17. How does an essential use case differ from a real use case?
18. What are the major elements of an overview use case?
19. What are the major elements of a detail use case?
20. What is the viewpoint of a use case, and why is it important?
21. What are some guidelines for designing a set of use cases? Give two examples of the extend associations on a use-case diagram. Give two examples for the include associations.
22. Which of the following could be an actor found on a use case diagram? Why?
    Ms. Mary Smith
    Supplier
    Customer
    Internet customer
    Mr. John Seals
    Data entry clerk
    Database administrator
23. What is CRUD? Why is it useful?
24. What is a walkthrough? How does it relate to verification and validation?
25. What are the different roles played during a walkthrough? What are their purposes?
26. How are the different functional models related and how does this affect the verification and validation of the models?

EXERCISES

A. Investigate the website for Rational Software (www.ibm.com/software/rational/) and its repository of information about UML. Write a paragraph news brief on the current state of UML (e.g., the current version and when it will be released, future improvements).

B. Investigate the Object Management Group. Write a brief memo describing what it is, its purpose, and its influence on UML and the object approach to systems development. (*Hint:* A good resource is www.omg.org.)

C. Draw a use-case diagram and a set of activity diagrams for the process of buying glasses from the viewpoint of the patient. The first step is to see an eye doctor who will give you a prescription. Once you have a prescription, you go to an optical dispensary, where you select your frames and place the order for your glasses. Once the glasses have been made, you return to the store for a fitting and pay for the glasses.

D. Create a set of detailed use-case descriptions for the process of buying glasses in exercise C.

E. Draw a use-case diagram and a set of activity diagrams for the following doctor's office system. Whenever new patients are seen for the first time, they complete a patient information form that asks their name, address, phone number, and brief medical history, which are stored in the patient information file. When a patient calls to schedule a new appointment or change an existing appointment, the receptionist checks the appointment file for an available time. Once a good time is found for the patient, the appointment is scheduled. If the patient is a new patient, an incomplete entry is made in the patient's file; the full information will be collected when the patient arrives for the appointment. Because appointments are often made far in advance, the receptionist usually mails a reminder postcard to each patient two weeks before the appointment.

F. Create a set of detail use-case descriptions for the dentist's office system in exercise E.

G. Draw a use-case diagram and a set of activity diagrams for an online university registration system. The system should enable the staff of each academic department to examine the courses offered by their department, add and remove courses, and change the information about them (e.g., the maximum number of students permitted). It should permit students to examine currently available courses, add and drop courses to and from their schedules, and examine the courses for which they are enrolled. Department staff should be able to print a variety of reports about the courses and the students enrolled in them. The system should ensure that no student takes too many courses and that students who have any unpaid fees are not permitted to register (assume that fees data are maintained by the university's financial office, which the registration system accesses but does not change).

H. Create a set of detailed use-case descriptions for the online university registration system in exercise G.

I. Draw a use-case diagram and a set of activity diagrams for the following system. A Real Estate Inc. (AREI) sells houses. People who want to sell their houses sign a contract with AREI and provide information on their house. This information is kept in a database by AREI, and a subset of this information is sent to the citywide multiple-listing service used by all

real estate agents. AREI works with two types of potential buyers. Some buyers have an interest in one specific house. In this case, AREI prints information from its database, which the real estate agent uses to help show the house to the buyer (a process beyond the scope of the system to be modeled). Other buyers seek AREI's advice in finding a house that meets their needs. In this case, the buyer completes a buyer information form that is entered into a buyer database, and AREI real estate agents use its information to search AREI's database and the multiple-listing service for houses that meet their needs. The results of these searches are printed and used to help the real estate agent show houses to the buyer.

J. Create a set of detailed use-case descriptions for the real estate system in exercise I.

K. Perform a verification and validation walkthrough of the functional models of the real estate system described in exercises I and J.

L. Draw a use-case diagram and a set of activity diagrams for the following system. A Video Store (AVS) runs a series of fairly standard video stores. Before a video can be put on the shelf, it must be cataloged and entered into the video database. Every customer must have a valid AVS customer card in order to rent a video. Customers rent videos for three days at a time. Every time a customer rents a video, the system must ensure that he or she does not have any overdue videos. If so, the overdue videos must be returned and an overdue fee paid before customer can rent more videos. Likewise, if the customer has returned overdue videos but has not paid the overdue fee, the fee must be paid before new videos can be rented. Every morning, the store manager prints a report that lists overdue videos. If a video is two or more days overdue, the manager calls the customer to remind him or her to return the video. If a video is returned in damaged condition, the manager removes it from the video database and may sometimes charge the customer.

M. Create a set of detailed use-case descriptions for the video system in exercise L.

N. Perform a verification and validation walkthrough of the functional models of the video store system described in exercises L and M.

O. Draw a use-case diagram and a set of activity diagrams for a gym membership system. When members join the gym, they pay a fee for a certain length of time. Most memberships are for one year, but memberships as short as two months are available. Throughout the year, the gym offers a variety of discounts on their regular membership prices (e.g., two memberships for the price of one for Valentine's day). It is common for members to pay different amounts for the same length of membership. The gym wants to mail out reminder letters to members asking them to renew their memberships one month before their memberships expire. Some members have become angry when asked to renew at a much higher rate than their original membership contract, so the club wants to track the prices paid so that the manager can override the regular prices with special prices when members are asked to renew. The system must track these new prices so that renewals can be processed accurately. One of the problems in the industry is the high turnover rate of members. Although some members remain active for many years, about half of the members do not renew their memberships. This is a major problem, because the gym spends a lot in advertising to attract each new member. The manager wants the system to track each time a member comes into the gym. The system will then identify the heavy users and generate a report so the manager can ask them to renew their memberships early, perhaps offering them a reduced rate for early renewal. Likewise, the system should identify members who have not visited the gym in more than a month, so the manager can call them and attempt to reinterest them in the gym.

P. Create a set of detailed use-case descriptions for the system in exercise O.

Q. Perform a verification and validation walkthrough of the functional models of the gym membership system described in exercises O and P.

R. Draw a use-case diagram and a set of activity diagrams for the following system. Picnics R Us (PRU) is a small catering firm with five employees. During a typical summer weekend, PRU caters fifteen picnics with twenty to fifty people each. The business has grown rapidly over the past year and the owner wants to install a new computer system for managing the ordering and buying process. PRU has a set of ten standard menus. When potential customers call, the receptionist describes the menus to them. If the customer decides to book a picnic, the receptionist records the customer information (e.g., name, address, phone number) and the information about the picnic (e.g., place, date, time, which one of the standard menus, total price) on a contract. The customer is then faxed a copy of the contract and must sign and return it along with a deposit (often a credit card or by debit

card) before the picnic is officially booked. The remaining money is collected when the picnic is delivered. Sometimes, the customer wants something special (e.g., birthday cake). In this case, the receptionist takes the information and gives it to the owner, who determines the cost; the receptionist then calls the customer back with the price information. Sometimes the customer accepts the price, other times, the customer requests some changes that have to go back to the owner for a new cost estimate. Each week, the owner looks through the picnics scheduled for that weekend and orders the supplies (e.g., plates) and food (e.g., bread, chicken) needed to make them. The owner would like to use the system for marketing as well. It should be able to track how customers learned about PRU and identify repeat customers, so that PRU can mail special offers to them. The owner also wants to track the picnics for which PRU sent a contract, but the customer never signed the contract and actually booked a picnic.

S. Create a set of detailed use-case descriptions for the system in exercise R.

T. Perform a verification and validation walkthrough of the functional models of the catering system described in exercises R and S.

U. Draw a use-case diagram and a set of activity diagrams for the following system. Of-the-Month Club (OTMC) is an innovative young firm that sells memberships to people who have an interest in certain products. People pay membership fees for one year and each month receive a product by mail. For example, OTMC has a coffee-of-the-month club that sends members one pound of special coffee each month. OTMC currently has six memberships (coffee, wine, beer, cigars, flowers, and computer games), each of which costs a different amount. Customers usually belong to just one, but some belong to two or more. When people join OTMC, the telephone operator records the name, mailing address, phone number, e-mail address, credit-card information, start date, and membership service(s) (e.g., coffee). Some customers request a double or triple membership (e.g., two pounds of coffee, three cases of beer). The computer game membership operates a bit differently from the others. In this case, the member must also select the type of game (action, arcade, fantasy/science fiction, educational, etc.) and age level. OTMC is planning to greatly expand the number of memberships it offers (e.g., video games, movies, toys, cheese, fruit, and vegetables), so the system needs to accommodate this future expansion. OTMC is also planning to offer three-month and six-month memberships.

V. Create a set of detailed use-case descriptions for the system in exercise U.

W. Perform a verification and validation walkthrough of the functional models of the Of-the-Month Club system described in exercises U and V.

MINICASES

1. Williams Specialty Company is a small printing and engraving organization. When Pat Williams, the owner, brought computers into the business office five years ago, the business was very small and very simple. Pat was able to use an inexpensive PC-based accounting system to handle the basic information-processing needs of the firm. As time has gone on, however, the business has grown and the work being performed has become significantly more complex. The simple accounting software still in use is no longer adequate to keep track of many of the company's sophisticated deals and arrangements with its customers.

Pat has a staff of four people in the business office who are familiar with the intricacies of the company's record-keeping requirements. Pat recently met with her staff to discuss her plan to hire an IS consulting firm to evaluate their information system needs and recommend a strategy for upgrading their computer system. The staff is excited about the prospect of a new system, because the current system causes them much annoyance. No one on the staff has ever done anything like this before, however, and they are a little wary of the consultants who will be conducting the project.

Assume that you are a systems analyst on the consulting team assigned to the Williams Specialty Co. engagement. At your first meeting with the Williams staff, you want to be sure that they understand the work that your team will be performing and how they will participate in that work.

a. Explain, in clear, nontechnical terms, the goals of the analysis of the project.

b. Explain, in clear, nontechnical terms, how functional models will be used by the project team to model the identified business processes. Explain what these models are, what they represent in the system, and how they will be used by the team.

2. Professional and Scientific Staff Management (PSSM) is a unique type of temporary staffing agency. Many organizations today hire highly skilled technical employees on a short-term, temporary basis to assist with special projects or to provide a needed technical skill. PSSM negotiates contracts with its client companies in which it agrees to provide temporary staff in specific job categories for a specified cost. For example, PSSM has a contract with an oil and gas exploration company in which it agrees to supply geologists with at least a master's degree for $5,000 per week. PSSM has contracts with a wide range of companies and can place almost any type of professional or scientific staff members, from computer programmers to geologists to astrophysicists.

When a PSSM client company determines that it will need a temporary professional or scientific employee, it issues a staffing request against the contract it had previously negotiated with PSSM. When PSSM's contract manager receives a staffing request, the contract number referenced on the staffing request is entered into the contract database. Using information from the database, the contract manager reviews the terms and conditions of the contract and determines whether the staffing request is valid. The staffing request is valid if the contract has not expired, the type of professional or scientific employee requested is listed on the original contract, and the requested fee falls within the negotiated fee range. If the staffing request is not valid, the contract manager sends the staffing request back to the client with a letter stating why the staffing request cannot be filled, and a copy of the letter is filed. If the staffing request is valid, the contract manager enters the staffing request into the staffing request database as an outstanding staffing request. The staffing request is then sent to the PSSM placement department.

In the placement department, the type of staff member, experience, and qualifications requested on the staffing request are checked against the database of available professional and scientific staff. If a qualified individual is found, he or she is marked "reserved" in the staff database. If a qualified individual cannot be found in the database or is not immediately available, the placement department creates a memo that explains the inability to meet the staffing request and attaches it to the staffing request. All staffing requests are then sent to the arrangements department.

In the arrangements department the prospective temporary employee is contacted and asked to agree to the placement. After the placement details have been worked out and agreed to, the staff member is marked "placed" in the staff database. A copy of the staffing request and a bill for the placement fee is sent to the client. Finally, the staffing request, the "unable-to-fill" memo (if any), and a copy of the placement fee bill is sent to the contract manager. If the staffing request was filled, the contract manager closes the open staffing request in the staffing request database. If the staffing request could not be filled, the client is notified. The staffing request, placement fee bill, and unable-to-fill memo are then filed in the contract office.

a. Create a use-case diagram for the system described here.

b. Create an activity diagram for the business process described here.

c. Develop a use-case description for each major use case.

d. Verify and validate the functional models.