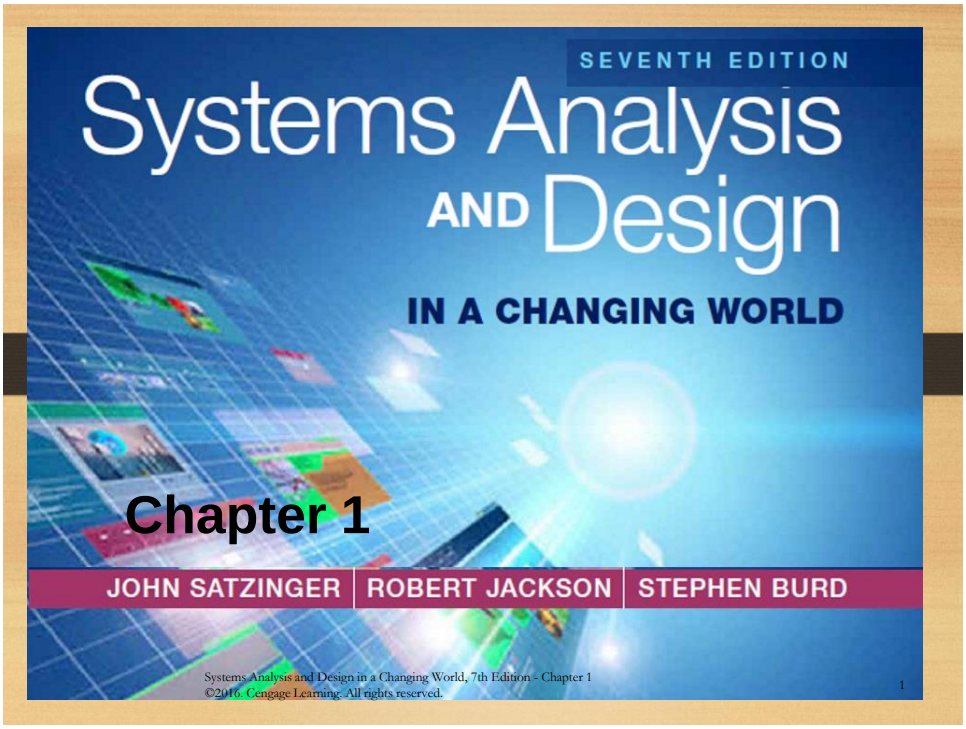


From Beginning to End:
An Overview of Systems Analysis and Design

Chapter 1

Systems Analysis and Design in a Changing World 7th Ed

Satzinger, Jackson & Burd

Chapter 1 Outline

- Software Development and Systems Analysis and Design
- Systems Development Lifecycle (SDLC)
- Iterative Development
- Introduction to Ridgeline Mountain Outfitters (RMO)
- Developing RMO's Tradeshow Systems
- Where You are Headed—The Rest of the Book

Learning Objectives

- After reading this chapter, you should be able to:
  - Describe the purpose of systems analysis and design when developing information systems
  - Explain the purpose of the system development life cycle and identify its six core processes
  - Explain how information system methodologies provide guidelines for completing the six core processes
  - Describe the characteristics of Agile methodologies and iterative system development

Learning Objectives (continued)

- Based on the Ridgeline Mountain Outfitters Tradeshow System example:
  - Describe how the six core processes of the SDLC are used in each iteration
  - Identify key documents used in planning a project
  - Identify key diagrams used in systems analysis and systems design

Overview

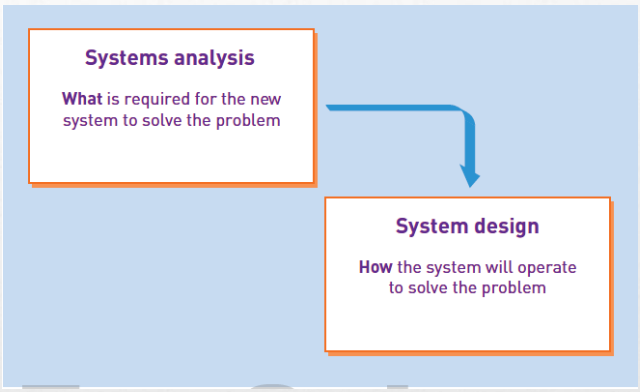
- This text is about developing information systems that solve an organization need.
- Chapter 1 takes you through the process of developing one rather small information system
- The rest of the textbook elaborates on the basic processes shown in chapter 1

Software Development

- **Computer application** (app) – a computer software program that executes on a computing device to carry out a specific set of functions
  - Modest scope
- **Information system** – a set of interrelated components that collects, processes, stores, and provides as output the information needed to complete business tasks
  - Broader in scope than "app"
  - Includes database and related manual processes

Software Development

- **Systems analysis** – those activities that enable a person to understand and specify what an information system should accomplish
- **Systems design** – those activities that enable a person to define and describe in detail the system that solves the need



Software Development

1. Understand the need (business need)
2. Capture the vision
3. Define a solution
4. Communicate the vision and solution
5. Build the solution
6. Confirm that the solution meets the need
7. Launch the solution system

System Development Life Cycle (SDLC)

- The process consisting of all activities required to build, launch, and maintain an information system. Six core processes are:
  1. Identify the problem or need and obtain approval
  2. Plan and monitor the project
  3. Discover and understand the details of the problem or need
  4. Design the system components that solve the problem
  5. Build, test, and integrate system components
  6. Complete system tests and then deploy the solution

Systems Development Life Cycle (SDLC)

- **Project** – a planned undertaking that has a beginning and end and that produces some definite result
  - Used to develop an information system
  - Requires knowledge of systems analysis and systems design tools and techniques

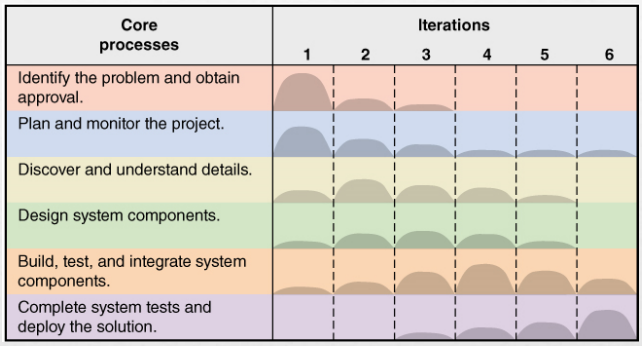
System Development Life Cycle (SDLC)

- **System development process** – the actual approach used to develop a particular information system (aka: ***methodology***)
  - Unified process (UP)
  - Extreme programming (XP)
  - Scrum
- Most processes/methodologies now use Agile and Iterative development

Iterative Development

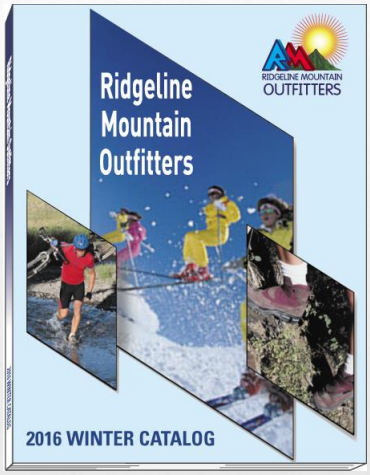
- **Agile development** – an information system development process that emphasizes flexibility to anticipate new requirements during development
  - Fast on feet; responsive to change
- **Iterative development** -- an approach to system development in which the system is "grown" piece by piece through multiple iterations
  - Complete small part of system (mini-project), then repeat processes to refine and add more, then repeat to refine and add more, until done

Iterative and Agile Systems Development Lifecycle (SDLC)

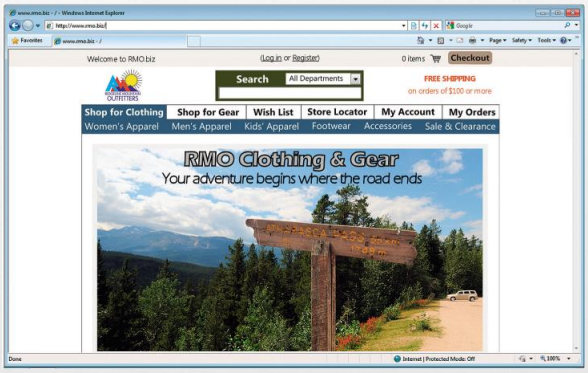


Ridgeline Mountain Outfitters (RMO)

- Large Retail Company
  - Outdoor and sporting clothing and accessories
  - Skiing, mountain biking, water sports
  - Hiking, camping, mountain climbing
- Rocky Mountain and Western States
  - Started mail order and phone order
  - Added retail stores
  - Added extensive E-business component



Ridgeline Mountain Outfitters (RMO)



RMO Tradeshow System

- Sample project for chapter
- Small information system (app)
- Being added to larger supply chain management system
- Demonstrates one iteration of the small project – assumes more iterations in total project
- Goes through all six core processes of SDLC
- The plan for this chapter is to complete iteration in six days

RMO Tradeshow System

- **Problem**-- purchasing agents attend apparel and fabric trade shows around the world to order new products from suppliers
- **Need**– information system (app) to collect and track information about suppliers and new products while at tradeshows
- **Tradeshow Project**– is proposed
  - Supplier information subsystem
  - Product information subsystem

Initial Activities – pre-project

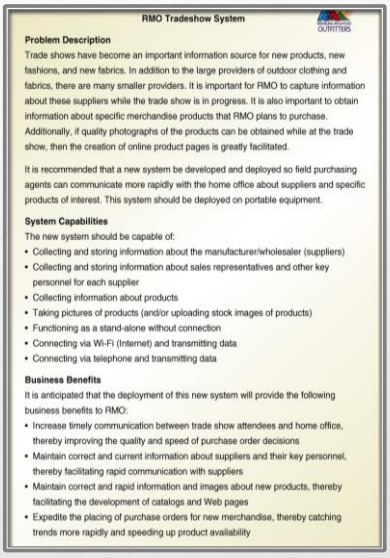
- Identify the problem and document the objective of the system (core process 1)
  - Preliminary investigation
  - System Vision Document
- Obtain approval to commence the project (core process 1)
  - Meet with key stakeholders, including executive management
  - Decision reached, approve plan and budget

System Vision Document

Problem description

System capabilities

Business benefits



RMO Tradeshow System

Problem Description

Trade shows have become an important information source for new products, new fashions, and new fabrics. In addition to the large providers of outdoor clothing and fabrics, there are many smaller providers. It is important for RMO to capture information about these suppliers while the trade show is in progress. It is also important to obtain information about specific merchandise products that RMO plans to purchase. Additionally, if quality photographs of the products can be obtained while at the trade show, then the creation of online product pages is greatly facilitated.

It is recommended that a new system be developed and deployed so field purchasing agents can communicate more rapidly with the home office about suppliers and specific products of interest. This system should be deployed on portable equipment.

System Capabilities

The new system should be capable of:

- Collecting and storing information about the manufacturer/wholesaler (suppliers)
- Collecting and storing information about sales representatives and other key personnel for each supplier
- Collecting information about products
- Taking pictures of products (and/or uploading stock images of products)
- Functioning as a stand-alone without connection
- Connecting via Wi-Fi (Internet) and transmitting data
- Connecting via telephone and transmitting data

Business Benefits

It is anticipated that the deployment of this new system will provide the following business benefits to RMO:

- Increase timely communication between trade show attendees and home office, thereby improving the quality and speed of purchase order decisions
- Maintain correct and current information about suppliers and their key personnel, thereby facilitating rapid communication with suppliers
- Maintain correct and rapid information and images about new products, thereby facilitating the development of catalogs and Web pages
- Expedite the placing of purchase orders for new merchandise, thereby catching trends more rapidly and speeding up product availability

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Day 1 Activities

- Core Process 2: Plan the Project
  - Determine the major components (functional areas) that are needed
    - Supplier information subsystem
    - Product information subsystem
  - Define the iterations and assign each function to an iteration
    - Decide to do Supplier subsystem first
    - Plan one iteration as it is small and straight forward
  - Determine team members and responsibilities

Work Breakdown Structure for Iteration

Describes the work and covers Core Processes 3, 4, 5, and 6

Work Breakdown Structure

I. Discover and understand the details of all aspects of the problem.
   1. Meet with the Purchasing Department manager. ~ 3 hours
   2. Meet with several purchasing agents. ~ 4 hours
   3. Identify and define use cases. ~ 3 hours
   4. Identify and define information requirements. ~ 2 hours
   5. Develop workflows and descriptions for the use cases. ~ 6 hours

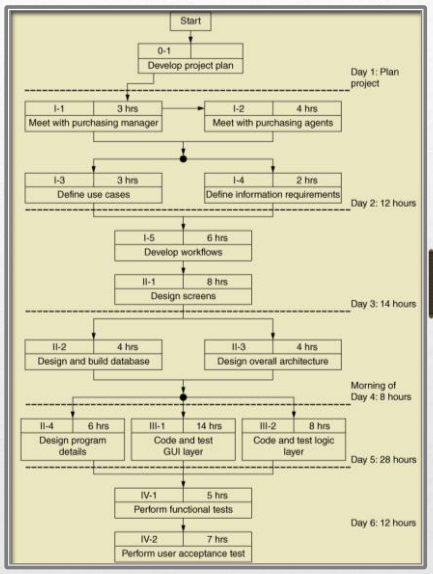
II. Design the components of the solution to the problem.
   1. Design (lay out) input screens, output screens, and reports. ~ 8 hours
   2. Design and build database (attributes, keys, indexes). ~ 4 hours
   3. Design overall architecture. ~ 4 hours
   4. Design program details. ~ 6 hours

III. Build the components and integrate everything into the solution.
   1. Code and unit test GUI layer programs. ~ 14 hours
   2. Code and unit test Logic layer programs. ~ 8 hours

IV. Perform all system-level tests and then deploy the solution.
   1. Perform system functionality tests. ~ 5 hours
   2. Perform user acceptance test. ~ 8 hours

Work Sequence Draft for Iteration

Elaborates the Work Breakdown Structure



Day 2 Activities

- Core Process 3: Discover and Understand Details
  - Do preliminary fact-finding to understand requirements
  - Develop a preliminary list of use cases and a use case diagram
  - Develop a preliminary list of classes and a class diagram

Identify Use Cases

Both subsystems

Use Case	Description
Look up supplier	Using supplier name, find supplier information and contacts
Enter/update supplier information	Enter (new) or update (existing) supplier information
Look up contact	Using contact name, find contact information
Enter/update contact information	Enter (new) or update (existing) contact information
Look up product information	Using description or supplier name, look up product information
Enter/update product information	Enter (new) or update (existing) product information
Upload product image	Upload images of the merchandise product

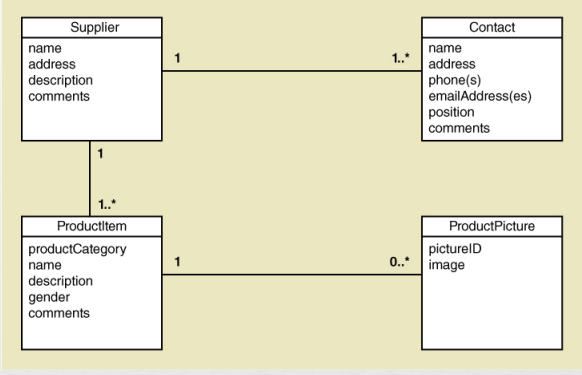
Identify Object Classes

Both subsystems

Object Classes	Attributes
Supplier	supplier name, address, description, comments
Contact	name, address, phone(s), e-mail address(es), position, comments
Product	category, name, description, gender, comments
ProductPicture	ID, image

Preliminary Class Diagram

Both subsystems



Day 3 Activities

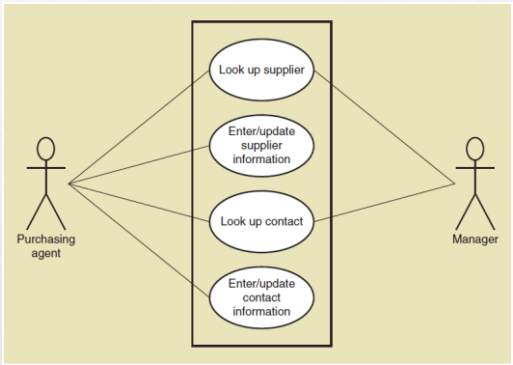
- Core Process 3: Discover and Understand Details
  - Do in-depth fact-finding to understand requirements
  - Understand and document the detailed workflow of each use case
- Core Process 4: Design System Components
  - Define the user experience with screens and report sketches

Supplier Information Subsystem

- Use cases:
  - Look up supplier
  - Enter/update supplier information
  - Lookup contact information
  - Enter/update contract information

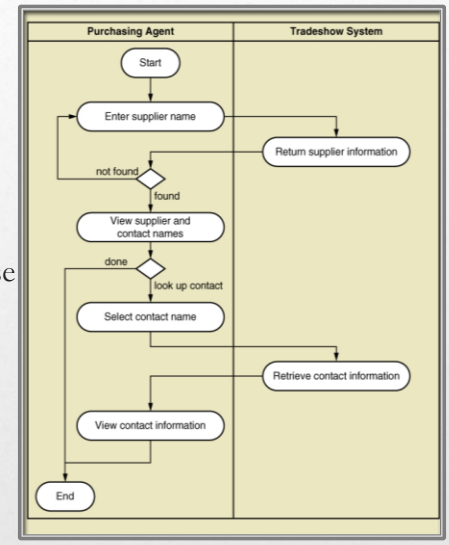
Use Case Diagram

Supplier information subsystem



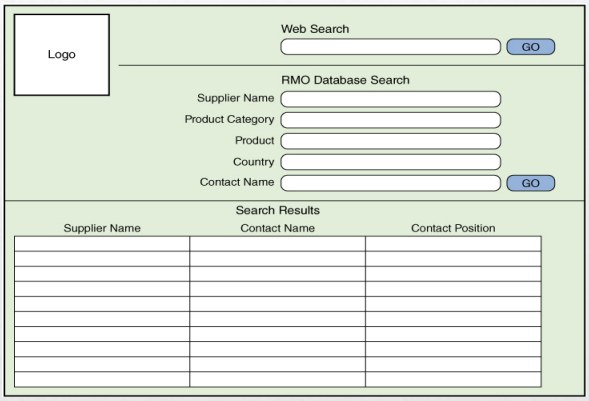
Activity Diagram (Workflow)

Look up supplier use case



Draft Screen Layout

Look up supplier use case



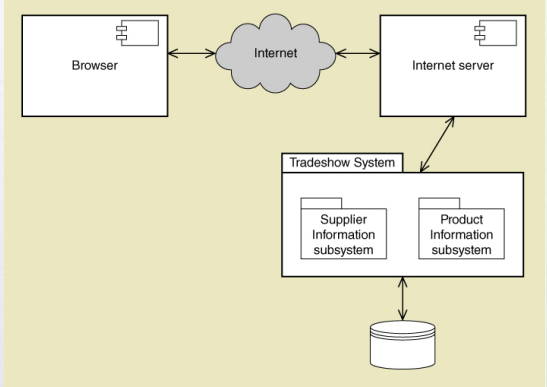
Day 4 Activities

- Core Process 4: Design System Components
  - Design the database (schema)
  - Design the system's high level structure
    - Browser, Windows, or Smart phone
    - Architectural configuration (components)
    - Design class diagram
    - Subsystem architectural design

Database Schema

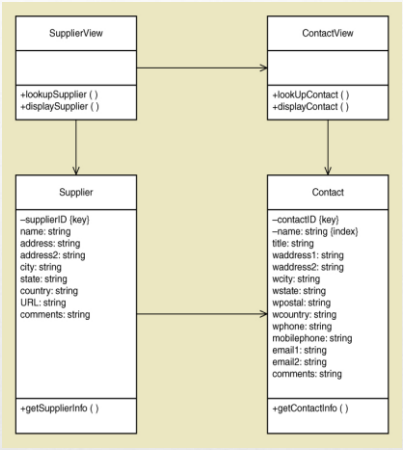
Table Name	Attributes
Supplier	SupplierID: integer {key} Name: string {index} Address1: string Address1: string City: string State-province: string Postal-code: string Country: string SupplierWebURL: string Comments: string
Contact	ContactID: integer {key} SupplierID: integer {foreign key} Name: string {index} Title: string WorkAddress1: string WorkAddress2: string WorkCity: string WorkState: string WorkPostal-code: string WorkCountry: string WorkPhone: string MobilePhone: string EmailAddress1: string EmailAddress2: string Comments: string

Architectural Configuration Diagram

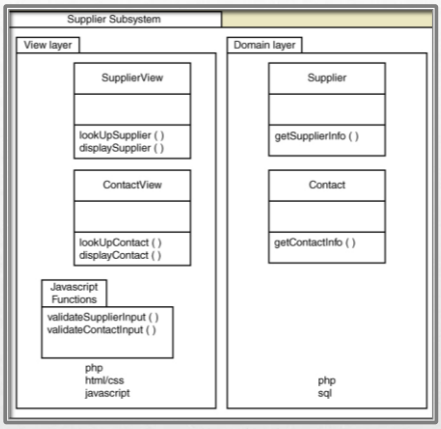


Preliminary Design Class Diagram

Includes View Layer Classes and Domain Layer Classes



Subsystem Architectural Design Diagram



Notes on Managing the Project

- Lots of design diagrams shown
  - Design in a complex activity with multiple levels
  - One diagram builds on/complements another
  - Not everything is diagrammed, especially for a small project. Pick and choose.
- Programming is also done concurrently
  - You don't design everything then code
  - You do some design, some coding, some design, some coding

Day 5 Activities

- Core Process 4: Design System Components
  - Continue with design details
  - Proceed use case by use case
- Core Process 5: Build, Test, and Integrate System Components
  - Continue programming (build)
  - Build use case by use case
  - Perform unit and integration tests

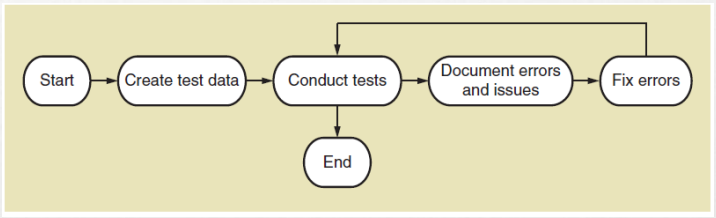
Code Example for One Class

```
<?php
    class SupplierView
    {
        private Supplier $theSupplier;

        function __construct()
        {
            $this->theSupplier = new Supplier();
        }

        function lookupSupplier()
        {
          include('lookupSupplier.inc.html');
        }

        function displaySupplier()
        {
             include('displaySupplierTop.inc.html');
             extract($_REQUEST);   // get Form data
           //Call Supplier class to retrieve the data
           $results = $theSupplier->getSupplierInfo($supplier, $category,
                                          $product, $country, $contact);

           foreach ($results as $resultItem){
           ?>
                  <tr>
                      <td style="border:1px solid black">
                            <?php echo $resultItem->supplierName?></td>
                      <td style="border:1px solid black">
                            <?php echo $resultItem->contactName?></td>
                      <td style="border:1px solid black">
                            <?php echo $resultItem->contactPosition?></td>
                  </tr>
           <?php }
           include('displaySupplierFoot.inc.html');
        }
    }
?>
```


Day 6 Activities

- Core Process 6: Complete System Testing and Deploy the System
  - Perform system functional testing
  - Perform user acceptance testing
  - Possibly deploy part of system

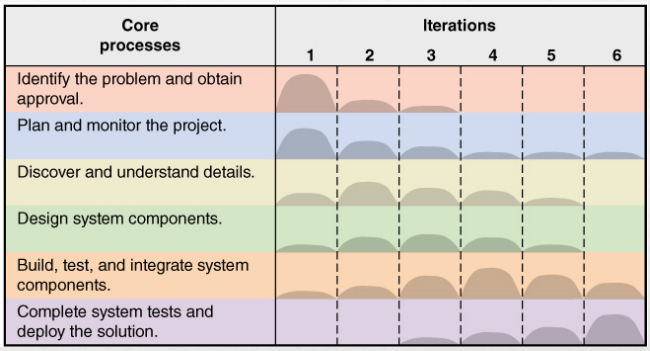
Workflow of Testing Tasks



First Iteration Recap

- This was a 6 day iteration of small project
  - Most iterations are longer (2 to 4 weeks)
  - This project might be 2 iterations
  - Most projects have many more iterations
- End users need to be involved, particularly in day 1, 2, 3 and 6.
- Days 4 and 5 involved design and programming concurrently.

This Book is about Activities and Tasks in the SDLC



Where You Are Headed – The Rest of the Book

- Part I: An Introduction to Systems Development
  - Chapter 1: From Beginning to End
    - Small project overview emphasizing analysis and design and iterative development
  - Online Chapter A: The Systems Analyst
    - More about the role of the systems analyst in systems development, including system concepts and careers

Where You Are Headed – The Rest of the Book

- Part II. Systems Analysis Activities
  - Chapter 2: Investigating System Requirements
    - More about core process 3: Systems analysis activities
  - Chapter 3: Identifying Use Cases
    - Techniques for Identifying and modeling use cases for systems analysis

Where You Are Headed – The Rest of the Book

- Part II. (continued)
  - Chapter 4: Domain Modeling
    - Techniques for identifying and modeling domain classes for systems analysis
  - Chapter 5: Use Case Modeling
    - Modeling more details about use cases
  - Online Chapter B: The Traditional Approach to Requirements
    - Modeling using Data Flow Diagrams

Where You Are Headed – The Rest of the Book

- Part III. Essentials of Systems Design
  - Chapter 6: Foundations of Systems Design
    - Design activities, Controls and Security
  - Chapter 7: Defining the System Architecture
    - Understanding the environment, configuring the application

Where You Are Headed – The Rest of the Book

- Part III. (continued)
  - Chapter 8: Designing the User Interface
    - Input and output design
  - Chapter 9: Designing the Database
    - Designing the schema – tables, data types, keys

Where You Are Headed – The Rest of the Book

- Part IV. Projects and Project Management
  - Chapter 10: Approaches to Systems Development
    - Predictive and adaptive approaches, SDLC, models
  - Chapter 11: Project Planning and Project Management
    - Core processes 1 and 2
  - Online Chapter C: Project Management Techniques
    - NPV, Pert charts, PMBOK knowledge areas

Where You Are Headed – The Rest of the Book

- Part V. Advanced Design and Deployment
  - Chapter 12: Object-Oriented Design: Fundamentals
    - Principles, Design Classes, CRC Cards
  - Chapter 13: Object-Oriented Design: Use Case Realization
    - Communication and Sequence Diagrams, three layer design
  - Chapter 14: Deploying the New System
    - Testing, deployment, support activities

Summary

- This text is about developing information systems that solve an organization need
- Chapter 1 takes you through the whole process for one small information system
- System development involves 6 core processes, known as the SDLC
- The rest of the text elaborates on the basic processes shown in chapter 1

Summary – Terms

- Terms to review and know include:
  - Computer application
  - Information system
  - Project
  - Systems analysis
  - System design
  - System development lifecycle (SDLC)
  - Information system development process (methodology)

Summary – Terms

- Agile development
- Iterative development
- System vision document
- Work breakdown structure
- Work sequence draft
- Use cases
- Use case diagram
- Object classes (domain classes)

Summary – Terms

- Class diagram
- Design class diagram
- High level structural design (architectural design)
- Database schema
- Screen layout