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CSI6207
Systems Analysis and Database Design

Requirements Modeling and Use Cases

Systems Analysis and Design in a Changing World, 7th Edition

Learning objectives

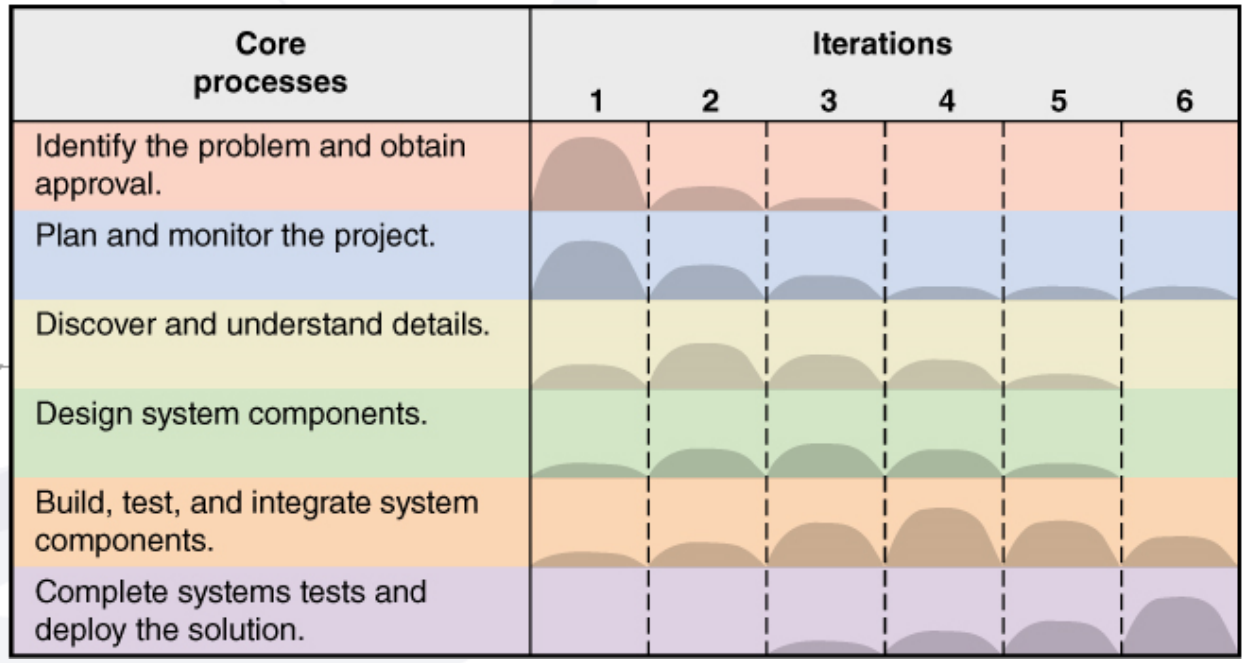
- Describe the activities of systems analysis
- Explain the difference between functional and nonfunctional requirements
- Identify and understand different kinds of stakeholders and their contributions to requirements definition
- Describe the basic kinds of process modelling including User Stories and Use Cases

Systems Analysis Activities

Involve discovery and understanding

(Systems Analysis and Design in a Changing World, ©2016. Cengage Learning)

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



Systems Analysis Activities

- Gather Detailed Information
  - Interviews, questionnaires, documents, observing business processes, researching vendors, comments and suggestions
- 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

Functional and non-functional req.

Plain Old Telephone System

- Feature:
  - Call subscriber
- Architecture:
- Good qualities

Same feature

Skype

- Feature:
  - Call subscriber
- Architecture:
- Good qualities

- http://georgefairbanks.com/assets/pdf/Intro-to-SA-CUBoulder-2012-09-18.pdf

https://www.youtube.com/watch?v=x30DcBfCJRI

Architects pay more attention to **qualities** that arise from architecture choices.

What are Requirements?

- System Requirements =Functional requirements +
  - Non-functional requirements
- Functional Requirements– the activities the system must perform
  - Business uses, functions the users carry out
  - Shown as use cases in Chapter 1

How to write FR:

- ***Try to write what is to be done, not how to do it, so:***

"The student can select a unit" not: "The student clicks the OK button to choose a unit"

- ***One way to write requirements is to use a template sentence structure that captures the following elements:***
  - ***the user***
  - ***the capability***
  - ***the object***
  - ***the (optional) qualifier***

Example: The warehouse manager (user) must be able to create (capability) an incoming stock record (object) anytime within standard business hours (qualifier)

What are Requirements?...

- Non-Functional Requirements– other system characteristics
  - Constraints and performance goals

- NFRs are often constraints such as:
  - Environment e.g. Hardware/Software
  - Availability
  - Quality
  - Security
  - Performance criteria
  - Conformance to standards

FURPS Framework

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

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
  - Automatic updates and enhancement methods

Exercise

- Determine following sentences whether FR, NFR, Something else (SE)
  - The system must send an email whenever an order is placed
  - The vehicle tracking system must measure the vehicle speed with a precision of ±0.1 m/sec
  - When placing a new order, the system shall display the total cost and require confirmation from the user
  - The system will be responsive to the user
  - The system will conform to ISO27799

Stakeholders

Who do you involve and talk to?

Stakeholders…

- **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…

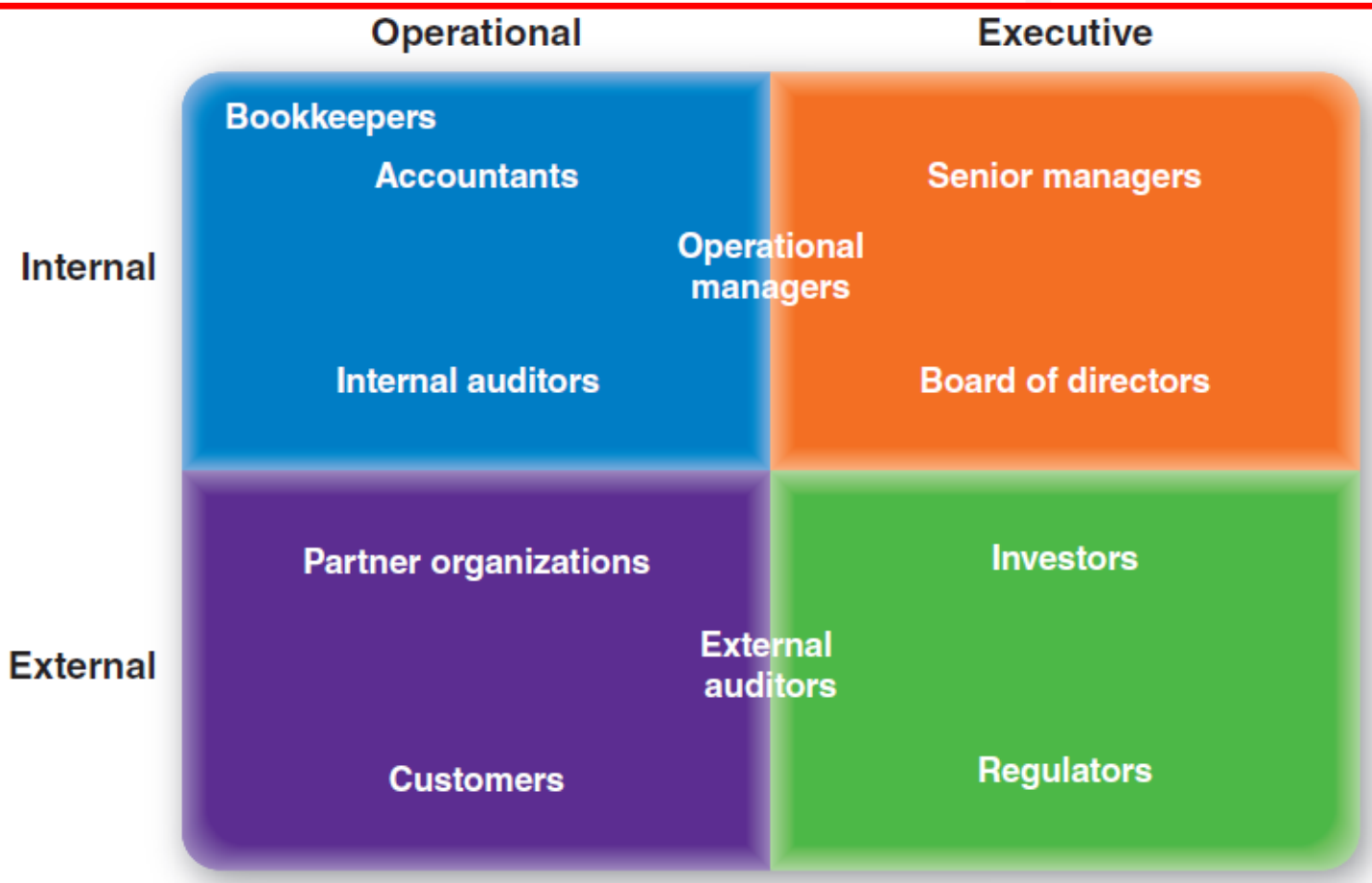


Fig. Stakeholders of a comprehensive accounting system for public company

Information Gathering Techniques

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

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Interviewing

Interviewing Users and Other Stakeholders

1. Prepare detailed questions
2. Meet with individuals or groups of users
3. Obtain and discuss answers to the questions
4. Document the answers
5. 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

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.
- ❑ 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.

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.

Interview Session Agenda

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

Project Team Participants
Mary Ellen Green and Jim Williams

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.

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 com-missions on special promotions?

RMO Case Study

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 was proposed
- This is a major project that grew out of the RMO strategic planning process

RMO Information Systems Strategic Plan

- **Technology architecture**— the set of computing hardware, network hardware and topology, and system software employed by the organization
- **Application architecture**—the information systems that supports the organization (information systems, subsystems, and supporting technology)

RMO Existing Application Architecture

- 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; minimal integration
- Retail Store System
  - Older package solution; minimal integration
- Customer Support System (CSS)
  - Web based system; evolved over the years, minimal integration

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Proposed Application Architecture: Integrate SCM and New CSMS

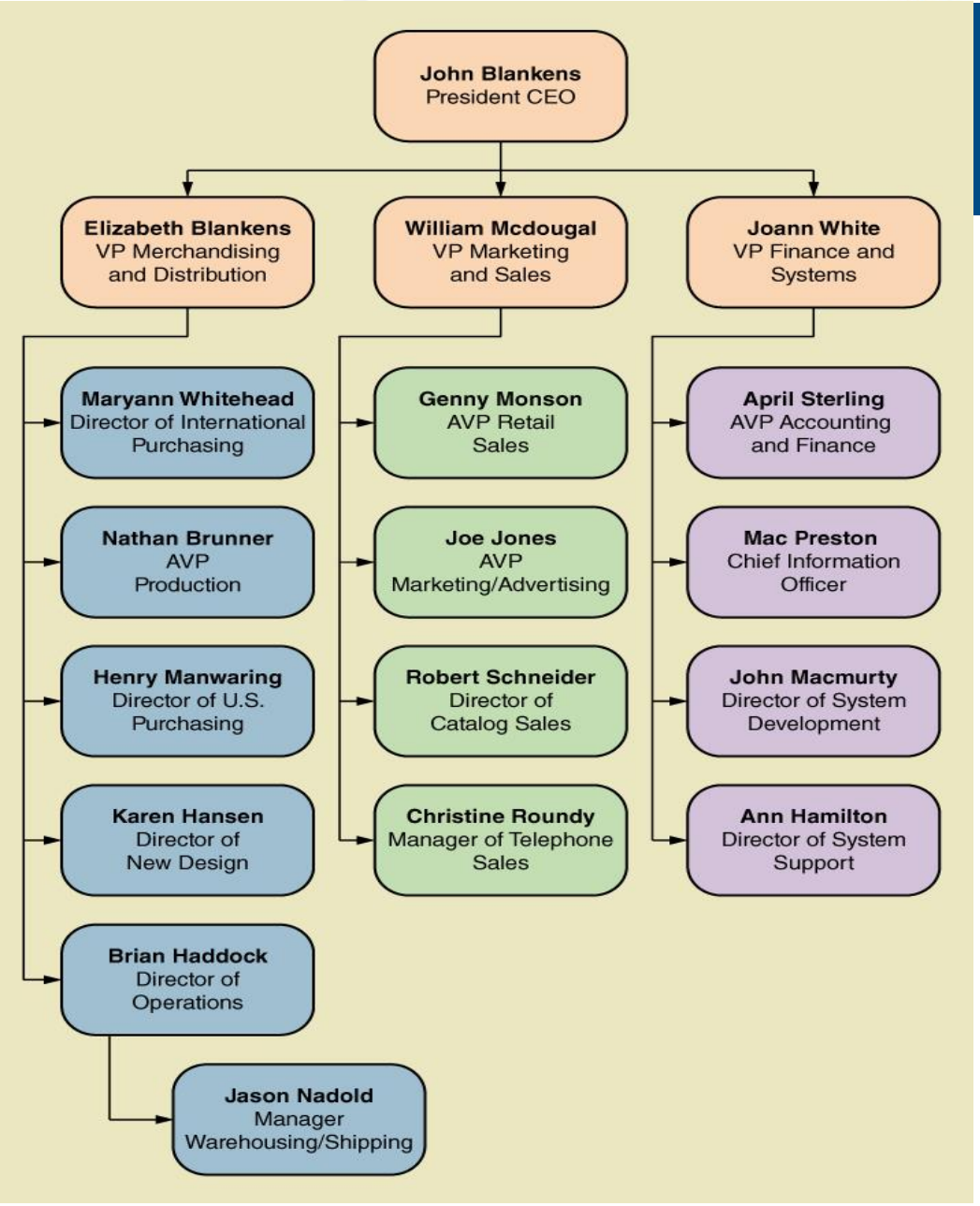
New Consolidated Sales and Marketing System (CSMS)

- 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

RMO CSMS Stakeholders

- 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



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.

_____
_____
_____

Review Inputs, Outputs, and Procedures

Ridgeline Mountain Outfitters—Customer Order Form

RIDGELINE MOUNTAIN OUTFITTERS

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

Method of Payment

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

American Express ☐ MasterCard ☐ VISA ☐ Other ☐

Account Number

MO YR
___/___
Expiration Date

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)

Signature

Summary

- Systems analysis activates correspond to the core SDLC process *Discover and understand details*
- System projects originate from the information system strategic plan, which contains an technology architecture plan and an application architecture plan

User Stories

User Stories

- A user story is a one-sentence description of a work-related task done by a user to achieve some goal or result
- Acceptance Criteria identify the features that must be present at the completion of the task

- The template for a user story description is: “As a <role> I want to <goal> so that <benefit>”

Example

User Story

As a shipping clerk I want to be able to ship an order as accurately as possible as soon as the order details are available so that the order is shipped quickly and accurately.

Example

Acceptance Criteria

1. Pop up available order details on the screen when available
2. Use portable display and scan device to cut time in half
3. Sort the items by bin location
4. Indicate number of items in stock for each item and mark backorder for those not available
5. Recommend shipper based on weight, size and location
6. Print out shipping label for selected shipper

Use Cases

Use Cases

- Use case— an activity that the system performs, usually in response to a request by a user
- Use cases define functional requirements
- Analysts decompose the system into a set of use cases (functional decomposition)
- Typically a use case is performed during ***one session in one location by one actor*** (unless manual in which case sometimes two or more actors)

– For example, withdrawing cash from an ATM

Use Cases vs User Stories

- Both Use Cases and User Stories identify users and describe goals.
- User Stories are more focused on the outcomes and purpose of a functional requirement.
- Use Cases are more focused on the specific process and how those outcomes can be achieved.

Use Cases vs User Stories

- User stories deliberately leave out some specific details to allow for more flexibility in implementation.
- User stories are designed to be a part of an ongoing conversation with stakeholders and not as a complete specification of the requirement.
- Use cases are used to describe the specific step-by-step process a user takes when interacting with the system.

Naming use cases

(Wirfs-Brock and Schwartz, 2001, p25)

- Each use case is usually named using a "verb-noun" format.
- Use concrete, "strong" verbs and nouns instead of generalised, weaker ones. Weak words may indicate uncertainty.
  - Strong verbs: create, merge, calculate, migrate, receive, archive, register, activate
  - Weaker verbs: make, report, use, copy, organise, record, find, process, maintain, list
  - Strong nouns: property, payment, transcript, account
  - Weaker nouns: data, paper, system, form

Brief Use Case Descriptions

- Brief use case descriptions are often a one sentence description showing the main steps in a use case.

Use case	Brief use case description
Create customer account	User/actor enters new customer account data, and the system assigns account number, creates a customer record, and creates an account record.
Look up customer	User/actor enters customer account number, and the system retrieves and displays customer and account data.
Process account adjustment	User/actor enters order number, and the system retrieves customer and order data; actor enters adjustment amount, and the system creates a transaction record for the adjustment.

Brief Use Case Descriptions

- Use cases need to be highly cohesive and lowly coupled from other use cases.
- – **Cohesion** is defined as the measure of the strength of association between activities within (in this case) a business process.
- – **Coupling** is the degree of interdependence between two (in this case) business processes.

Use Case Descriptions and Diagrams

In the next lecture we will show you how to create more detailed use case descriptions and draw diagrams to show the relationships between use cases.

Summary

- 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

- 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
- Information gathering techniques are used to collect information about the project
  - Interviews, questionnaires, reviewing documents, observing business processes, researching vendors, comments and suggestions

Summary

- User stories and use cases are part of the modelling of functional requirements
- Use cases identify the processes and activities the system carries out usually in response to a user request
- User stories identify a work-related task done by a user to achieve some goal or result and the acceptance criteria that must be met to achieve that goal or result

Review questions

- Define the following:
  - Functional requirement
  - Non-functional requirement
- What are different information gathering techniques?
- What is the difference between open and closed questions?
- What is the difference between structured, unstructured and semi-structured interviews?
- What are the five steps in conducting an interview?
- What are the differences and similarities between a user story and a use case?
- Who takes responsibility to document a user story?

Questions

?