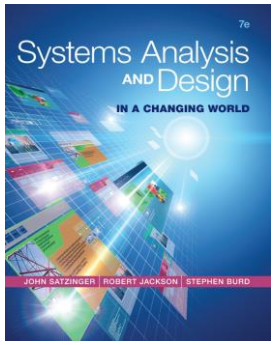
Investigating System Requirements



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TEXAS A&M
UNIVERSITY
COMMERCE

Outline

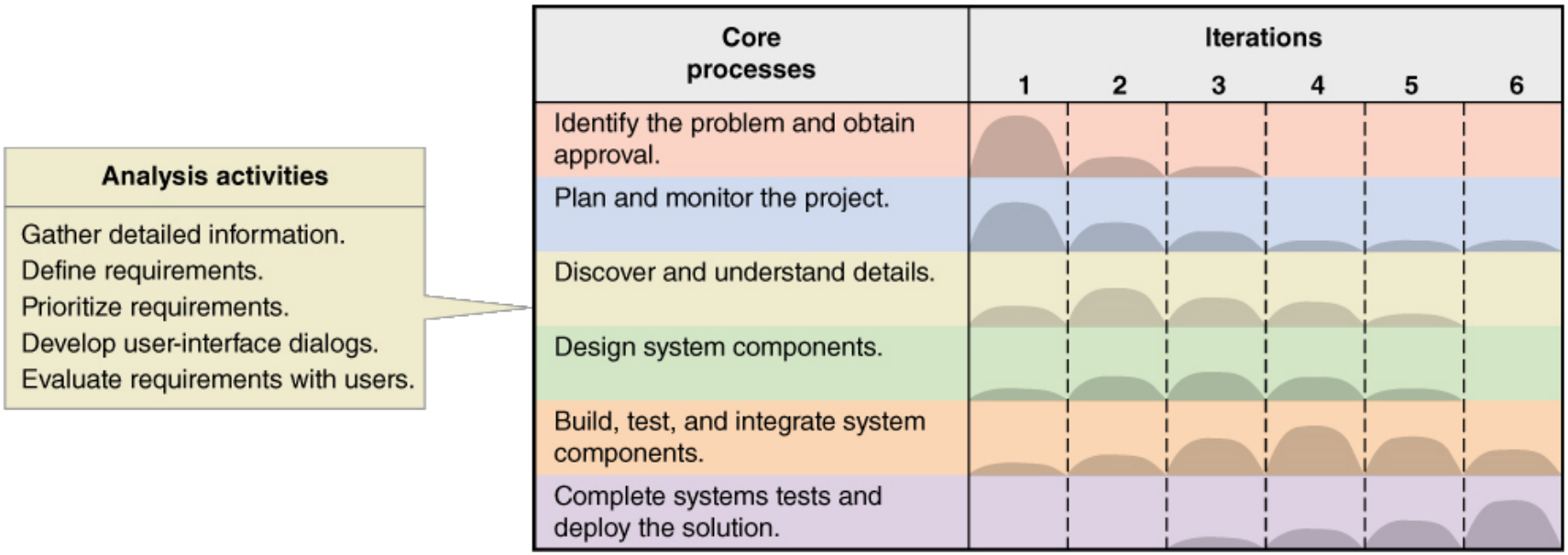
- The RMO Consolidated Sales and Marketing System Project
- Systems Analysis Activities
- What Are Requirements?
- Stakeholders
- Information-Gathering Techniques
- Models and Modeling
- Documenting Workflows with Activity Diagrams

Learning Objectives

- Describe the activities of systems analysis
- Explain the difference between functional and nonfunctional requirements
- Identify and understand different kinds of stakeholders and their contributions to requirements definition
- Describe information-gathering techniques and determine when each is best applied
- Describe the role of models in systems analysis

SDLC

- Six core processes



- Core 3: to Discover and understand the details of the problem or need-This core process also goes by the name systems analysis.

- Note :
  - Although we concentrate only on analysis activities in this lecture, keep in mind that they are usually intermixed with design, implementation, and other activities during the system development life cycle.
- Why do we study the activities of the Core process 3?
  - Planning?
    - Project planning involves planning, organizing, and scheduling the report the project
    - Gantt chart or net present value (NPV)

RMO Tradeshow

Ridgeline Mountain Outfitters (RMO)

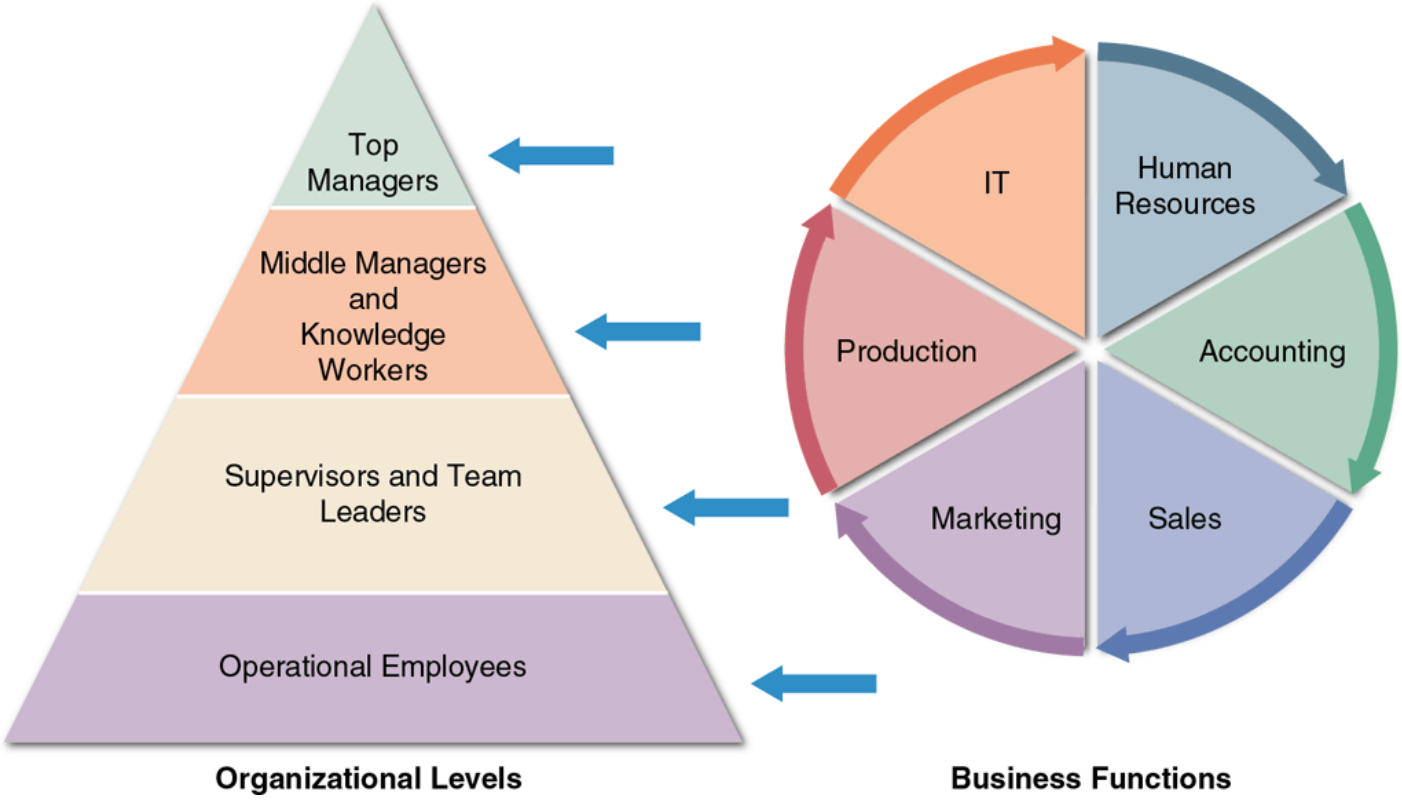
- RMO has an elaborate set of information systems that support operations and management
- Customer expectations, modern technological capabilities, and competitive pressures led RMO to believe it is time to upgrade support for sales and marketing
- A new Consolidated Sales and Marketing System is proposed
- This is a major project that grew out of the RMO strategic planning process


Supply Chain Management (SCM)
Consolidated Sales and Marketing System (CSMS)
Suppliers
Warehouses
Shipments
Shipments
Customers
BUY
BUY NOW
Orders
Online Sales
Orders
Shipments
Phone Sales
Buyers
Retail Sales
Trade Show System (TSS)
Retail Stores
Customers

Strategy

it is always a good idea to know whether a project fits the company's overall strategy.

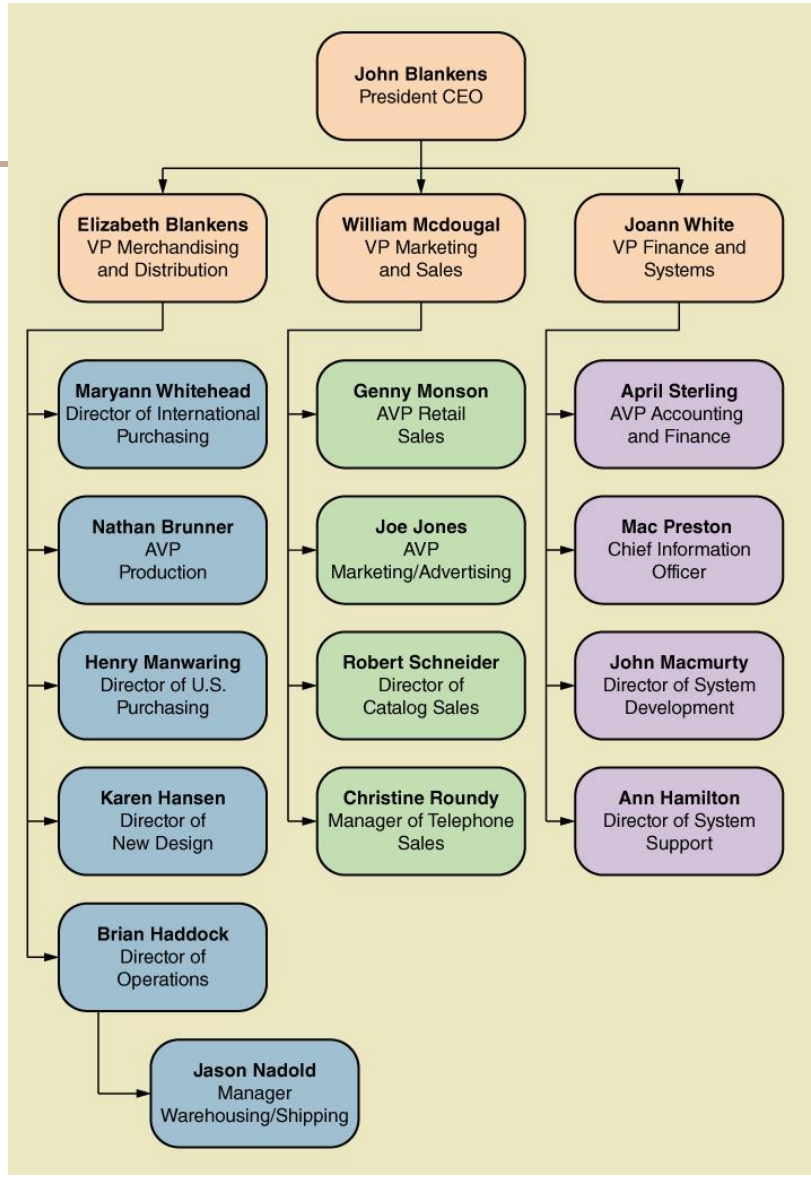
Strategic Plan



A typical organizational model identifies business functions and organizational levels.

A systems analyst must understand the company's organizational model to recognize who is responsible for specific processes and decisions and to be aware of what information is required by whom.

RMO Organization



- Top managers develop long-range plans, called **strategic plans**, which define the company's overall mission and goals.
- Strategic planning affects the company's future survival and growth, including long-term IT plans.
- Top managers focus on the overall business enterprise and use IT to set the company's course and direction.

RMO Information Systems Strategic Plan

- RMO's Information Systems Department has always been forward looking.
  - In past years, the department, in conjunction with corporate strategic plans, has developed five-year plans for development and deployment of new technology and information systems.
  - Aims to adopt new technology as soon as it became cost effective
    - In the tradeshow system, it was made possible by the availability of powerful and flexible handheld devices and the widespread availability of Wi-Fi and Internet connections.
    - keep its product line innovative and responsive to consumer demand
    - others

RMO Information Systems Architecure

- At present, RMO has a disparate collection of computers dispersed across home offices, retail stores, telephone centers, order fulfillment, shipping centers, and warehouses
  - everything connected by a complex set of local area networks (LANs), wide area networks (WANs), and virtual private networks (VPNs).
- ***Technology architecture***
  - the set of computing hardware, network hardware and topology, and system software employed by the organization
  - is consistent with its goal of adopting proven technology.
- ***Application architecture***
  - The set of the information systems that supports the organization (information systems, subsystems, and supporting technology)

- ***Technology architecture***
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  - is consistent with its goal of adopting proven technology.
- ***Application architecture***
  - The set of the information systems that supports the organization (information systems, subsystems, and supporting technology)
  - Each information system supports the work that needs to be carried out by the organization; the strategic plan includes what the information systems are and how the information systems are integrated together.

RMO Existing Application Architecture

- The major systems in RMO's application architecture consist of the following:
  - Supply Chain Management (SCM)
    - 5 years old; Java/Oracle
    - Tradeshow system will interface with SCM
  - Phone/Mail Order System
    - 12 years old; Visual Studio/MS SQL
    - Reached capacity;
  - Retail Store System
    - Older package solution; was upgraded eight years ago from overnight batch
  - Customer Support System (C S S)
    - Web based system; evolved over the years

Challenges and shortcomings

- All organizations—including RMO—face a difficult challenge keeping all their information systems current and effective.
  - development resources are limited
  - technology architecture and application architecture will include a mix of old and new
    - Older systems were often designed for outdated operational methods and typically lack modern technologies and features that some competitors have adopted
- Shortcoming
  - Treating phone, Web, and retail sales as separate systems rather than as an integrated whole
  - Employing outdated Web-based storefront technology
  - Not supporting modern technologies and customer interaction modes, including mobile computing devices and social networking

Proposed Application Architecture: Integrate SCM and New CSMS

New Consolidated Sales and Marketing System (CSMS)

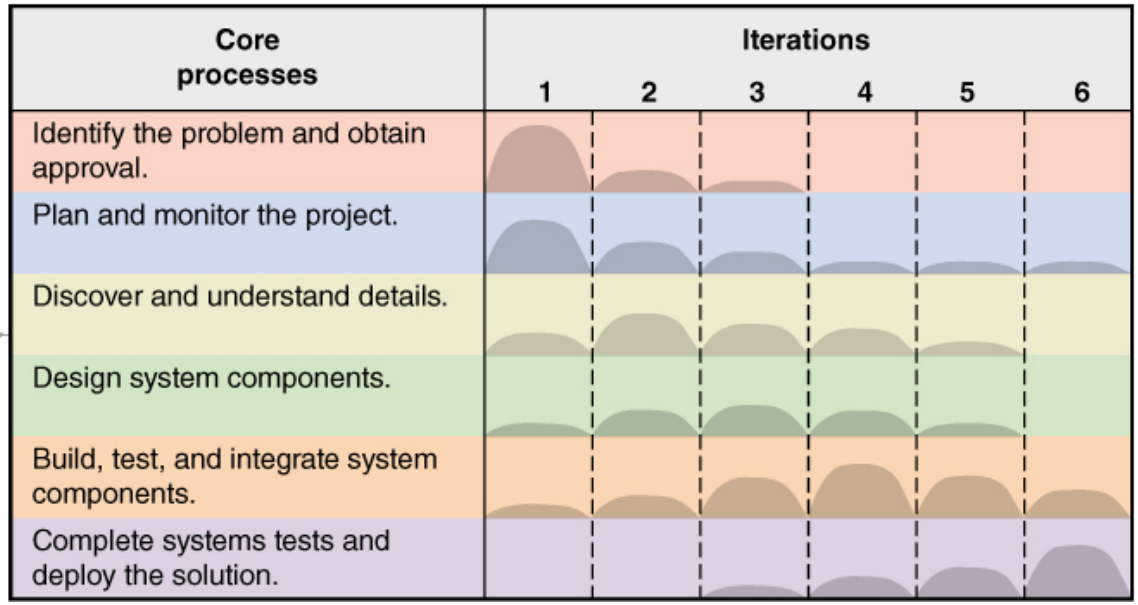
- Sales Subsystem
  - Integrates online, phone, and retail stores
- Order Fulfillment Subsystem
  - Track shipments, rate products and services
- Customer Account Subsystem
  - Shopping history, linkups, “mountain bucks” rewards
- Marketing Subsystem
  - Promotional packages, partner relationships, more complete merchandise information and reporting

Systems Analysis Activities (1 of 2)

- The New Consolidated Sales and Marketing System (CSMS) will
  - require discovering and understanding extensive and complex business processes and business rules
- Assuming the project has been proposed, approved, and planned,
  - we will describe activities associated with the next step in the development process: systems analysis (SDLC Core Process 3).
  - Project planning and project management are covered I detail later in our course

Systems Analysis Activities (1 of 2)

Analysis activities
Gather detailed information.
Define requirements.
Prioritize requirements.
Develop user-interface dialogs.
Evaluate requirements with users.



Systems Analysis Activities (2 of 2)

- The activities are as follows:
  - Gather Detailed Information
    - Interviews, questionnaires, documents, observing business processes, researching vendors, comments and suggestions
    - Users, employees, managers, customers, documents
  - Define Requirements
    - Modeling functional requirements and non-functional requirements
  - Prioritize Requirements
    - Essential, important, vs. nice to have
  - Develop User-Interface Dialogs
    - Flow of interaction between user and system
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Information Gathering Techniques

- Interviewing users and other stakeholders
- Distributing and collecting questionnaires
- Reviewing inputs, outputs, and documentation
- Observing and documenting business procedures
- Researching vendor solutions
- Collecting active user comments and suggestions

Stakeholders: Who do you involve and talk to?

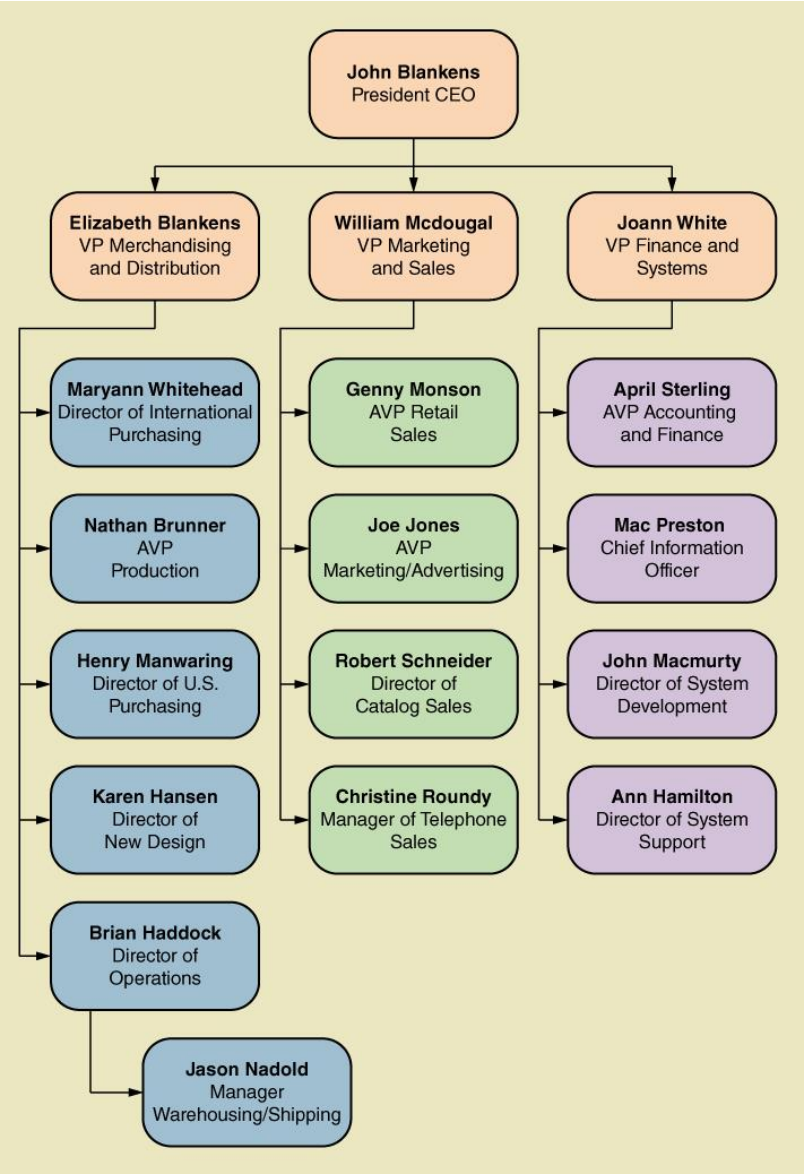
- **Stakeholders**– persons who have an interest in the successful implementation of the system
  - **Internal Stakeholders**– persons within the organization
  - **External stakeholders** – persons outside the organization
  - **Operational stakeholders** – persons who regularly interact with the system
  - **Executive stakeholders**– persons who don't directly interact, but use the information or have financial interest

Stakeholders of a comprehensive accounting system for public company

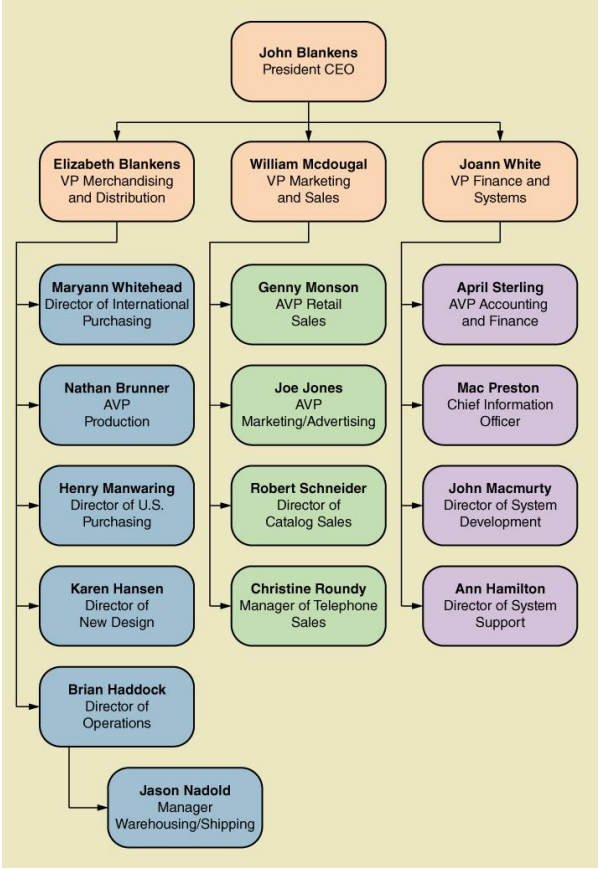
Stakeholders For RMO CSMS Project

- Phone/mail sales order clerks
- Warehouse and shipping personnel
- Marketing personnel who maintain online catalog information
- Marketing, sales, accounting, and financial managers
- Senior executives
- Customers
- External shippers (e.g., UPS and FedEx)

RMO Internal Stakeholders



	Operational	Executive
Internal		
External		



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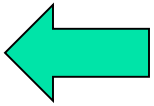
- Interviewing users and other stakeholders 
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Interviewing Users and Other Stakeholders

- Prepare detailed questions
- Meet with individuals or groups of users
- Obtain and discuss answers to the questions
- Document the answers
- Follow up as needed in future meetings or interviews

Themes for Information Gathering Questions

Theme	Questions to users
What are the business operations and processes?	What do you do?
How should those operations be performed?	How do you do it? What steps do you follow? How could they be done differently?
What information is needed to perform those operations?	What information do you use? What inputs do you use? What outputs do you produce?

Preparing for the Interview (1 of 2)

Before

- Establish the objective for the interview.
- Determine correct user(s) to be involved.
- Determine project team members to participate.
- Build a list of questions and issues to be discussed.
- Review related documents and materials.
- Set the time and location.
- Inform all participants of objective, time, and locations.

During

- Arrive on time.
- Look for exception and error conditions.
- Probe for details.
- Take thorough notes.
- Identify and document unanswered items or open questions.

Preparing for the Interview (2 of 2)

After

- Review notes for accuracy, completeness, and understanding.
- Transfer information to appropriate models and documents.
- Identify areas needing further clarification.
- Thank the participants.
- Follow up on open and unanswered questions.

Checklist for Conducting an Interview

Before

- ☐ Establish the objective for the interview.
- ☐ Determine correct user(s) to be involved.
- ☐ Determine project team members to participate.
- ☐ Build a list of questions and issues to be discussed.
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- ☐ Review notes for accuracy, completeness, and understanding.
- ☐ Transfer information to appropriate models and documents.
- ☐ Identify areas needing further clarification.
- ☐ Thank the participants.
- ☐ Follow up on open and unanswered questions.

Interview Session Agenda (1 of 2)

Setting

- Objective of Interview

  Determine processing rules for sales commission rates

- Date, Time, and Location

  April 21, 2016, at 9:00 a.m. in William McDougal's office

- User Participants (names and titles/positions)

  William McDougal, vice president of marketing and sales, and several of his staff

- Project Team Participants

  Mary Ellen Green and Jim Williams

Interview Session Agenda (2 of 2)

Interview/Discussion

1. *Who is eligible for sales commissions?*
2. *What is the basis for commissions? What rates are paid?*
3. *How is commission for returns handled?*
4. *Are there special incentives? Contests? Programs based on time?*
5. *Is there a variable scale for commissions? Are there quotas?*
6. *What are the exceptions?*

Follow-Up

- Important decisions or answers to questions

  See attached write-up on commission policies

- Open items not resolved with assignments for solution

  See Item numbers 2 and 3 on open items list

- Date and time of next meeting or follow-up session

  April 28, 2016, at 9:00 a.m.

Discussion and Interview Agenda

Setting

Objective of Interview
Determine processing rules for sales commission rates

Date,Time, and Location
April 21, 2016, at 9:00 a.m. in William McDougal's office

User Participants (names and titles/positions)
William McDougal, vice president of marketing and sales, and several of his staff

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Interview/Discussion

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Follow-Up

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See attached write-up on commission policies

Open items not resolved with assignments for solution
See Item numbers 2 and 3 on open items list

Date and time of next meeting or follow-up session
April 28, 2016, at 9:00 a.m.

Keeping an Open Items List

ID	Issue title	Date identified	Target end date	Responsible project person	User contact	Comments
1	Partial shipments	6-12-2016	7-15-2016	Jim Williams	Jason Nadold	Ship partials or wait for full shipment?
2	Returns and commissions	7-01-2016	9-01-2016	Jim Williams	William McDougal	Are commissions recouped on returns?
3	Extra commissions	7-01-2016	8-01-2016	Mary Ellen Green	William McDougal	How to handle commissions on special promotions?

Information Gathering Techniques

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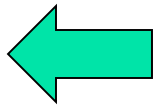
- Distributing and collecting questionnaires 
- Reviewing inputs, outputs, and documentation
- Observing and documenting business procedures
- Researching vendor solutions
- Collecting active user comments and suggestions

Distribute and Collect Questionnaires

RMO Questionnaire

This questionnaire is being sent to all telephone-order sales personnel. As you know, RMO is developing a new customer support system for order taking and customer service.

The purpose of this questionnaire is to obtain preliminary information to assist in defining the requirements for the new system. Follow-up discussions will be held to permit everybody to elaborate on the system requirements.

Part I. Answer these questions based on a typical four-hour shift.

1. How many phone calls do you receive?_____
2. How many phone calls are necessary to place an order for a product?_____
3. How many phone calls are for information about RMO products, that is, questions only?_____
4. Estimate how many times during a shift customers request items that are out of stock._____
5. Of those out-of-stock requests, what percentage of the time does the customer desire to put the item on back order?_____%
6. How many times does a customer try to order from an expired catalog?_____
7. How many times does a customer cancel an order in the middle of the conversation?_____
8. How many times does an order get denied due to bad credit?_____

Part II. Circle the appropriate number on the scale from 1 to 7 based on how strongly you agree or disagree with the statement.

Question	Strongly Agree						Strongly Disagree
It would help me do my job better to have longer descriptions of products available while talking to a customer.	1	2	3	4	5	6	7
It would help me do my job better if I had the past purchase history of the customer available.	1	2	3	4	5	6	7
I could provide better service to the customer if I had information about accessories that were appropriate for the items ordered.	1	2	3	4	5	6	7
The computer response time is slow and causes difficulties in responding to customer requests.	1	2	3	4	5	6	7

Part III. Please enter your opinions and comments.

Please briefly identify the problems with the current system that you would like to see resolved in a new system.

_____
_____
_____

- **Question Types**
  - Questions can be roughly divided into two types:
    - **open-ended questions**—such as “How do you do this function?”—encourage discussion and explanation.
    - **closed-ended questions**—such as “How many forms a day do you process?”— are used to get specific facts.

Information Gathering Techniques

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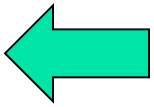
- Reviewing inputs, outputs, and documentation 
- Observing and documenting business procedures
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Review Inputs, Outputs, and Procedures

- There are two sources of information about inputs, outputs, and procedures.
  - One source is external to the organization—industry-wide professional organizations and other companies.
    - It may not be easy to obtain information from other companies, but they are a potential source of important information.
    - Sometimes, industry journals and magazines report the findings of “best practices” studies.
  - Second source---existing business documents and procedure descriptions within the organization
    - it is a good way to get a preliminary understanding of the processes
    - existing inputs, outputs, and documents can serve as visual aids for the interview and as the working documents for discussion

Ridgeline Mountain Outfitters—Customer Order Form

Name and address of person placing order.
(Please verify your mailing address and make correction below.)
Order Date ___/___/___

Name

Address Apt. No

City State Zip

Phone: Day ( ) Evening ( )

Gift Order or Ship To: (Use only if different from address at left.)

Name

Address Apt. No

City State Zip

Gift ☐ Address for this Shipment Only ☐ Permanent Change of Address ☐

Gift Card Message

Delivery Phone ( )

Item No.	Description	Style	Color	Size	Sleeve Length	Qty	Monogram	Style	Price Each	Total

MERCHANDISE TOTAL

Regular FedEx shipping $4.50 per U.S. delivery address
(Items are sent within 24 hours for delivery in 2 to 4 days)

Please add $4.50 per each additional U.S. delivery address

FedEx Standard Overnight Service

Any additional freight charges

International Shipping (see shipping information on back)

Method of Payment

Check/Money Order ☐ Gift Certificate(s) ☐ AMOUNT ENCLOSED $ ____

American Express ☐ MasterCard ☐ VISA ☐ Other ☐

Account Number

MO YR
___/___
Expiration Date

Signature

Information Gathering Techniques

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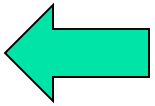
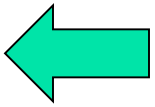
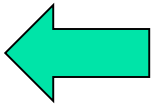
- Observing and documenting business procedures 
- Researching vendor solutions 
- Collecting active user comments and suggestions 

Additional Techniques

- Observe and Document Business Processes
  - Watch and learn
  - Document with Activity diagram (next section)
- Research Vendor Solutions
  - See what others have done for similar situations
  - White papers, vendor literature, competitors
- Collect Active User Comments and Suggestions
  - Feedback on models and tests
  - Users know it when the see it

Systems Analysis Activities (2 of 2)

- The activities are as follows:
  - Gather Detailed Information
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  - Define Requirements
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Recap

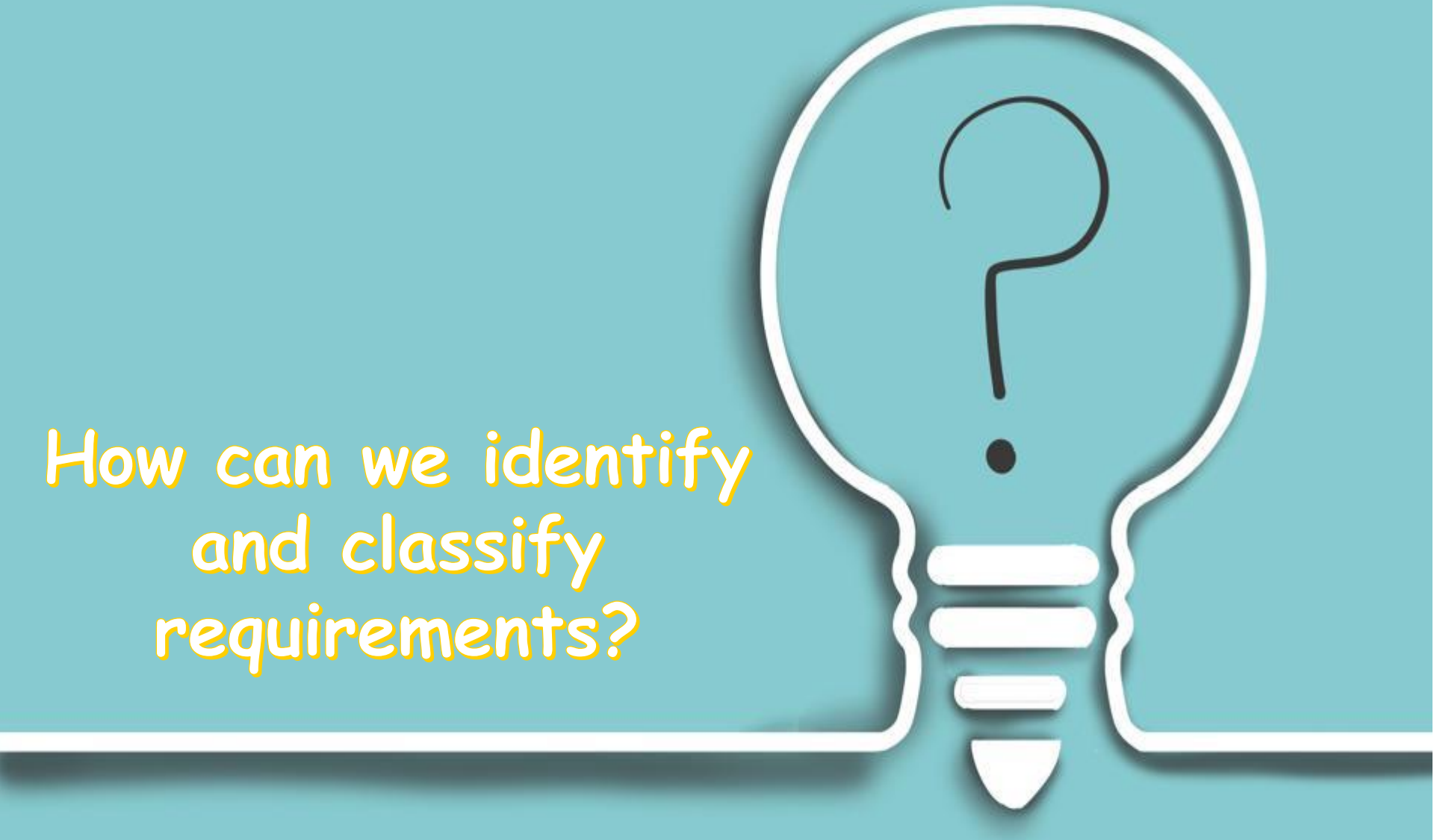
Analysis activities
Gather detailed information.
Define requirements.
Prioritize requirements.
Develop user-interface dialogs.
Evaluate requirements with users.

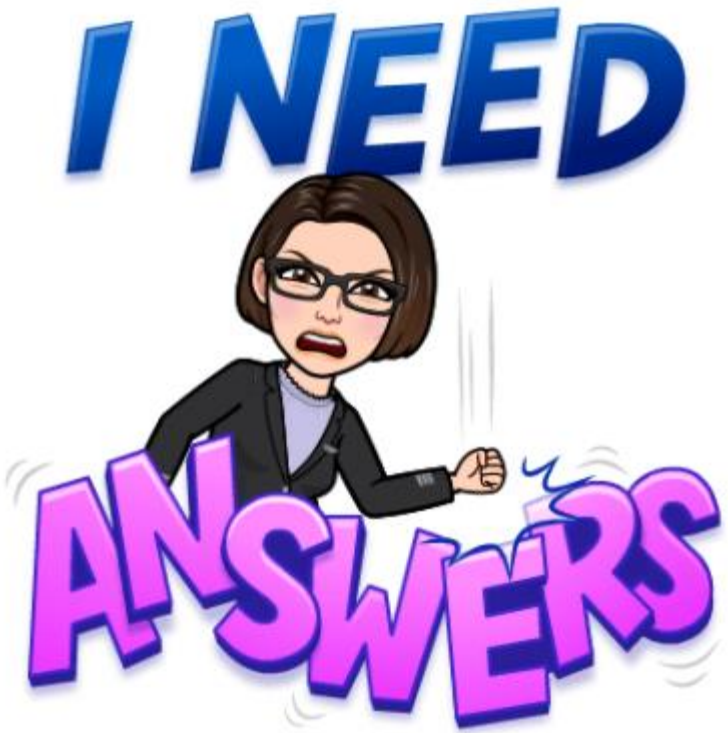
Core processes	Iterations 1	2	3	4	5	6
Identify the problem and obtain approval.						
Plan and monitor the project.						
Discover and understand details.						
Design system components.						
Build, test, and integrate system components.						
Complete systems tests and deploy the solution.						

What Are Requirements?

- System Requirements
  - Functional requirements-the activities the system must perform
    - Business uses, functions the users carry out
      - if you are developing a payroll system, the required business uses might include such functions as “generate electronic fund transfers,” “calculate commission amounts,” “calculate payroll taxes,” “maintain employee-dependent information,” and “report tax deductions to the IRS.”
      - In RMO, “Air shipping charges are reduced by 50 percent for orders over $200 that weigh less than two pounds.”
  - Non-Functional Requirements–system characteristics other than functional requirements
    - Constraints and performance goals

How can we identify and classify requirements?




I NEED
ANSWERS

How can we identify and classify requirements?

FURPS/FURPS+

FURPS+ Requirements Acronym (1 of 2)

- Functional requirements
- Usability requirements
- Reliability requirements
- Performance requirements
- Security requirements
- + even more categories…

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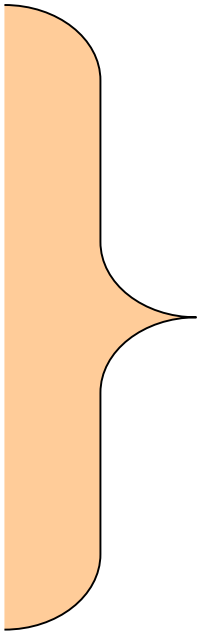

Nonfunctional requirements

FURPS+ Requirements Acronym (1 of 2)

Requirement categories	FURPS categories	Example requirements
Functional	Functions	Business rules and processes
Nonfunctional	Usability Reliability Performance Security	User interface, ease of use Failure rate, recovery methods Response time, throughput Access controls, encryption

FURPS+

- **Usability requirements** describe operational characteristics related to users
  - User interface for a smartshop app with gesture control
    - Two-figure slides, pinching, and expanding
    - Menu format, color schemes, use of the organization's logo, and multilanguage support.
- **Reliability requirements** describe the dependability of a system
  - Service outages, incorrect processing, failure rate, recovery methods

- **Performance requirements** describe operational characteristics related to measures of workload, such as throughput and response time.
  - Server might need to support 100 simultaneous client sessions
  - Client needs to have a .5 second response time to all button presses
- **Security requirements** describe how access to the application will be controlled and how data will be protected during storage and transmission.
  - password protected, encrypt locally stored data with 1024-bit keys, and use secure HTTP for communication among client and server nodes.

Additional Requirements Categories

- Design constraints
  - Specific restrictions for hardware and software
- Implementation requirements
  - Specific languages, tools, protocols, etc.
- Interface requirements
  - Interface links to other systems
- Physical requirements
  - Physical facilities and equipment constraints
- Supportability requirements
  - Installation, automatic updates and enhancement methods

FURPS+

Recap

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Build, test, and integrate system components.						
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Models and Modeling

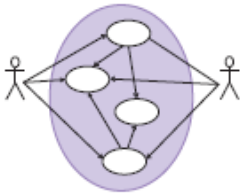
- How do we define requirements?
  - After collecting information, create models
- Model– a representation of some aspect of the system being built
- Types of Models
  - Textual model– something written down, described
    - memos, reports, narratives, and lists to describe requirements
  - Graphical models– diagram, schematic
    - make it easier to understand complex relationships that are difficult to follow when described as a list or narrative.
  - Mathematical models– formulas, statistics, algorithms

- Many graphical models used in system development are drawn according to the notation specified by the Unified Modeling Language (UML).
- Unified Modeling Language (UML)
  - Standard graphical modeling symbols/terminology used for information systems
- UML symbols and notations are defined by the Object Management Group (OMG), a standards organization for system development.

Some Analysis and Design Models

1 buy new car
2 sell car
3 get car serviced
4 make payment
5 trade in car

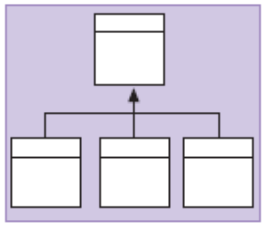
Event list



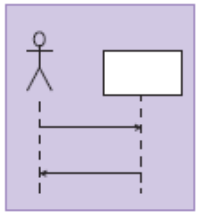
Use case diagram

Use case description

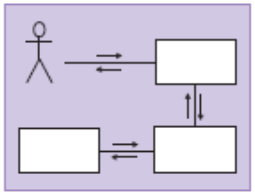
Location diagram



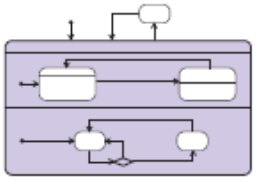
Class diagram



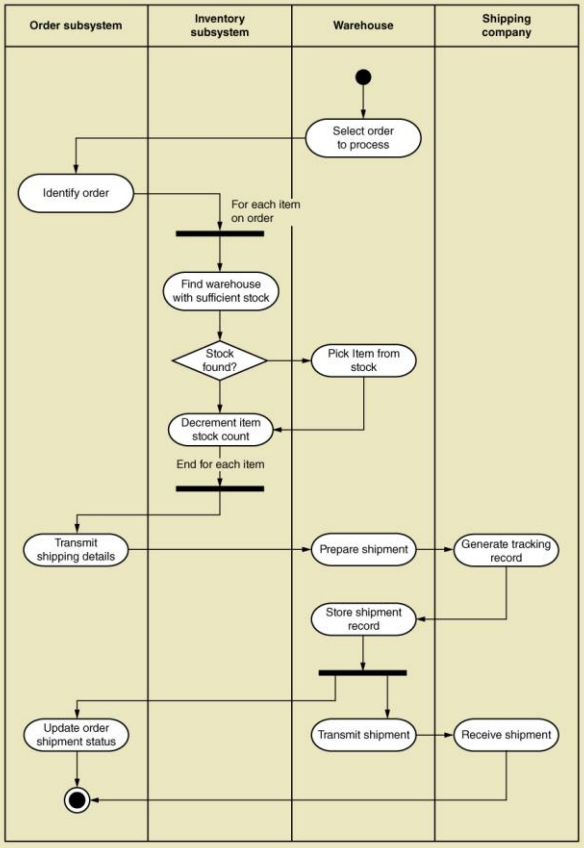
Sequence diagram



Communication diagram



State machine diagram



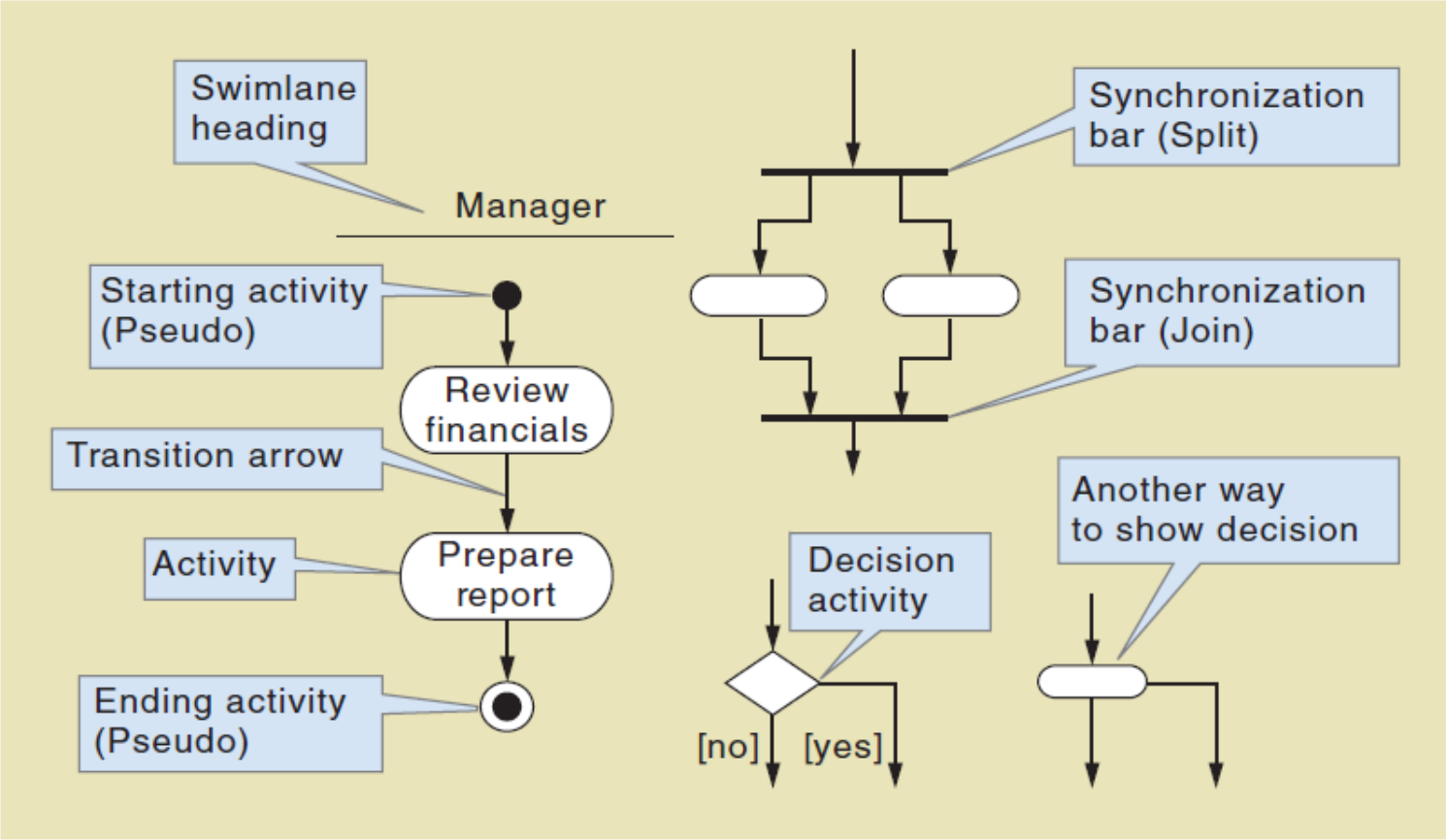
Reasons for Modeling

- Learning from the modeling process
- Reducing complexity by abstraction
- Remembering all the details
- Communicating with other development team members
- Communicating with a variety of users and stakeholders
- Documenting what was done for future maintenance/enhancement

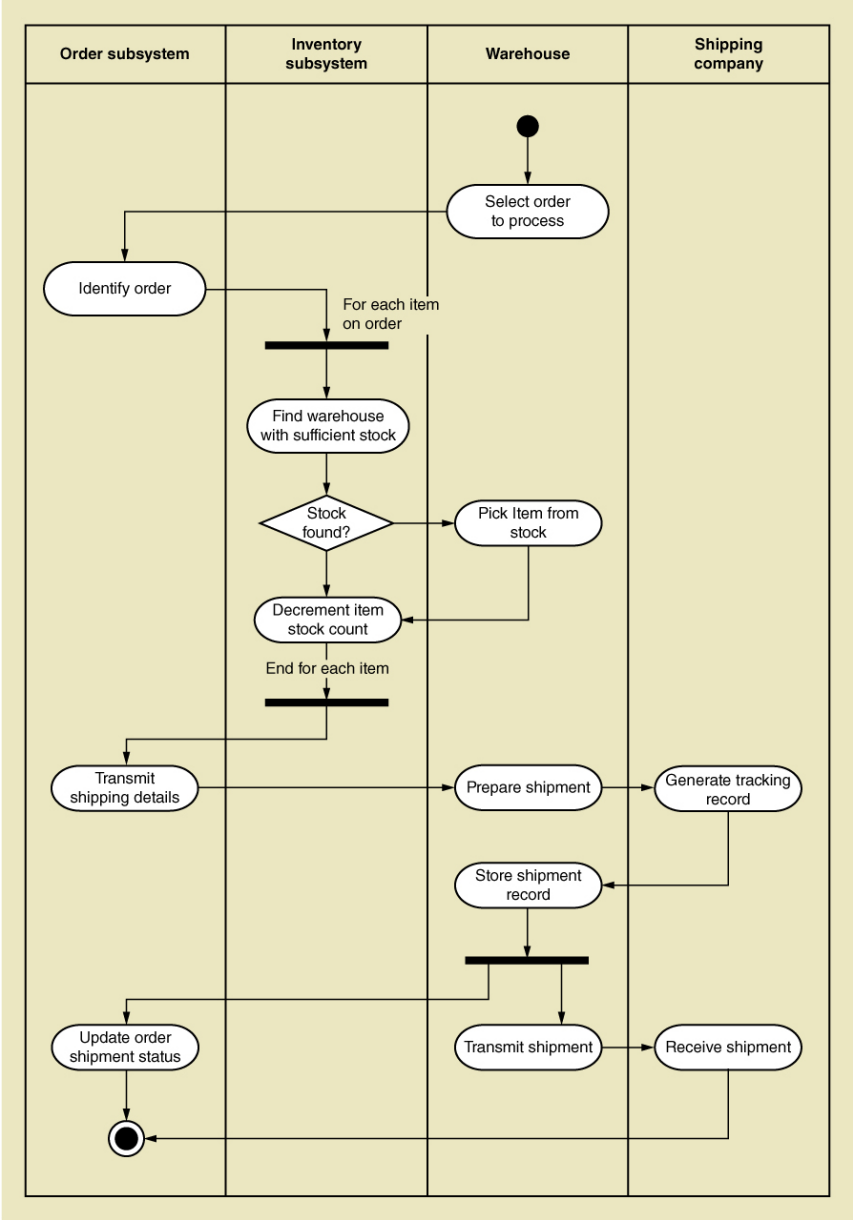
Documenting Workflows with Activity Diagrams

- **Workflow**– sequence of processing steps that completely handles one business transaction or customer request
- **Activity Diagram**– describes user (or system) activities, the person who does each activity, and the sequential flow of these activities
  - Useful for showing a graphical model of a workflow
  - A UML diagram

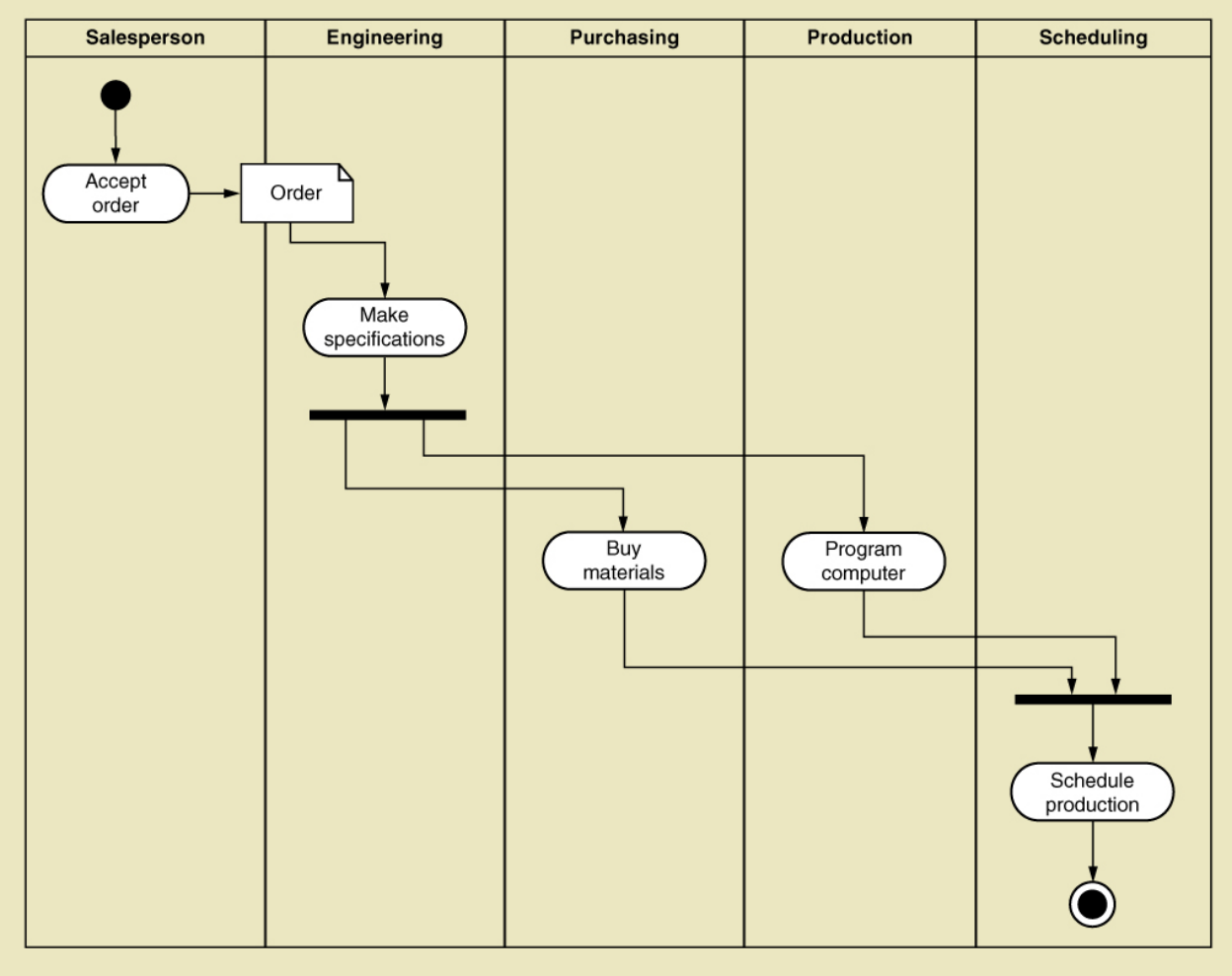
Activity Diagrams Symbols



Activity Diagram for RMO Order Fulfillment



Activity Diagram with Concurrent Paths



Recap

Analysis activities
Gather detailed information.
Define requirements.
Prioritize requirements.
Develop user-interface dialogs.
Evaluate requirements with users.

Core processes	Iterations 1	2	3	4	5	6
Identify the problem and obtain approval.						
Plan and monitor the project.						
Discover and understand details.						
Design system components.						
Build, test, and integrate system components.						
Complete systems tests and deploy the solution.						

Systems Analysis Activities (2 of 2)

- The activities are as follows:
  - Gather Detailed Information
    - Interviews, questionnaires, documents, observing business processes, researching vendors, comments and suggestions
    - Users, employees, managers, customers, documents
  - Define Requirements
    - Modeling functional requirements and non-functional requirements
  - Prioritize Requirements
    - Essential, important, vs. nice to have
  - Develop User-Interface Dialogs
    - Flow of interaction between user and system
  - Evaluate Requirements with Users
    - User involvement, feedback, adapt to changes

- Prioritize Requirements
  - Once the system requirements are well understood, it is important to establish which requirements are most crucial for the system. Sometime, extra system functions or resources are desired, but are not essential.
    - Functions can be truly important, fairly important but not absolutely required
    - The analyst needs to justify the scope of system and prioritize requirements
- Develop User-Interface Dialogs
  - In some cases, a new system may replace the old system that does similar work
  - In other cases, the new system breaks new ground by automating functions from the old system
  - In either case, users tend to be uncertain of many aspects of system requirements.
  - Comparing to diagrams like use cases, activity diagrams and interaction diagrams, user-interface dialog is much similar and more reliable because the user can see and feel the system directly.
- Evaluate Requirements with Users

Summary (1 of 4)

- Systems analysis activates correspond to the core SDLC process *Discover and understand details*
- System projects originate from the information system strategic plan, which contains a technology architecture plan and an application architecture plan
- The RMO CSMS Project will be used throughout the text as an example of analysis and design

Summary (2 of 4)

- Systems analysis involves defining system requirements– functional and non-functional
- Analysis activities include
  - Gather detailed information
  - Define requirements
  - Prioritize requirements
  - Develop user-interface dialogs
  - Evaluate requirements with users
- FURPS+ is the acronym for functional, usability, reliability, performance, and security requirements

Summary (3 of 4)

- Stakeholders are the people who have an interest in the success of the project
- There are internal vs. external stakeholders and operational vs. executive stakeholders

Summary (4 of 4)

- Information gathering techniques are used to collect information about the project
  - Interviews, questionnaires, reviewing documents, observing business processes, researching vendors, comments and suggestions
- The UML Activity Diagram is used to document (model) workflows after collecting information
- Models and modeling are used to explore and document requirements
- Unified Modeling Language (UML) is the standard set of notations and terminology for information systems models


Ethics

A question of ethics

- "Better blow the whistle," says Roy, your friend and project teammate at Final Four Industries. "The project is out of control, and you know it!" "Maybe so," you respond, "But that's not my call—I'm not the project manager." What you do not say is that Stephanie, the project manager, feels like her career is on the line and she is reluctant to bring bad news to management at this time. She honestly believes that the project can catch up, and says that a bad report on a major project could result in bad publicity for the firm and frighten potential customers.

- To be fair, the next management progress report is scheduled in three weeks. It is possible that the team could catch up, but you doubt it. You wonder if there is an ethical question here: Even though the report is not due yet, should a significant problem be reported to management as soon as possible? You are concerned about the issue, and you decide to discuss it with Stephanie. What will you say to her?