

SYSTEMS ANALYSIS AND DESIGN IN A CHANGING WORLD

Satzinger | Jackson | Burd

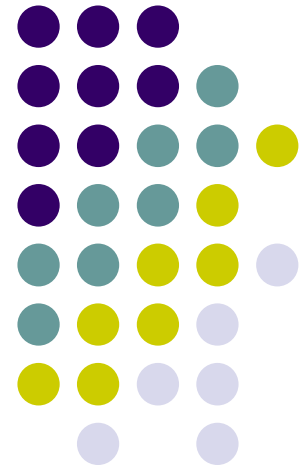
Chapter 1

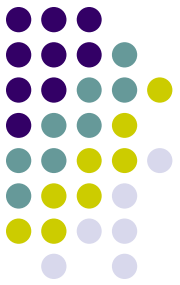
From Beginning to End: An Overview of Systems Analysis and Design

Chapter 1

Systems Analysis and Design
in a Changing World 6th Ed

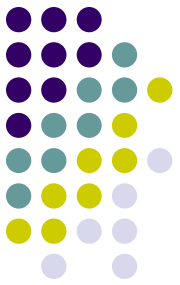
Satzinger, Jackson & Burd





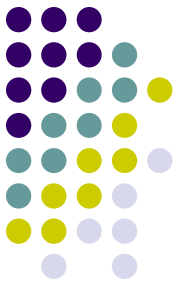
Chapter 1 Outline

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



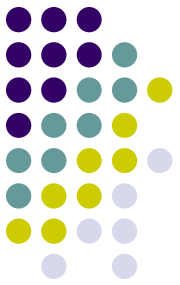
Learning Objectives

- After reading this chapter, you should be able to:
 - Describe the purpose of systems analysis and design in the development of information systems
 - Describe the characteristics of iterative systems development
 - Explain the six core processes of the Systems Development Life Cycle



Learning Objectives

- Identify key documents that are used in planning a project
- Identify key diagrams used in systems analysis and systems design
- Explain the utility of identifying use cases in systems development
- Explain the utility of identifying object classes in systems development



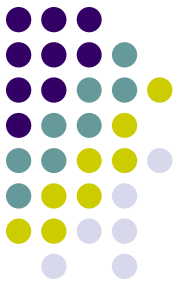
Overview

- 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 text elaborates on the basic processes shown in chapter 1

Overview (continued)



- **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



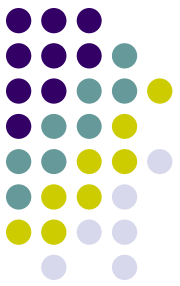
Overview (continued)

- **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



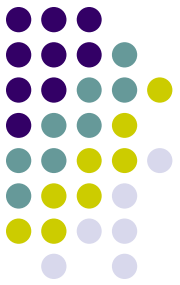
Overview (continued)

- **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



Overview (continued)

- **System development lifecycle (SDLC)** – the entire process consisting of all activities required to build, launch, and maintain an information system
 - Identify the problem or need and obtain approval
 - Plan and monitor the project
 - Discover and understand the details of the problem or need
 - Design the system components that solve the problem or satisfy the need
 - Build, test, and integrate system components
 - Complete system tests and then deploy the solution



Overview (continued)

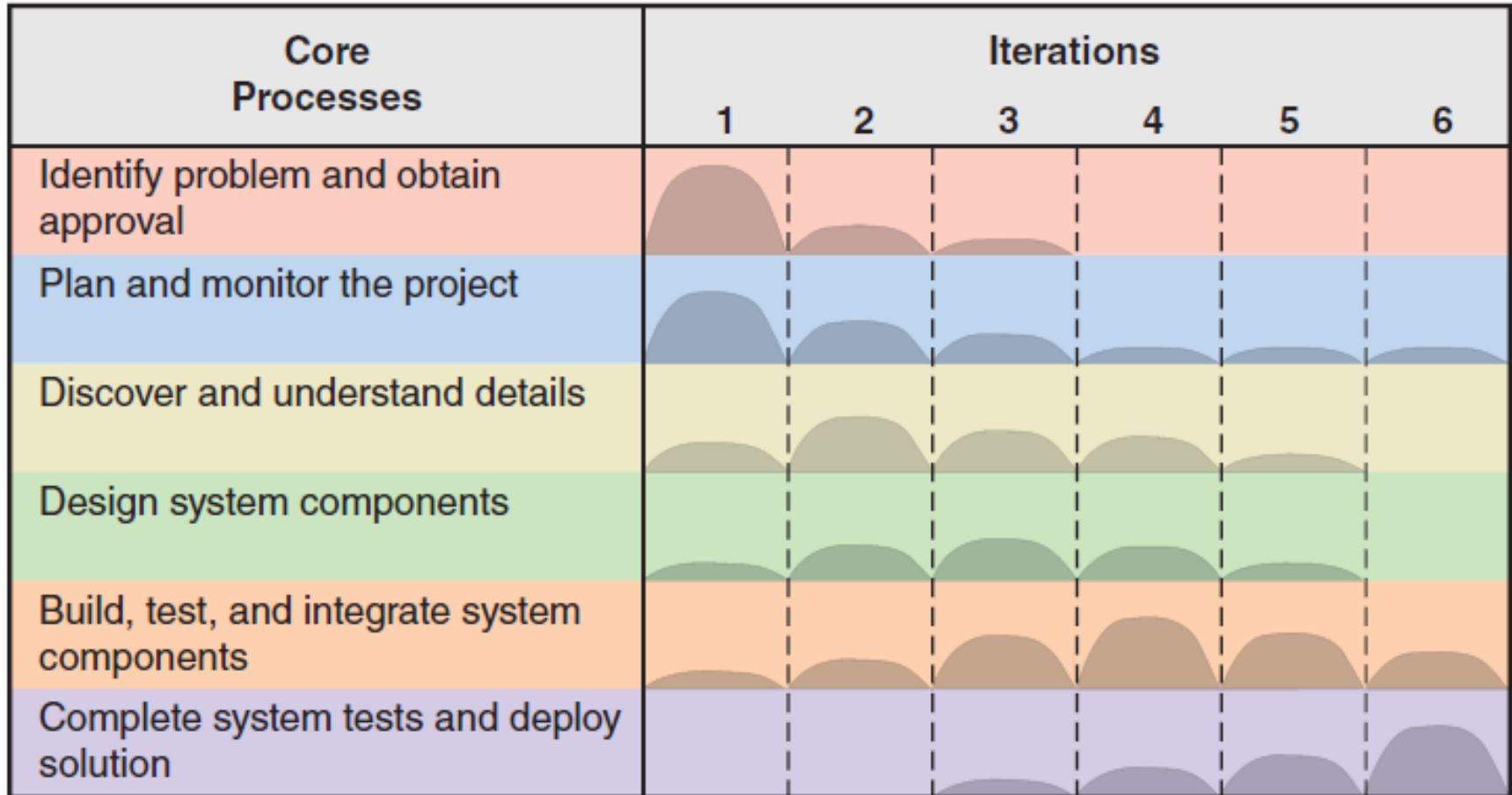
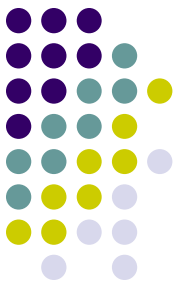
- **Information systems development process** – the actual approach used to develop a particular information system (aka: *methodology*)
 - Unified process (UP)
 - Extreme programming (XP)
 - Scrum
- Most processes/methodologies now use Agile and Iterative development

Overview (continued)



- **Agile development** – an information system development process that emphasizes flexibility to predict 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)

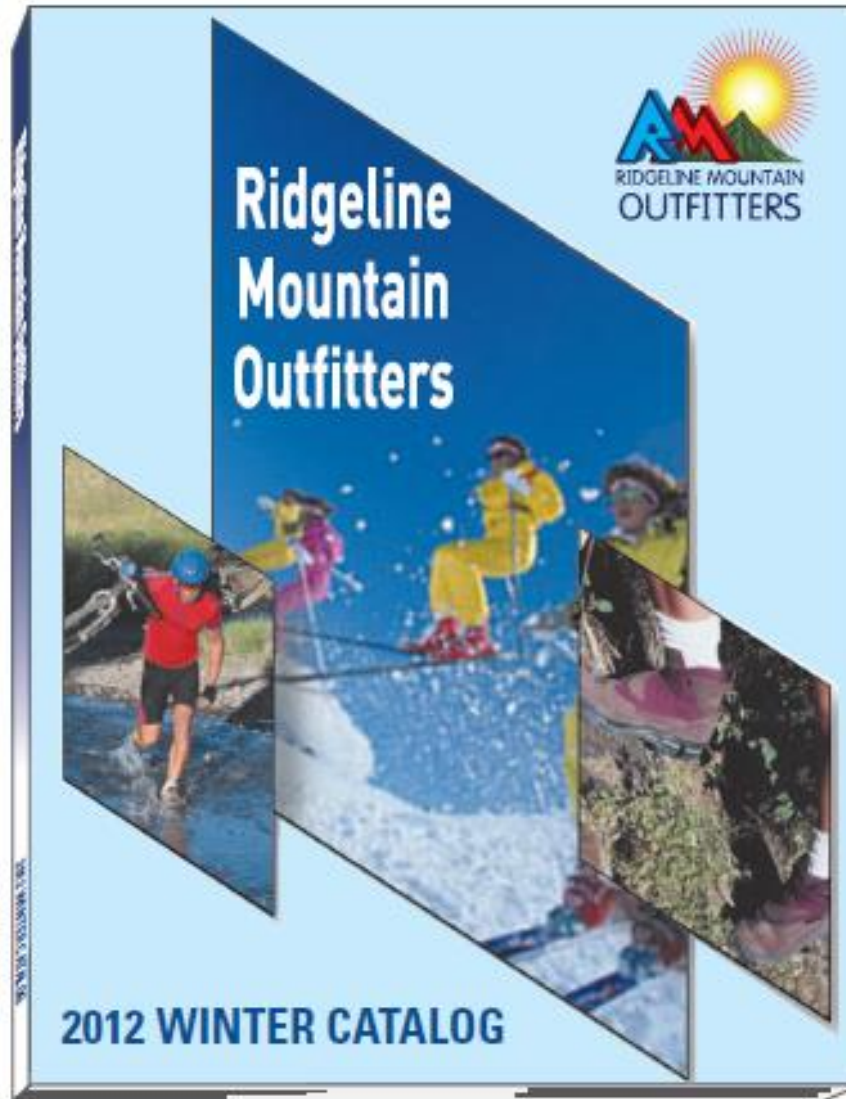
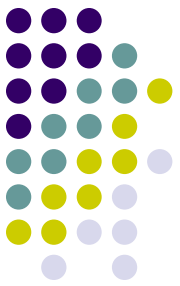


Ridgeline Mountain Outfitters (RMO)

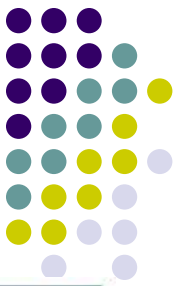


- Large Retail Company
 - outdoor and sporting clothing and accessories
 - Skiing, mountain biking, water sports
 - Hiking, camping, mountain climbing
- Rocky Mountain and Western States
 - Started mail order and phone order
 - Added retail stores
 - Added extensive E-business component

Ridgeline Mountain Outfitters (RMO)

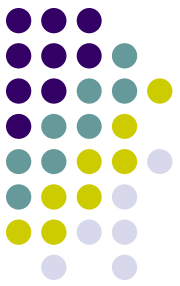


Ridgeline Mountain Outfitters (RMO)



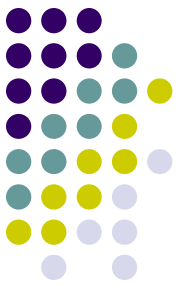
The screenshot shows the RMO website in a Windows Internet Explorer browser window. The address bar displays <http://www.rmo.biz/>. The page content includes:

- Header: "Welcome to RMO.biz" with a "(Log in or Register)" link and a shopping cart icon showing "0 items" and a "Checkout" button.
- Search bar: A search input field with a "Search" button and a dropdown menu set to "All Departments".
- Promotional text: "FREE SHIPPING on orders of \$100 or more".
- Navigation menu: A dark blue bar with links for "Shop for Clothing", "Shop for Gear", "Wish List", "Store Locator", "My Account", and "My Orders". Below this, a secondary bar lists "Women's Apparel", "Men's Apparel", "Kids' Apparel", "Footwear", "Accessories", and "Sale & Clearance".
- Main banner: A large image of a wooden signpost pointing towards mountains. The sign reads "ATHABASCA PASS 35 km" and "1748 m". The text "RMO Clothing & Gear" and "Your adventure begins where the road ends" is overlaid on the image.
- Footer: "Done" on the left and "Internet | Protected Mode: Off" and "100%" on the right.



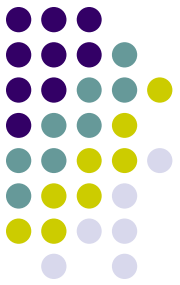
RMO Tradeshow System

- Sample project for chapter
- Small information system (app)
- Being added to larger supply chain management system
- Demonstrates one iteration of the small project, assuming there are more
- Goes through all six core processes of SDLC
- Plan 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 tradeshow
- **Tradeshow Project–** is proposed
 - Supplier information subsystem
 - Product information subsystem



Pre-Project Activities

- 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



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

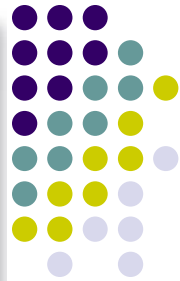
The new system should be capable of:

- 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

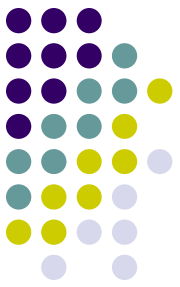
Business Benefits

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



Problem Description



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Day 1 Activities

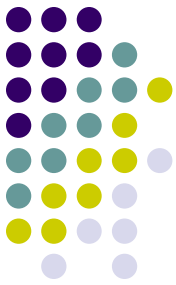
- Core Process 2: Plan the Project
 - Determine the major components (functional areas) that are needed
 - Supplier information subsystem
 - Product information subsystem
 - Define the iterations and assign each function to an iteration
 - Decide to do Supplier subsystem first
 - Plan one iteration as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

Work Breakdown Structure for Iteration

Based on the next four core processes in SDLC

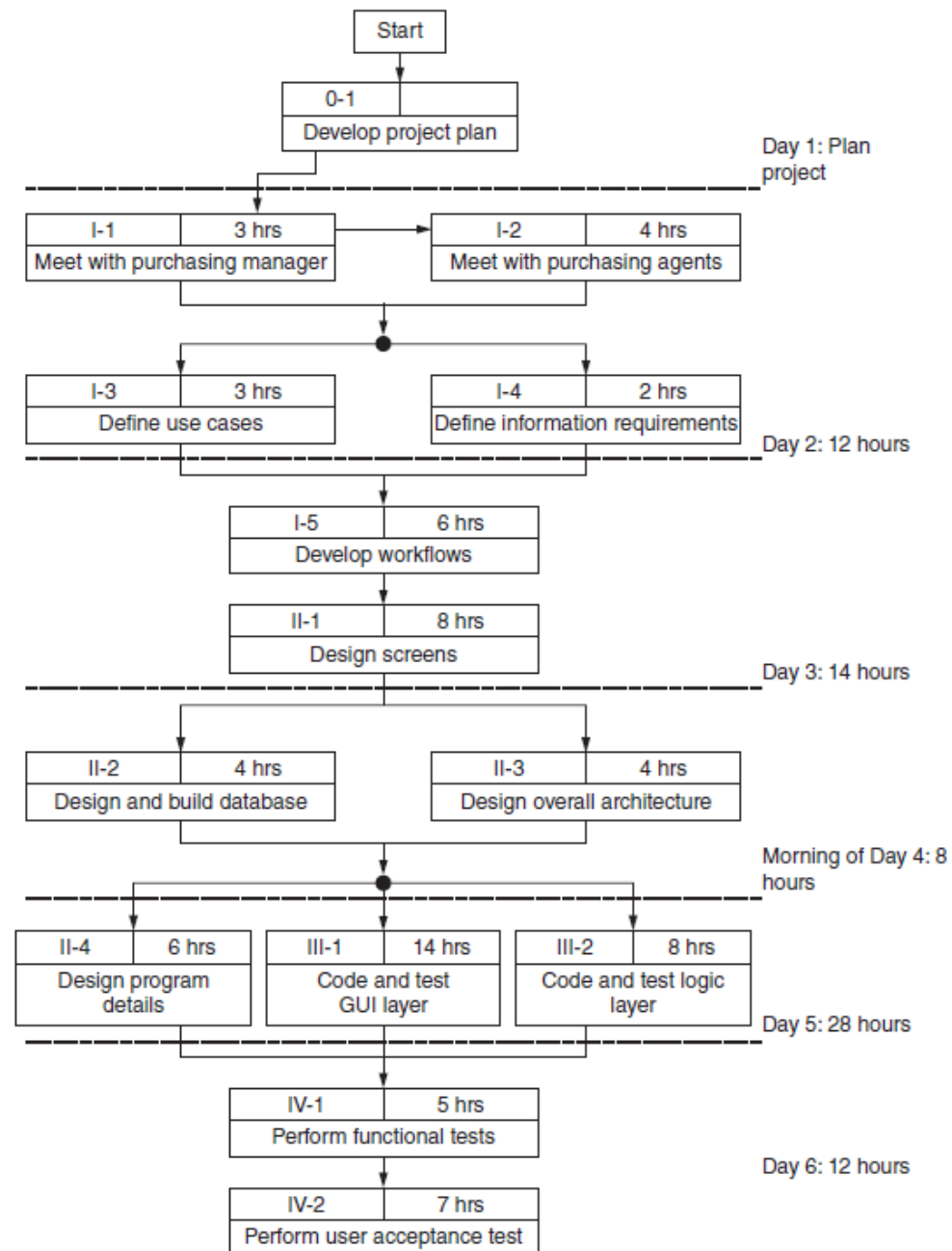
Work Breakdown Structure

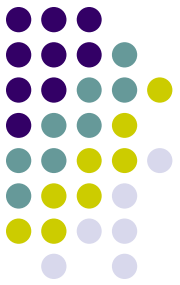
- I. *Discover and understand the details of all aspects of the problem.*
 1. *Meet with the Purchasing Department manager. ~ 3 hours*
 2. *Meet with several purchasing agents. ~ 4 hours*
 3. *Identify and define use cases. ~ 3 hours*
 4. *Identify and define information requirements. ~ 2 hours*
 5. *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 on Work Breakdown Structure



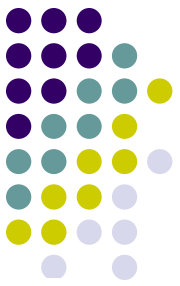


Day 2 Activities

- 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

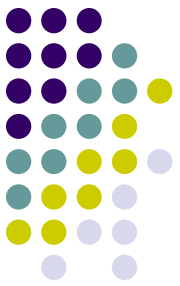
Both subsystems



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

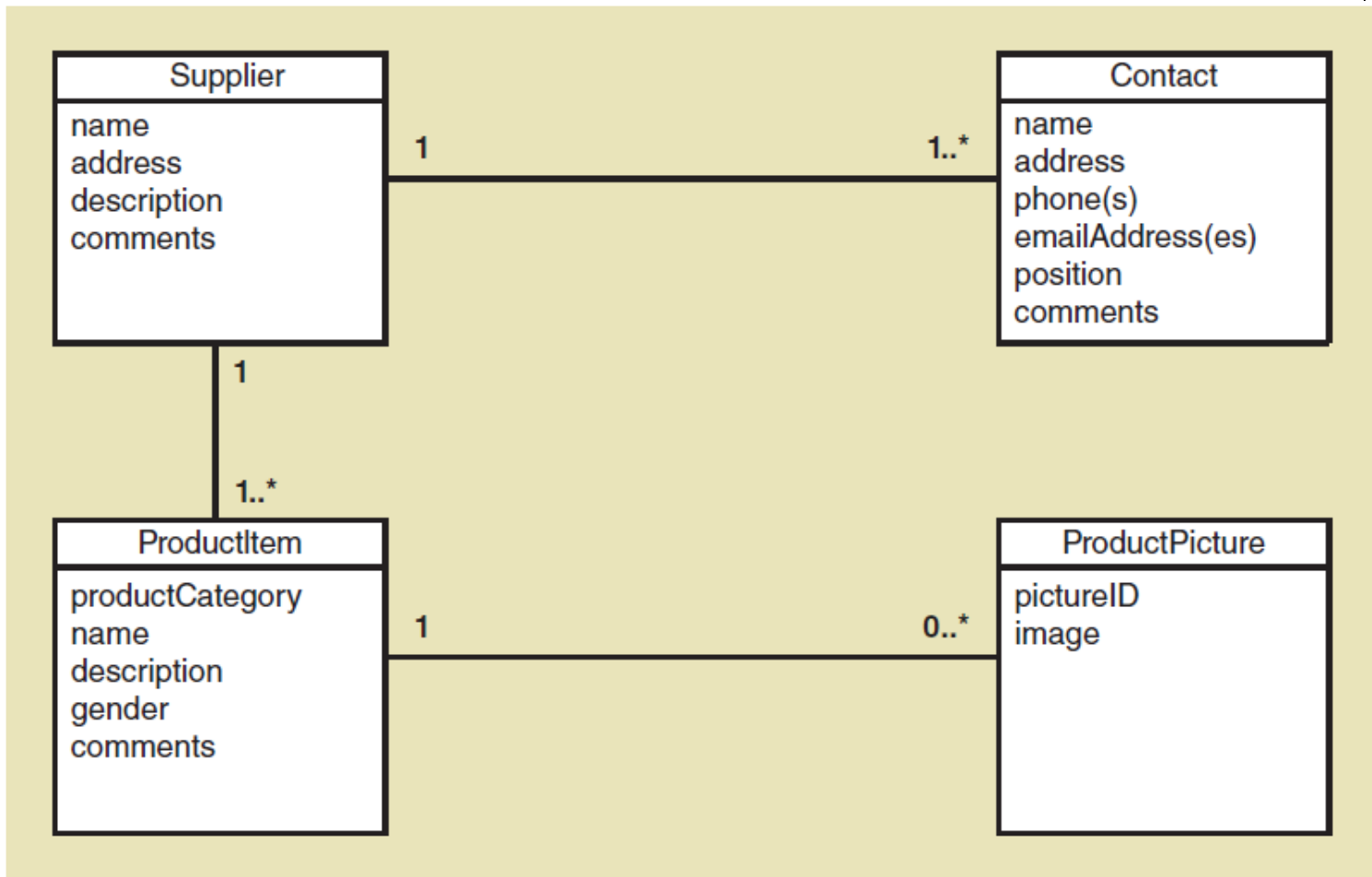
Both subsystems



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 reports

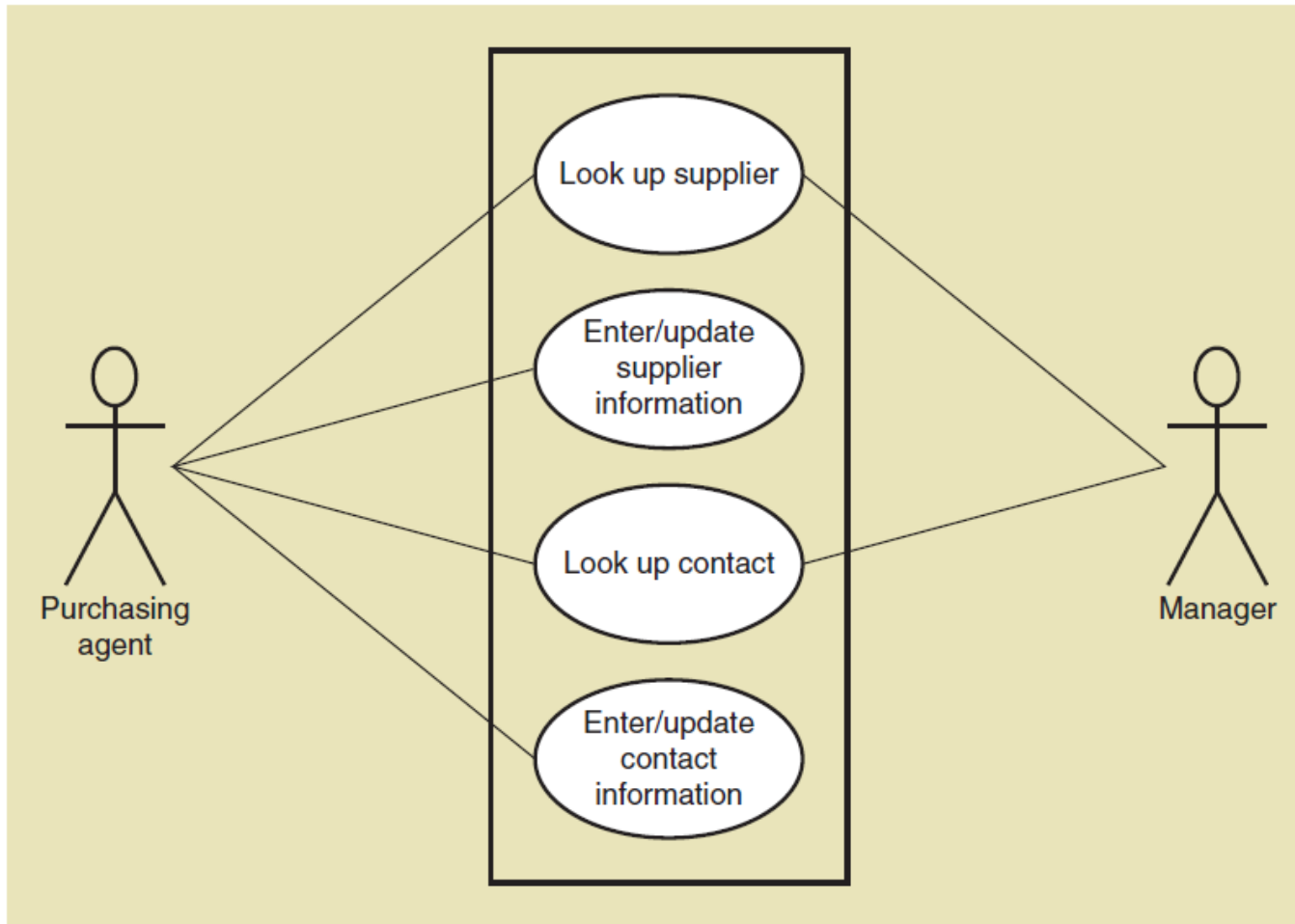
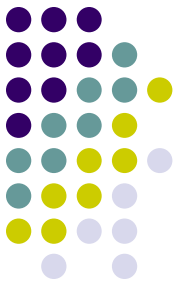
Details Focus on Supplier Information Subsystem



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

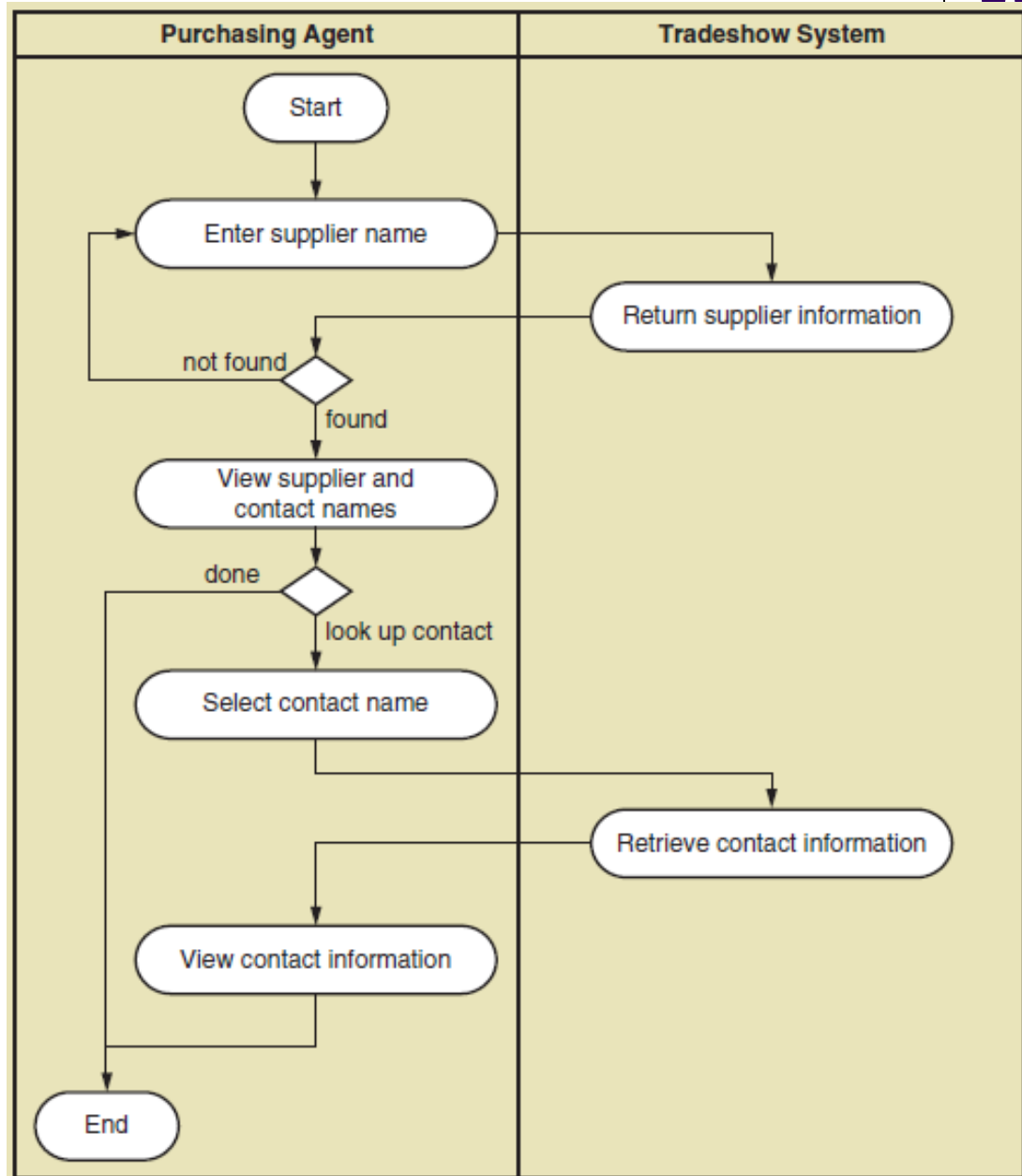
Use Case Diagram

Supplier information subsystem



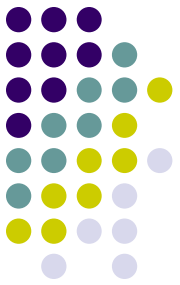
Activity Diagram (Workflow)

Look up supplier use case



Draft Screen Layout

Look up supplier use case



Logo

Web Search

RMO Database Search

Supplier Name

Product Category

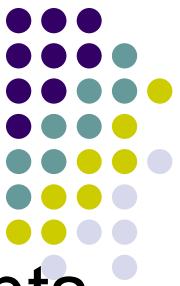
Product

Country

Contact Name

Search Results

Supplier Name	Contact Name	Contact Position



Day 4 Activities

- Core Process 4: Design System Components
 - Design the database (schema)
 - Table design
 - Key and index identification
 - Attribute types
 - Referential integrity
 - Design the system's high level structure
 - Browser, Windows, or Smart phone; OO or procedural
 - Architectural configuration (components)
 - Design class diagram
 - Subsystem architectural design

Database Schema

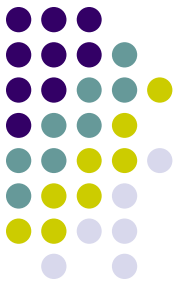
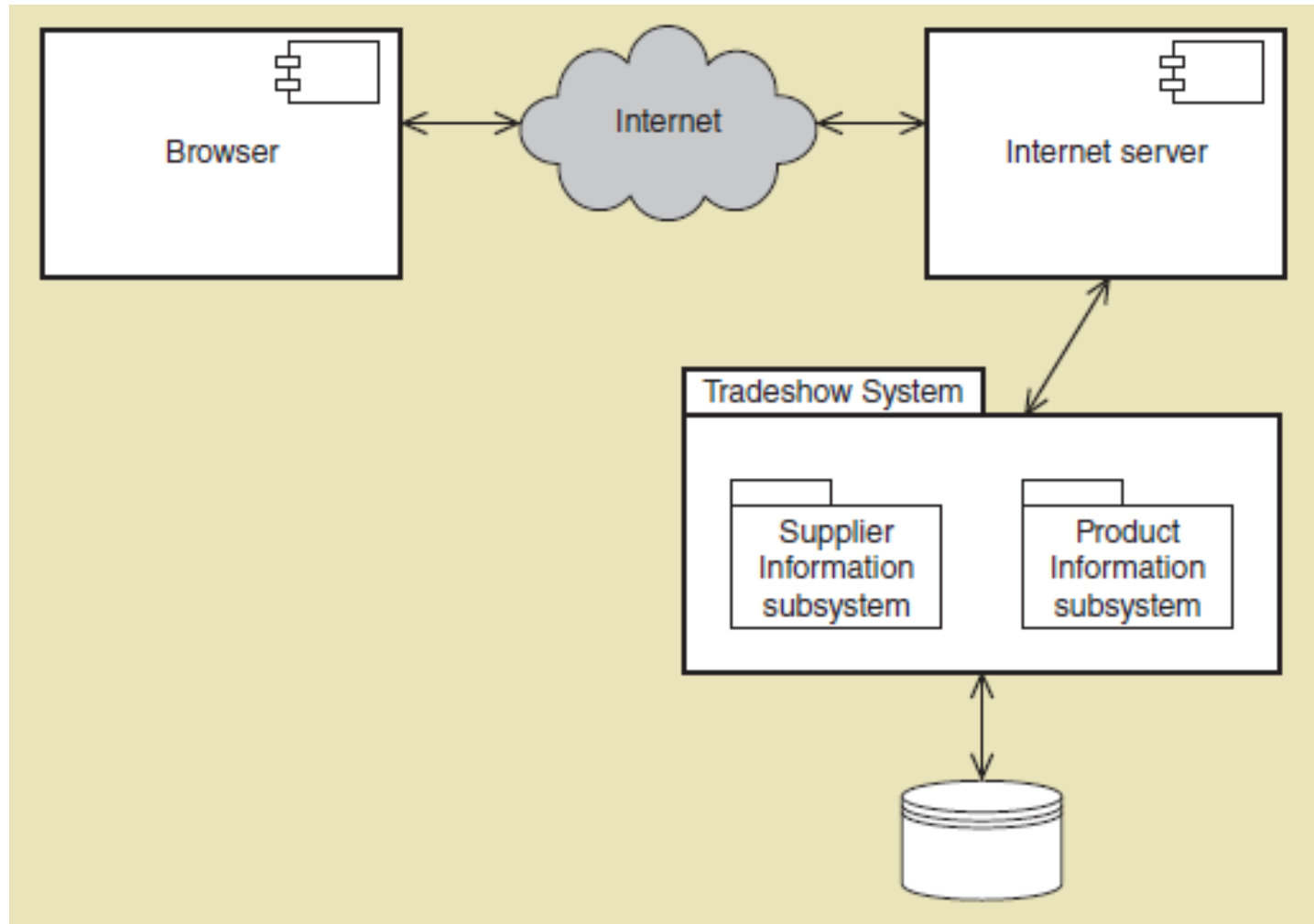
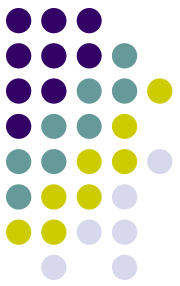
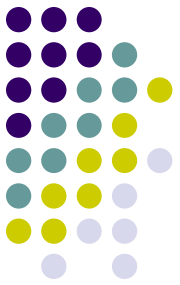


Table Name	Attributes
Supplier	SupplierID: integer {key} Name: string {index} Address1: string Address1: string City: string State-province: string Postal-code: string Country: string SupplierWebURL: string Comments: string
Contact	ContactID: integer {key} SupplierID: integer {foreign key} Name: string {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

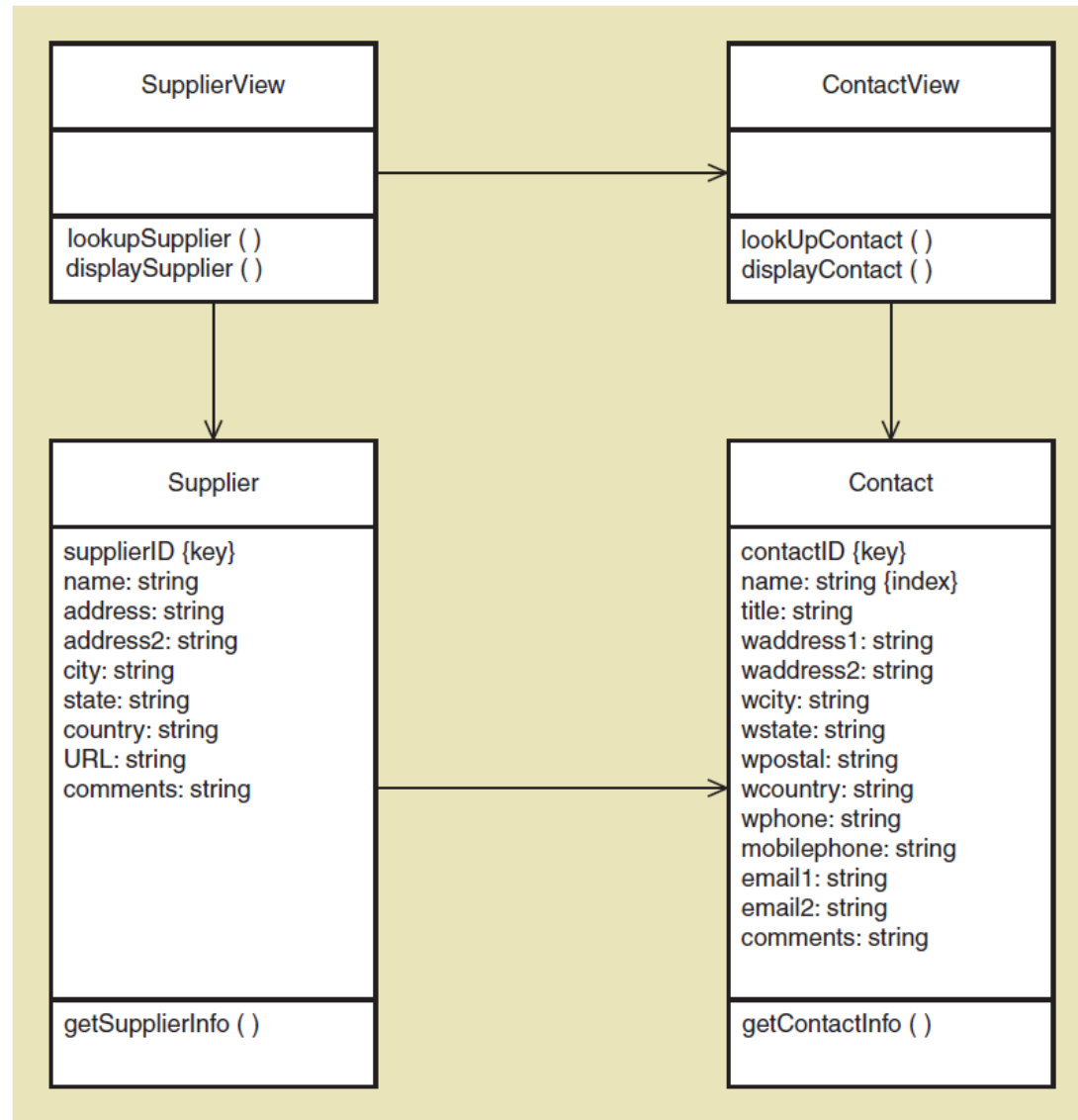




Preliminary Design Class Diagram

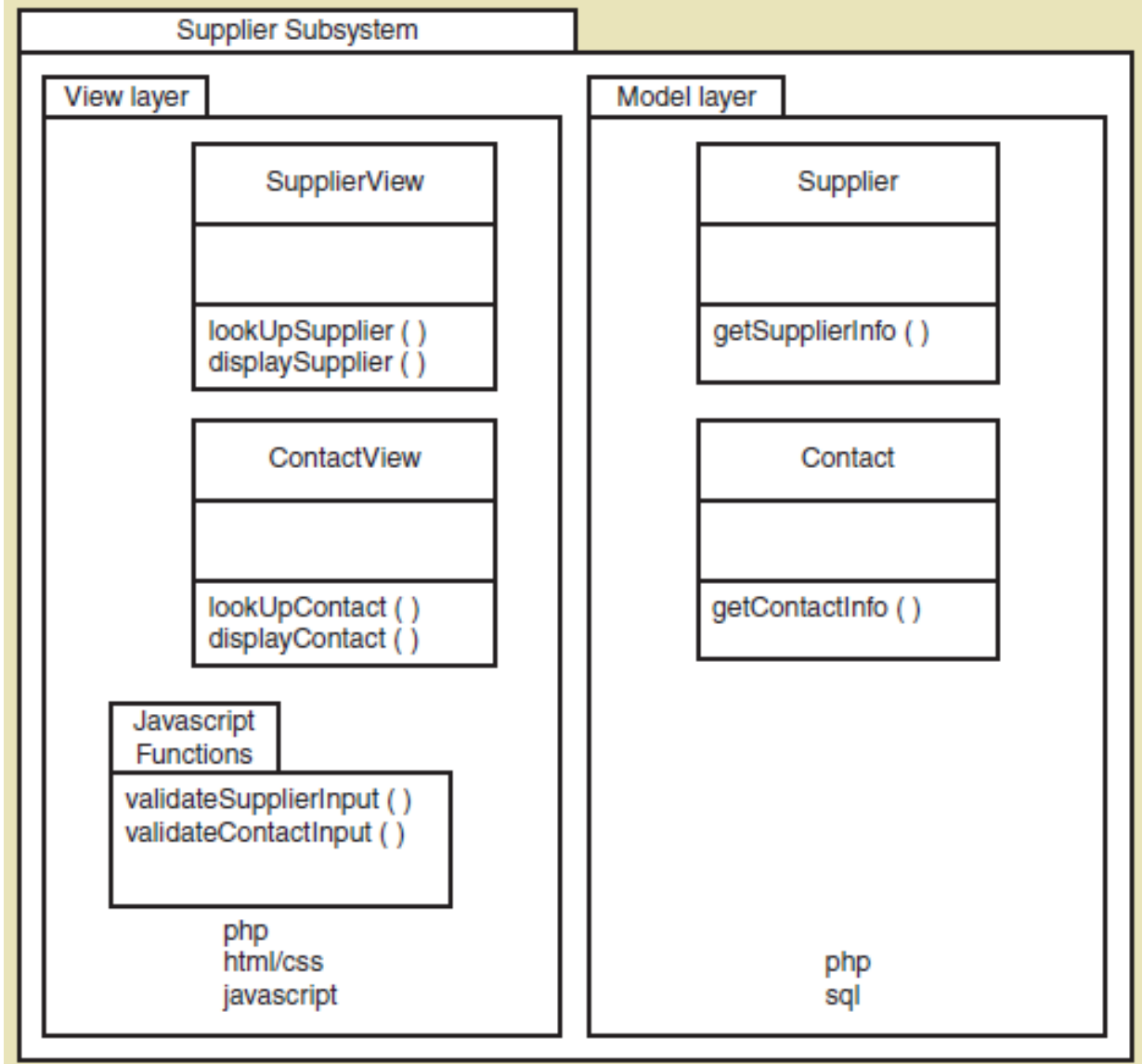
Includes View Layer Classes and Domain Layer Classes

Need to add Utility Classes as well

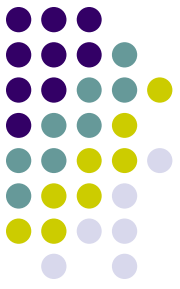




Subsystem Architectural Design Diagram



Notes on Managing the Project



- Lots of design diagrams shown
 - Design in a complex activity with multiple levels
 - High level architectural
 - Low level detailed design
 - 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

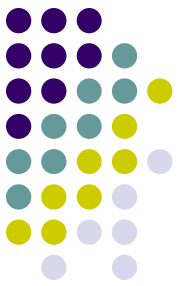
```
<?php
class SupplierView
{
    private Supplier $theSupplier;

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

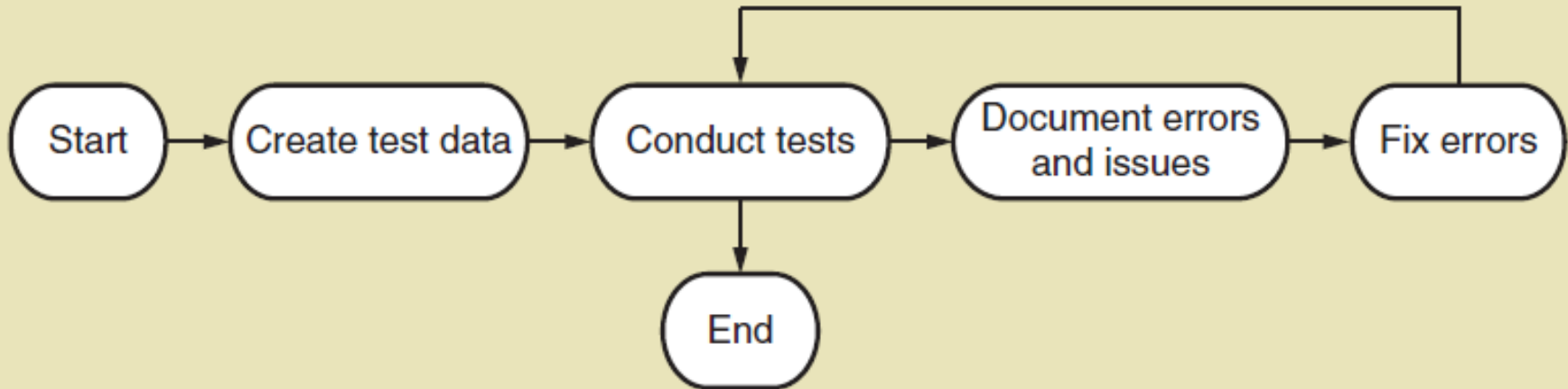
    function lookupSupplier()
    {
        include('lookupSupplier.inc.html');
    }

    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);

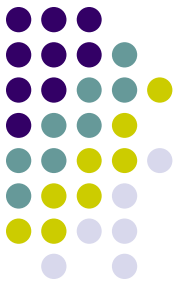
        foreach ($results as $resultItem){
            ?>
                <tr>
                    <td style="border:1px solid black">
                        <?php echo $resultItem->supplierName?></td>
                    <td style="border:1px solid black">
                        <?php echo $resultItem->contactName?>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



Workflow of Testing Tasks



Screen Capture for Look up supplier use case



RIDGELINE MOUNTAIN OUTFITTERS

Web Search

RMO Database Search

Supplier Name

Product Category

Product

Country

Contact Name

Search Results

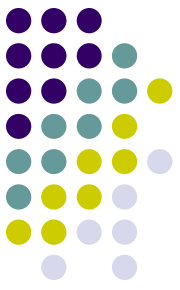
Supplier Name	Contact Name	Contact Position

Day 6 Activities

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

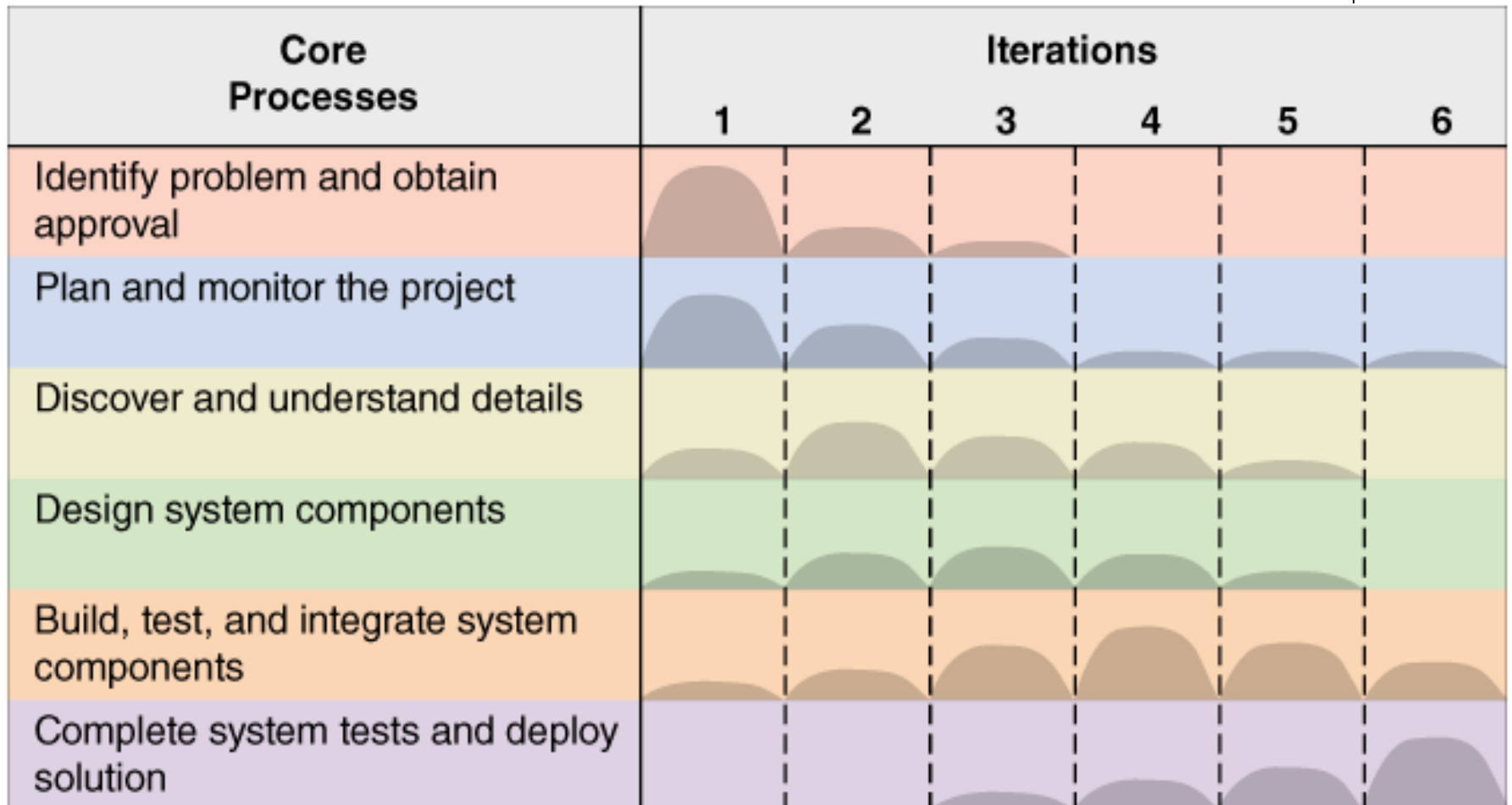
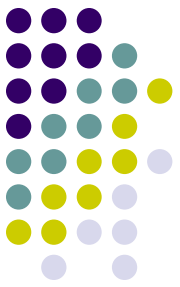


First Iteration Recap

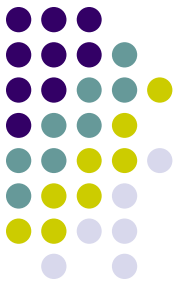


- This was a 6 day iteration of small project
 - Most iterations are longer (2 to 4 weeks)
 - This project might be 2 iterations
 - Most projects have many more iterations
- End users need to be involved, particularly in day 1, 2, 3 and 6.
- Days 4 and 5 involved design and programming concurrently.
 - Lots of time was spent programming along with design (not emphasized here)

This Book is about Activities and Tasks in the SDLC



Where You Are Headed



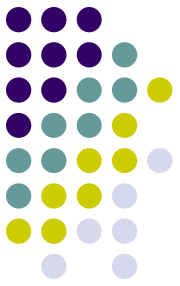
- Chapter 1: From Beginning to End
 - Small project overview emphasizing analysis and design and iterative development
 - Done!
- Online Chapter A: The Systems Analyst
 - More about the role of the systems analyst in systems development, including system concepts and careers
- Chapter 2: Investigating System Requirements
 - More about core process 3: Systems analysis activities
- Chapter 3: Use Cases
 - Techniques for Identifying and modeling use cases for systems analysis

Where You Are Headed



- Chapter 4: Domain Modeling
 - Techniques for Identifying and modeling domain classes for systems analysis
- Chapter 5: Extending the Requirements Models
 - Modeling more details about use cases and domain classes for systems analysis
- Online Chapter B: The Traditional Approach to Requirements
 - Systems analysis using data flow diagrams (DFDs) in place of use case descriptions and use case diagrams
 - Not as common now, but widely known by experienced developers

Where You Are Headed



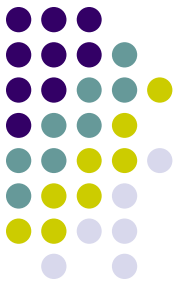
- Chapter 6: Essentials of Design
 - More about core process 4: system design activities
- Chapter 7: Designing User and System Interfaces
 - Human computer interaction, user interface design principles, outputs and reports, system interfaces
- Chapter 8: Approaches to System Development
 - More about the SDLC, models, tools, techniques, and agile methodologies
- Chapter 9: Project Planning and Project Management
 - More about core processes 1 and 2

Where You Are Headed



- Online Chapter C: Project Management Techniques
 - More hands on project management skills
- Chapter 10: Object-Oriented Design: Principles
 - Design principles, design models, and designing use cases
- Chapter 11: Object-Oriented Design: Use Case Realization
 - Three layer design and design patterns
- Chapter 12: Databases, Controls, and Security
 - More about database design and protecting the integrity of the system.

Where You Are Headed



- Chapter 13: Making the System Operational
 - More about core processes 5 and 6: programming, testing, and deployment
- Chapter 14: Current Trends in System Development
 - Trends in system development methodologies: Unified process, extreme programming, and scrum
 - Trends in technology infrastructure
 - Trends in software availability
 - The Web as an application platform

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

Summary



- System vision document
- Work breakdown structure
- Work sequence draft
- Use cases
- Use case diagram
- Object classes (domain classes)
- Class diagram
- Design class diagram
- High level structural design (architectural design)
- Database schema
- Screen layout