs when a company tries to decide *how* the system will be implemented before determining *what* the system is supposed to do.

Information System Components

- A **system** is a set of related components that produces specific results.
- A **mission-critical system** is one that is vital to a company's operations.
- **Information** is data that has been transformed into output that is valuable to users

Information System Components (cont'd)

- Information systems have five key components: **hardware**, **software**, **data**, **processes**, and **people**

Information System Components (cont'd)

- **Hardware**
  - Its the physical layer of the information system
  - Hardware can include severs, workstations, networks, telecommunications equipment, etc.

Information System Components (cont'd)

- **Software**
  - It refers to the programs that control the hardware and produce the desired information or results.
  - Software consists of **system software** and **application software.**
    - **System Software** manages the hardware components and also controls the flow of data, provides data security, and manages network operations.

Information System Components (cont'd)

- **Application Software** consists of programs that support day-to-day business functions and provide users with the information they require.
- Application software includes **horizontal** and **vertical** systems.
  - A **horizontal system** is a system, such as an inventory or payroll application, that can be adapted for use in many different types of companies.
  - A **vertical system** is designed to meet the unique requirements of a specific business or industry.

Information System Components (cont'd)

- **Data**
  - Is the raw material that an information system transforms into useful information
- **Processes**
  - These describe the tasks and business functions that users, managers, and IT staff members perform to achieve specific results.
  - They are the building blocks of an IS because they represent actual day-to-day business operations.

Information System Components (cont'd)

- **People**
  - Stakeholders
  - Users, or end users

System Development Tools

- Systems analysts must know how to use a variety of techniques such as modeling, prototyping, and computer-aided systems engineering tools to plan, design, and implement information systems.

System Development Tools -Modeling

- **Modeling** produces a graphical representation of a concept or process that systems developers can analyze, test and modify.
- A systems analyst can describe and simplify an IS by using a set of business, data, object, network and process models.

System Development Tools –Modeling cont'd

- **Business model** or **requirements model** describes the information that a system must provide.
- **Data model** describes data structures and design.
- **Object model** describes objects which combine data and processes.
- **Network model** describes the design and protocols of telecommunications links.
- **Process model** describes the logic that the programmers use to write code modules.

System Development Tools -Prototyping

- **Prototyping** tests system concepts and provides an opportunity to examine input, output and user interfaces before final decisions are made.
- A **prototype** is an early version of an IS.
  - A prototype can serve as an initial model that is used as a benchmark to evaluate the finished system, or the prototype itself can develop into the final version of the system.
- Prototyping speeds up the development process but a possible disadvantage is that important decisions might be made too early before business or IT issues are understood thoroughly.

System Development Tools –CASE Tools

- **Computer-Aided Systems (or Software) Engineering** tools provide an overall framework for systems development and support a wide variety of design methodologies.

Systems Development Methods

- The most popular alternatives are **structured analysis**, which is a traditional method that still is widely used, and **object-oriented analysis (O-O)**, which is a newer approach that many analysts prefer, and **agile methods**, also called **adaptive methods**

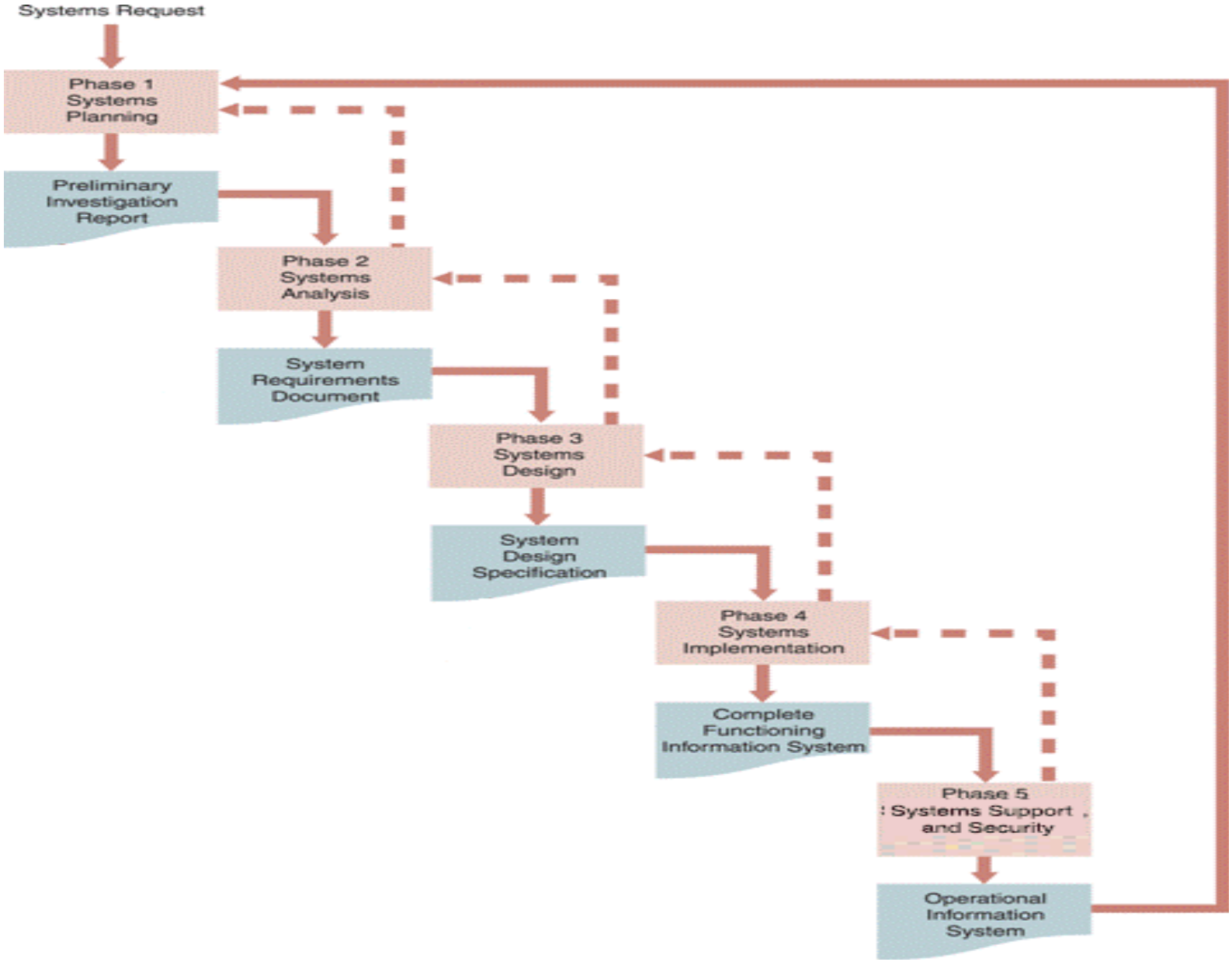
Structured Analysis

- Structured Analysis is a traditional systems development technique that is time-tested and easy to understand.
  - Systems development life cycle (SDLC)
    - Systems planning
    - Systems analysis
    - Systems design
    - Systems implementation
    - Systems support and security

Structured Analysis (cont'd)

- Process-centered technique
  - Process modeling identifies the data flowing into a process, the business rules that transform the data, and the resulting output data flow.
- Waterfall model
  - Deliverable or end product

Phases and deliverables of the SDLC



Structured Analysis (cont'd)

- Some analysts see a disadvantage in the built-in structure of the SDLC, because the waterfall model does not emphasize interactivity among the phases.
- This criticism can be valid if the SDLC phases are followed too rigidly. However, in reality adjacent phases usually interact.

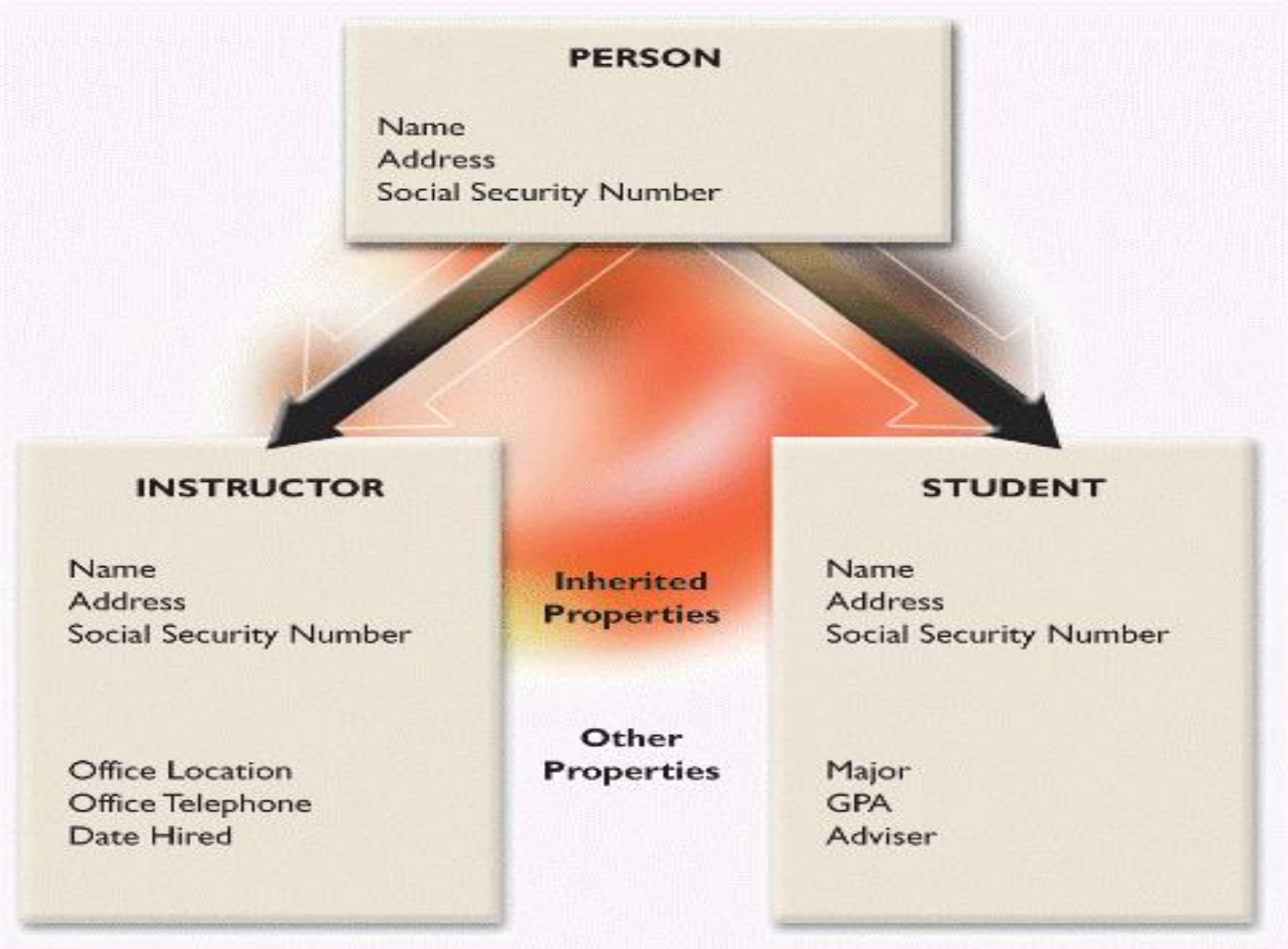
Structured Analysis - Summary

- It represents the system in terms of data and the processes that act upon that data.
- System development is organized into phases, with deliverables and milestones to measure progress.
- The SDLC waterfall model typically consists of five phases.
- Iteration is possible among the phases.

Object-Oriented Analysis

- O-O analysis views the system in terms of **objects** that combine data and processes.
- The objects represent actual people, things, transactions and events.
  - An object is a member of a **class,** which is a collection of similar objects.
- Objects possess characteristics called **properties**, which the object inherits from its class or possesses on its own.

Object-Oriented Analysis (cont'd)



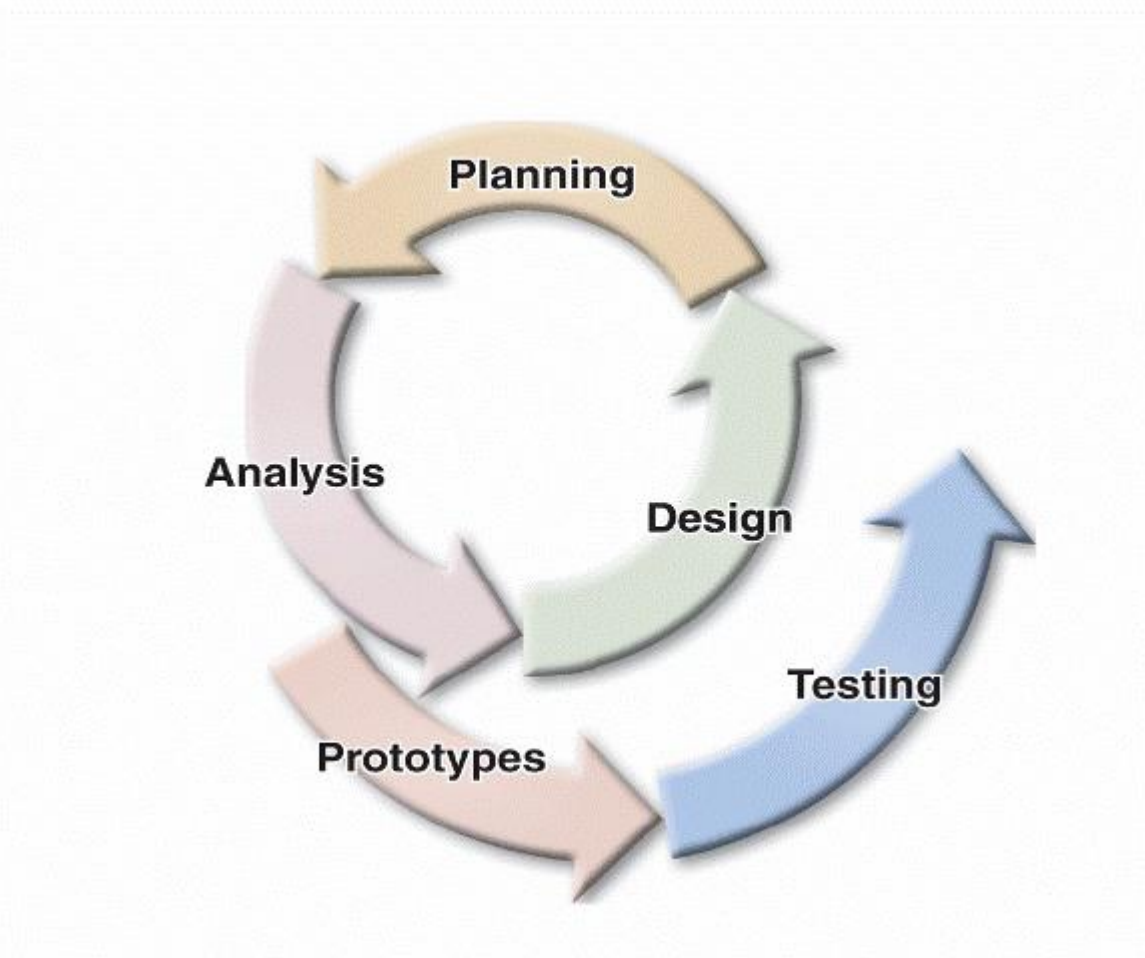
Object-Oriented Analysis (cont'd)

- In O-O design, built in processes called **methods** can change an object's properties.
- One object can send information to another object by using a message.
  - A **message** requests specific behaviour or information from another object.

Object-Oriented Analysis (cont'd)

- O-O methods usually follow a series of analysis and design phases that are similar to the SDLC, although there is less agreement on the number of phases and their names.
- In an O-O model, the phases tend to be more interactive.

O-O model



Object-Oriented Analysis (cont'd)

- In the O-O model planning, analysis and design tasks interact continuously to produce prototypes that can be tested and implemented.
- The result is an interactive model that accurately depict real-world business processes.
- O-O methodology is popular because it provides an easy transition to O-O programming languages such as Java, Smalltalk, C++ and Perl.

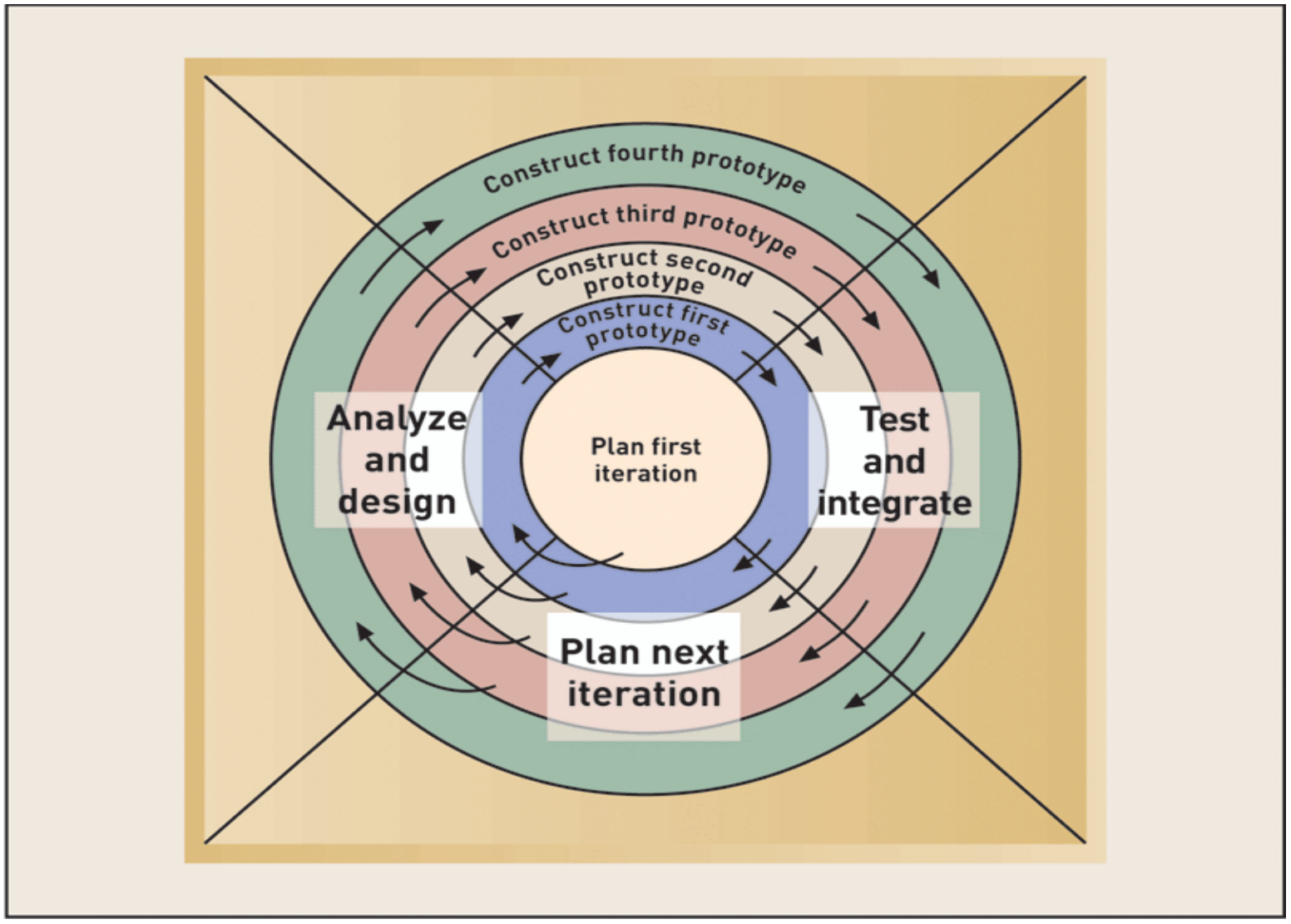
Agile Methods

- Agile methods attempt to develop a system incrementally, by building a series of prototypes and constantly adjusting them to meet user requirements.
- As the agile process continues, developers revise, extend and merge earlier versions into the final product.
- Agile methods use a spiral model, which represents a series of iterations or revisions based on user feedback.

Agile Methods (cont'd)

- An agile approach requires intense interactivity between developers and individual users and does not begin with an overall objective. Instead, the agile process determines the end result.
- Proponents of the spiral model believe that this approach reduces risks and speeds up software development.

Spiral Model



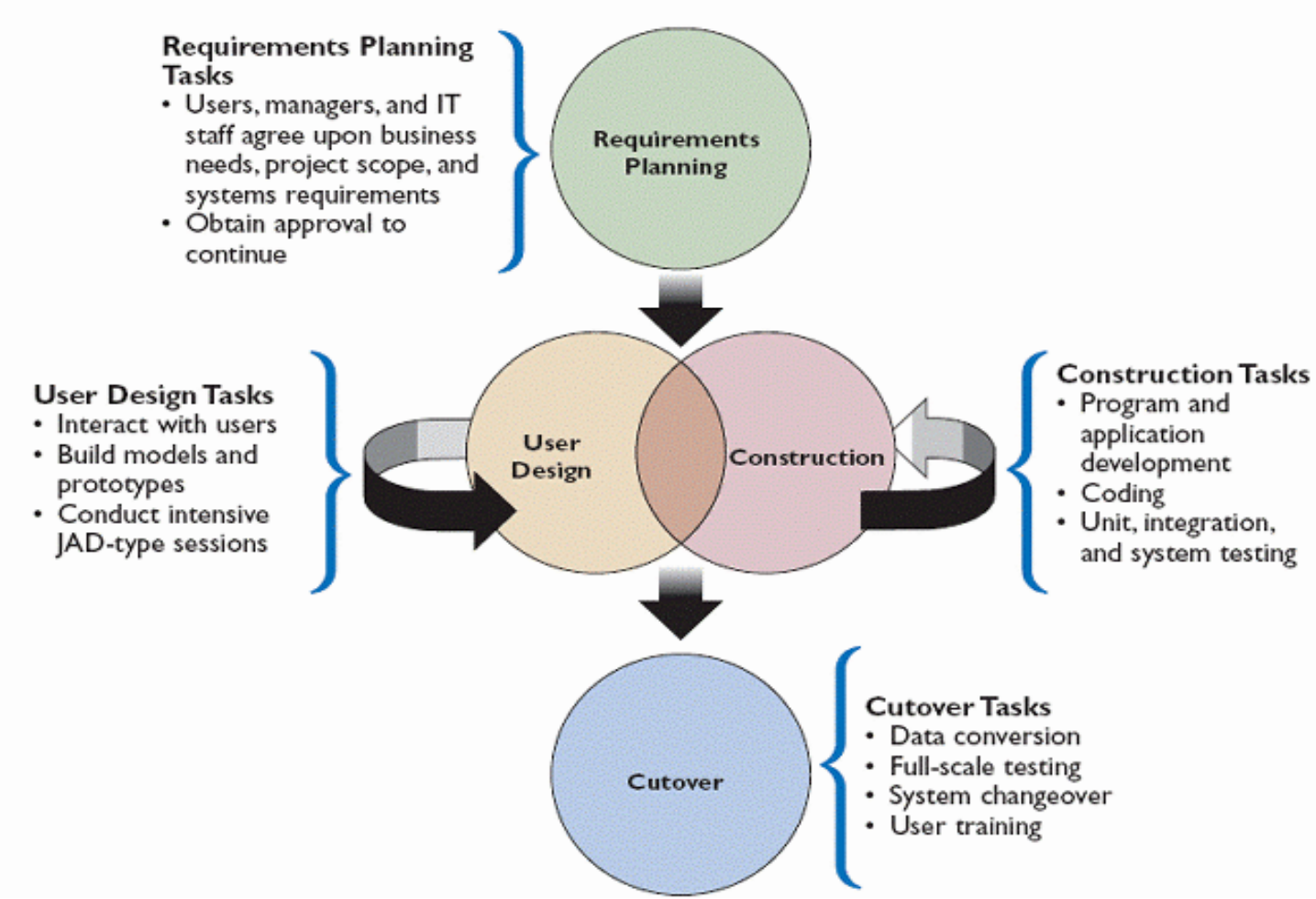
Other Development Methods

- **Joint Application Development (JAD)** is a technique that complements other system analysis and design techniques by emphasizing **participative development.** i.e., it's a fact-finding technique that brings system owners, users, designers, and builders into the development process as active participants.
- The end product of JAD is a requirements model.

Other Development Methods (cont'd)

- **Rapid Application Development (RAD)** is a team-based object-oriented approach to systems development that speeds up IS development and produces a functioning IS.
- RAD relies heavily on prototyping and user involvement.
- It has four phases that parallels the traditional SDLC phases.

RAD Phases and Activities



Systems Development Guidelines

- Develop a Project Plan
  - Prepare an overall project plan and stick to it
- Involve Users and Listen Carefully to Them
  - Ensure that users are involved in the development process especially when identifying and modeling system requirements.
- Use Project Management Tools to Identify Tasks and Milestones
  - Regardless of the development methodology, the systems analyst must keep the project on track and avoid surprises.

Systems Development Guidelines (cont'd)

- Develop Accurate Cost and Benefit Information
  - Provide accurate and reliable cost and benefit information. At the start of each phase provide specific estimates and update these as necessary.
- Remain Flexible
  - Be flexible within the framework of your plan.