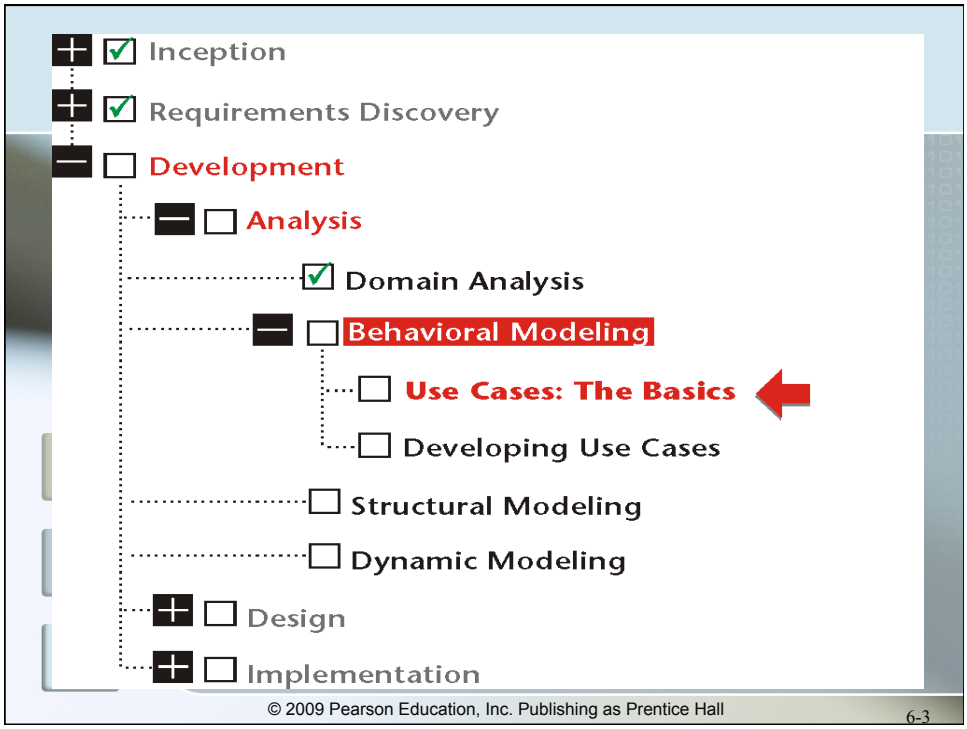
Custom Text Chapter 5

Behavioral Modeling I: Use Cases: The Basics

Chapter Topics

- What use case modeling is and is not.
- The four components of a use case.
- The basic elements of use case diagram.
- How to transform concepts from domain analysis into use cases.
- Identifying prominent actors.
- Identifying major use cases.
- The context diagram.



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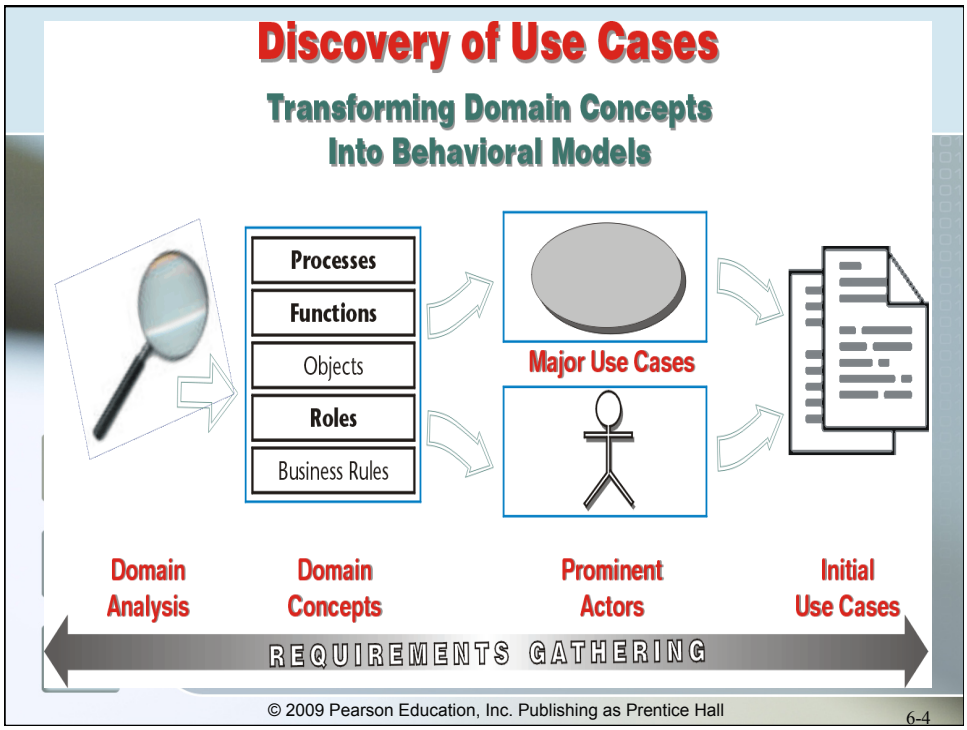

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Use Case Modeling

- Use cases model the behavior of a system
  - A use case is a unit of system behavior
  - A use case is a contract that formalizes the interaction between stakeholders and the system
  - A use case details the interaction of an actor with a system to accomplish a goal of value to the actor
  - Use cases are technology-independent

What Use Case Modeling Is Not

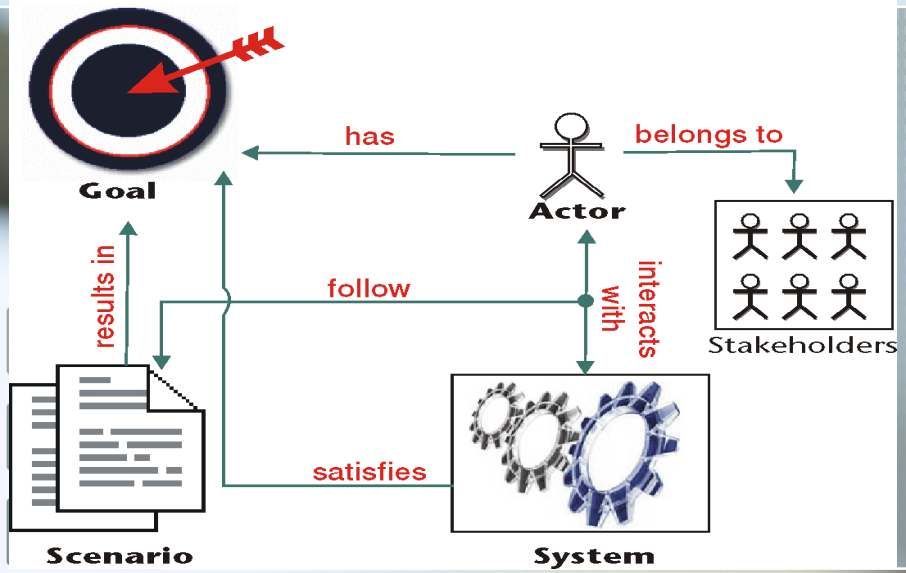
- Use Case modeling is limited to a system's external behavior
  - Use cases do not model the system from *inside*.
  - Use cases are not effective in capturing the non-functional requirements.
  - Use case modeling is *not* the same as functional decomposition.
  - Use cases are not inherently object-oriented.
  - Use cases describe **what** a system accomplishes, not **how**.

Components of Use Cases

- A use case has four components:
  - A goal,
  - Stakeholders,
  - A system, and
  - A scenario.

Components of a Use Case

Actor(s), System, Goal, Scenario



Goal

- A use case is successful only if its stated goal is completely achieved
- A use case's name is its goal. The name must be active, concise and decisive.
- It is the goal that decides the relevance of activities in a use case.

Stakeholders and Actors

- Stakeholders are those entities whose interests are affected by the success or the failure of the use case.
- An actor is an entity outside the system that interacts with the system to achieve a specific goal.
- A use case must enforce the interests of all stakeholder.

Circle of Stakeholders

Actor

- Actor is a role that any user who has been given the part can play.
- The goal of the primary actor is specified by the name of the use case.
- Supporting (or secondary) actors support the primary actor in reaching the goal of the use case.
- An actor is identified by a unique name which describes a unique role.

A System

- The system defines the boundaries of a use case
- Two types of systems
  - Real system
    - Grocery store "bricks-and-mortar"
  - Information system
    - Point of Sales System (POS)
- A use case cannot leave a system, but can reach across its boundaries

One Supermarket, Two Systems

The System Is the Boundary of the Use Case

The Real System

The Information System

Purchase Groceries	Checkout Groceries
1. Customer enters the supermarket.	1. Cust. deposits groceries on checkout counter.
2. Customer picks a shopping cart.	2. Cashier scans items one by one.
3. Customer selects groceries.	3. Cashier calculates the total.
4. Customer brings groceries to cash register.	4. Cashier informs customer of total.
5. Customer pays for groceries.	5. Cashier receives payment from customer.
6. Customer leaves with groceries.	6. Cashiers gives receipt to customer.

Purchase Groceries — The Real System Scenario

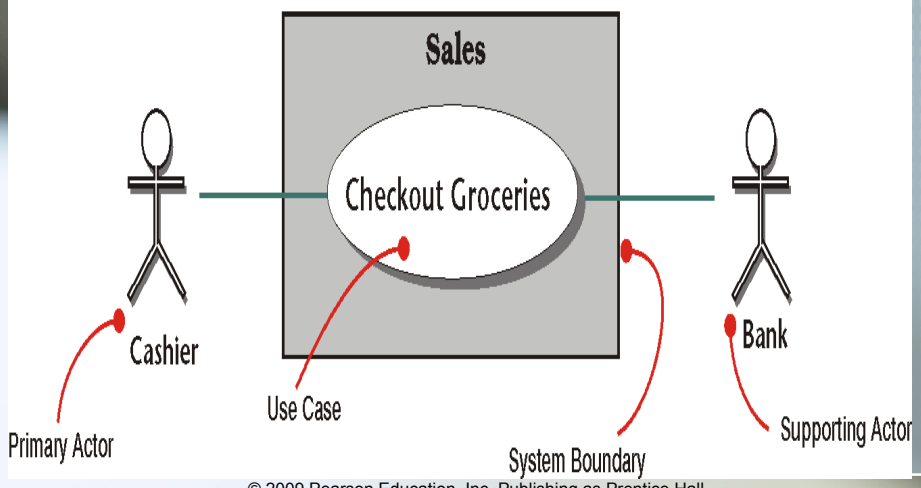
- A customer enters the supermarket. The customer takes a shopping cart or basket and strolls through the supermarket. The customer selects items from the shelves and puts them in the shopping cart or the basket. When finished, the customer brings the items to the cash register. The cashier calculates the total price of the merchandise. The customer pays for the merchandise. The cashier bags the items, issues a receipt to the customer and, if necessary, returns the change. The customer picks up the bags and leaves the supermarket.

Purchase Groceries — The Point-of-Sale System

- The customer deposits groceries on the checkout counter. The cashier scans each item and deposits the item on the bagging counter. When the last item is scanned, the cashier reads the total amount from the system and announces it to the customer. If the customer pays by credit card, the cashier swipes the card through the cash register to charge the amount. The customer then signs the printout. If the customer pays by cash, the cashier returns the change, if any. The cashier then gives a receipt to the customer.

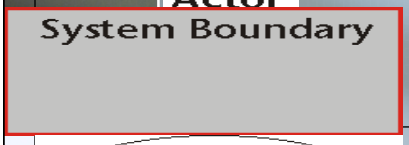
Use Case Diagram

The Interaction Between the Actors & the System



The Basic Elements

Of the Use Case Diagram

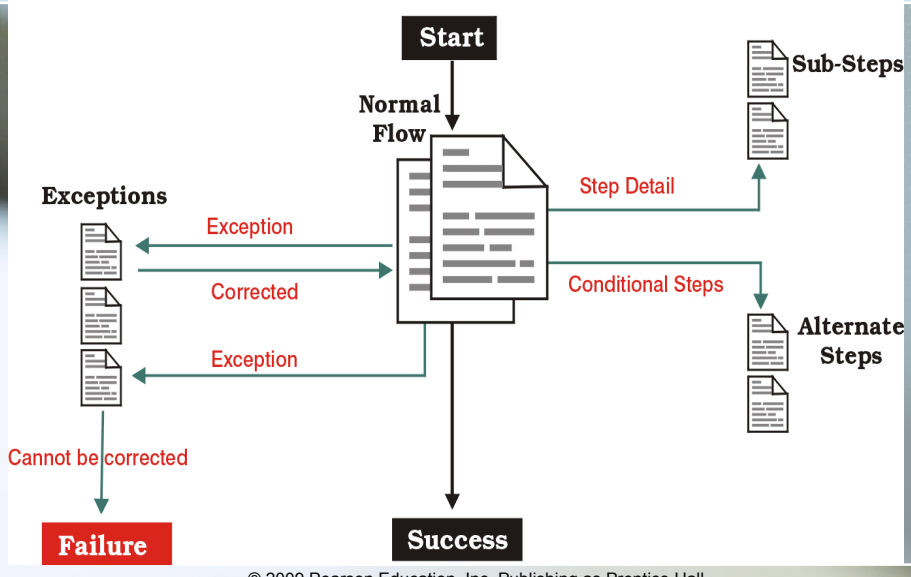
	The stick figure identifies an **actor**. More than one actor can be associated with a use case, and one actor can be associated with more than use case.
	The rectangle is the **system boundary** or the **scope**. For the use case, any entity outside this boundary can exist only as an actor.
	The ellipse (the oval) represents the **use case**. It resides inside the system boundary. In the diagram,
	The simple line on the left represents **association**. It shows the communication between an actor and a use case.

A Scenario

- The scenario is an *ordered* sequence of interactions between the actor(s) and the system to accomplish a goal.
  It consists of:
  - Normal Flow
  - Alternate Flow
  - Sub-Flows
  - Exceptions

Use Case Flows

Classifying the Steps



Steps in a Use Case Scenario

- Steps can be repeated
  - One step or a set of step can be repeated until a certain condition is met. In Checkout Groceries, the cashier scans purchase items until there are no more groceries are left to scan.
- A step can call on another use case
  - Each step may call on another use case to complete its function.
- A step is a transaction
  - Each step appears as just an interaction, but it is really a transaction between the actor and the system. That means that in each step:
    - the actor sends a request to the system,
    - the system validates the request,
    - the system changes its state as a result of validation, and then
    - the system responds.

Use Cases in the Modeling Spectrum

- Use cases reside near the dynamic edge of the modeling spectrum.

Develop Initial Use Cases

- Components of use case modeling are provided by analyzing and expanding concepts that result from domain analysis.
- Use cases straddle two worlds: the language-driven world of requirements and the structured world of models.

Walden Hospital: Milestones Achieved

- To illustrate how domain concepts are transformed into use cases, we need concrete examples. Let us, then, recap the milestones that our main case history, the Walden project, has achieved up to this point.

Walden Hospital: Milestones Achieved

- **Business Analysis**
  - The business analyst conducted a broad-based study of Walden Medical Center's business.
- **Problem Definition**
  - the business analyst identified and scoped the problems that the hospital must solve to save its sagging business.
- **Propose Solutions**
  - The analyst proposed a capital project for improving all aspects of Walden's operations and infrastructure.
- **Project Initiation**
  - The hospital charged its newly hired CIO with the task of planning an IS strategy for the medical center.
- **Domain Definition**
  - Business domains that need the services of an information system are: Patient Management, Medical Records Management, Legal, Drug Inventory & Purchasing, Transportation, Accounting, and many more.
- **Domain Scoping**
  - The hospital decided that the Patient Management domain must have the highest priority.
- **Domain Analysis & Domain Dictionary**
  - Within the scope of Patient Management, business concepts were explored, defined, and organized into a preliminary domain dictionary.

Identify Prominent Actors

- The primary candidates for becoming actors are domain concepts classified as "role."
- Discovering actors is a process of consecutive abstraction.

Finding Actors

Does the entity interact with the information system?

Patients

No

Doctors & Nurses

Yes

Patient Management: Domain Dictionary

Name	Description
Appointment Clerk	Makes appointments for the patient.
Billing Clerk	Produces individual patient bills on request; records payments; resolves billing issues.
Doctor	Provides a specialized level of medical services to the patient: diagnosis, procedures and operations, prescriptions and monitoring of medical conditions.
Emergency Medical Worker	Refers the patient to the emergency room. Performs emergency medical services before emergency room.
Lab Technician	Performs a test medical service: X-ray, blood test, MRI, etc.
Medical Staff	Any person who provides a medical service to a patient: a doctor, a nurse, a lab technician, or an emergency medical worker.
Nurse	Helps the doctor in providing medical services. Administers drugs and monitors the patient.
Outside Hospital	Refers patient for an appointment and medical service.
Primary Care Physician	Refers the patient to the hospital to receive medical services.
Referral Source	A primary care physician, an emergency medical worker or an outside hospital that refers a patient for an appointment to receive a medical service. Patient himself or herself can be a referral source.
Registration Clerk	Performs registration.

Identify Major Use Cases

- Major use cases are identified by analyzing business processes and functions
  1. Take Apart
  2. Join

Walden's Major Use Cases
Patient Management: Use Case Summary

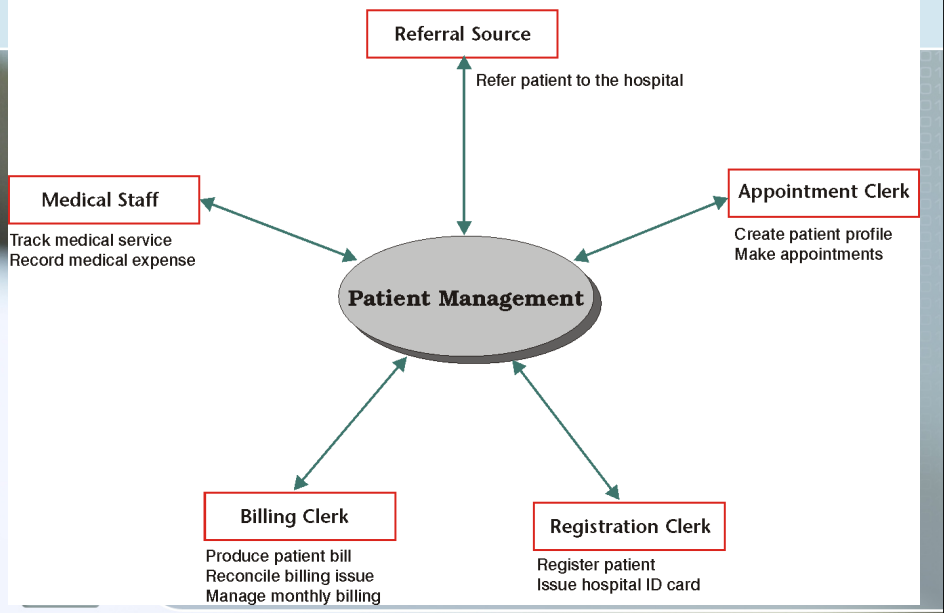
ID	Name	Description	Actors
100	**Refer Patient**	A referral source refers the patient to the hospital for an appointment to receive a medical service.	Primary Care Physician, Emergency Medical Worker, Another hospital, Patient.
120	**Make Appointment**	On referral, the appointment clerk schedules a medical service for the patient.	Appointment Clerk
140	**Register Patient**	Before a medical service, the registration clerk updates personal and insurance information if the patient is new or the relevant information is changed. A hospital ID card is issued if the patient is new or has lost the card.	Registration Clerk
160	**Track Medical Service**	Hospital renders a medical service to a patient. A medical service covers all activities performed by the medical staff that relate to a patient, from a visit to a doctor to a lab test to hospitalization and discharge. Medical staff records each service along its cost.	Doctor, Nurse, Lab Technician, Emergency Medical Worker
180	**Manage Patient Billing**	On request, the billing clerk produces a bill for the patient. The clerk also reconciles the patient's account and accepts payments.	Billing Clerk

Develop Context Diagram

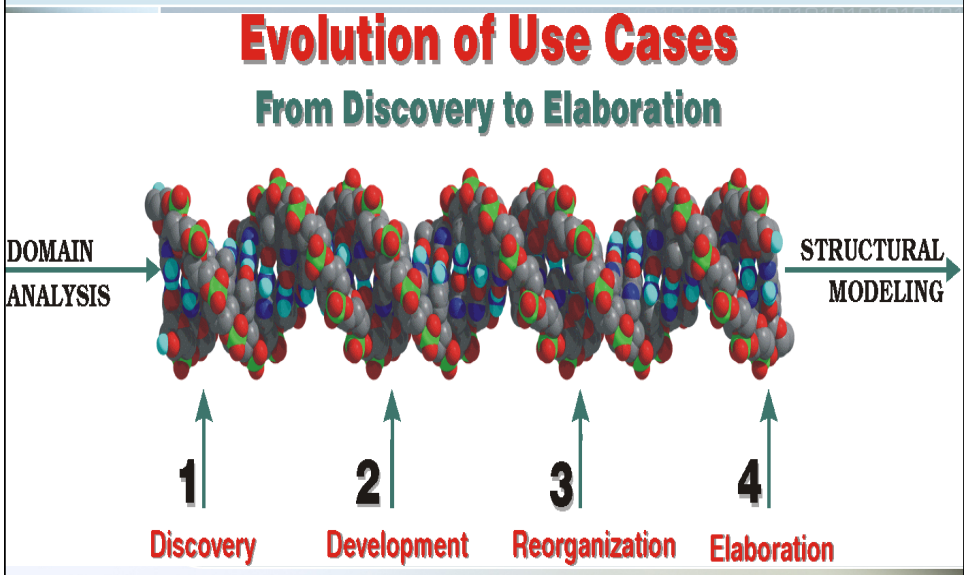
- Context diagram represents the interaction of outside entities with a system as a whole.
- Context diagram is composed of three elements:
  - A system or subsystem.
  - Entities outside the system that interact with it.
  - Interactions between outside entities and the system.

Context Diagram

For Walden's 'Patient Management'



Next: Developing Use Cases



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