Systems Analysis and Design

5th Edition

Chapter 4. Use Case Analysis

by

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Modeling System requirements with Use Case

Chapter 4 Outline

Use Cases

- Elements of a use case.
- Alternative use case formats.
- Use cases and functional requirements.
- Building use cases.

Use-Case Modeling

- **Use cases** are a means of **expressing user requirements** that used extensively in the **analysis phase**.
- A **use case** represents how a **system interacts** with its **environment** by illustrating the **activities** that are **performed** by the **users** and the system's **responses**.
  - The text-based use case is easy for the users to understand, and also **complement traditional modeling tools** *that flows easily into* the creation of process models and the data model.

Use-Case Modeling

- A use case is a written **description** within the graphical representation of **how** users will **perform** tasks on the system.
- It outlines, ***from a user's point of view***, a system's **behaviour** as it responds to a **request**.
- Each use case is represented as a **sequence of simple steps**, beginning with a user's goal and ending when that goal is fulfilled

Use-Case Modeling

- A ***use case*** depicts a set of activities that produce some output result that describes **how an external user *triggers* an *event* to which the system must respond**.
- With this type of ***event-driven modeling,*** everything in the system can be thought of as a **response** to some **triggering event**.
- Creation of use cases is often done as **a part of interview session** with users or **a part of JAD sessions.**

Use Case Name: Request a chemical	ID: UC-2	Priority: High

Actor: Lawn Chemical Applicator (LCA)

Description: The Lawn Chemical Applicator (LCA) specifies the lawn chemical needed for a job by entering its name or ID number. The system satisfies the request by reserving the quantity requested or the quantity available and notifying the Chemical Supply Warehouse of the pick-up.

Trigger: A Lawn Chemical Applicator (LCA) needs a chemical for a job.

Type: ☑ External □ Temporal

Preconditions:

1. The LCA identity is authenticated.
2. The LCA has necessary training and credentials on file.
3. The Chemical Supply datastore is up-to-date and on-line.

Normal Course:			Information for Steps:
1.0	Request a lawn chemical from the chemical supply warehouse.		
1.	The LCA specifies the desired lawn chemical	←	Chemical name or ID
2.	The system verifies the chemical is approved for usage	←	List of approved chemicals
3.	The system displays the quantity of the lawn chemical on hand	←	Quantity on hand
4.	The LCA specifies the quantity needed	←	Quantity needed
5.	The system asks the LCA to confirm the request for the quantity needed or the quantity available (Alternative Course 1.1)	←	Request confirmation
6.	The system gives the LCA a Chemical Pick-up Authorization for the quantity requested	→	Chemical Pick-up Authorization
7.	The system notifies the Chemical Supply Warehouse of the chemical pick-up	→	Chemical Pick-up Notice
8.	The system stores the Lawn Chemical Request in the Chemical Request datastore	→	Lawn Chemical Request

Alternative Courses:			
1.1	Quantity available is less than quantity needed (branch at step 5)		
1.	The system asks the LCA if he wants the quantity available or to cancel the request		
2a.	The LCA asks to take the quantity available	←	Request quantity available
3a.	The system changes the quantity requested to the quantity available		
4a.	The system gives the LCA a Chemical Pick-up-Authorization for the quantity available	→	Chemical Pick-up Authorization
5a.	The system notifies the Chemical Supply Warehouse of the chemical pick-up	→	Chemical Pick-up Notice
6a.	The system stores the Lawn Chemical Request in the Chemical Management System	→	Lawn Chemical Request
7a.	The system notifies Purchasing of the chemical outage	→	Chemical Outage Notice
2b.	The LCA asks to cancel the request	←	Cancellation
3b.	The system terminates the use case		

Postconditions:

1. The Lawn Chemical Request is stored in the Chemical Management System.
2. The Chemical Pick-up Authorization is produced for the LCA.
3. The Chemical Supply Warehouse is notified of the chemical pick-up.
4. Purchasing is notified of chemical outage.

Exceptions:

E1: Chemical is no longer approved for use (occurs at step 2)

1. The system displays message. "That chemical is no longer approved for use"
2. The system asks the LCA if he wants to request another chemical or to exit

3a The LCA asks to request another chemical

4a. The system starts Normal Course again

3b. The LCA asks to exit

4b. The system terminates the use case

Summary

Inputs	Source	Outputs	Destination
Chemical name or ID	LCA	Chemical Pick-up Authorization	LCA
List of approved chemicals	Lawn Chemicals Supply datastore		
Chemical quantity on hand	Lawn Chemicals Supply datastore	Chemical Pick-up Notice	Chemical Supply Warehouse
Quantity needed	LCA		
Request confirmation	LCA	Lawn Chemical Request	Chemical Request datastore
Request quantity available or cancellation	LCA	Chemical Outage Notice	Purchasing

Elements of a Use Case

1-Basic Information

- Each use case has a *name,* should be as simple, yet descriptive, as possible, *number*, is simply a **sequential number** that serves to reference each use case (e.g., UC-2), and brief description, that briefly conveys the use case's purpose.
- The *priority* may be assigned to indicate the **relative significance** in the overall system. Some use cases will describe **essential activities** that the system must perform and hence will have a ***high priority level***. Other use cases may describe activities that are **less critical**, having ***medium or low priority***.

Elements of a Use Case

- The *actor* refers to a person, another system, or a hardware device that **interacts** with the system to achieve a useful goal. Some organizations use the term *user role* rather than actor **because there may be several different user groups who interact with the system in the same way.**
- The *trigger* for the use case – the event that causes the use case to begin. A trigger can be an ***external trigger***, such as a customer placing an order, or in our example, the LCA needing a chemical for a job. Triggers can also be a ***temporal trigger***, such as a DVD becoming overdue at the video store or time to pay the rent.

Elements of a Use Case

2-Preconditions

- Use cases are often performed in a sequence in order to accomplish an overall business task.
- While it might be possible to describe everything in one very large use case, that use case could become unwieldy.
- Therefore,It is common practice to create smaller, more focused use cases breaking the whole process down into parts.
- It is important to define clearly what needs to be accomplished before each use case begins.
- The *preconditions* define the state the system must be in before the use case begins.

Elements of a Use Case

3- Normal Course

- The next part of a use case is the description of the major steps that are performed to execute the response to the event, the inputs used for the steps, and the outputs produced by the steps.
- The ***normal course*** lists the steps.
- As you read through the steps, you can clearly understand the interactions that occur between the user and the system.
- The steps are listed in the order in which they are performed

Elements of a Use Case

4-Alternative Courses

- **Alternative courses** depict branches (alternative paths of the steps) in logic that also will lead to a successful conclusion of the use case.

Elements of a Use Case

5-Postconditions

- The **postconditions** section of defines the final product of the use case.
- These postconditions also serve to define the preconditions for the next use case in the series.

Elements of a Use Case

6- Exceptions

- A use case should describe any error conditions or **exceptions** that may occur as the use case steps are performed.
- These are not normal branches in decision logic, but are unusual occurrences or errors that could potentially be encountered and will lead to an unsuccessful result.

Elements of a Use Case

7-Summary of Inputs and Outputs

- The final section of the use case summarizes the set of major **inputs** and **outputs** of the use case, along with their source or destination.

Additional Use Case Issues

- Additional sections may be included, e.g.,

  - Frequency of use
  - Business rules
  - Special requirements
  - Assumptions
  - Notes and issues

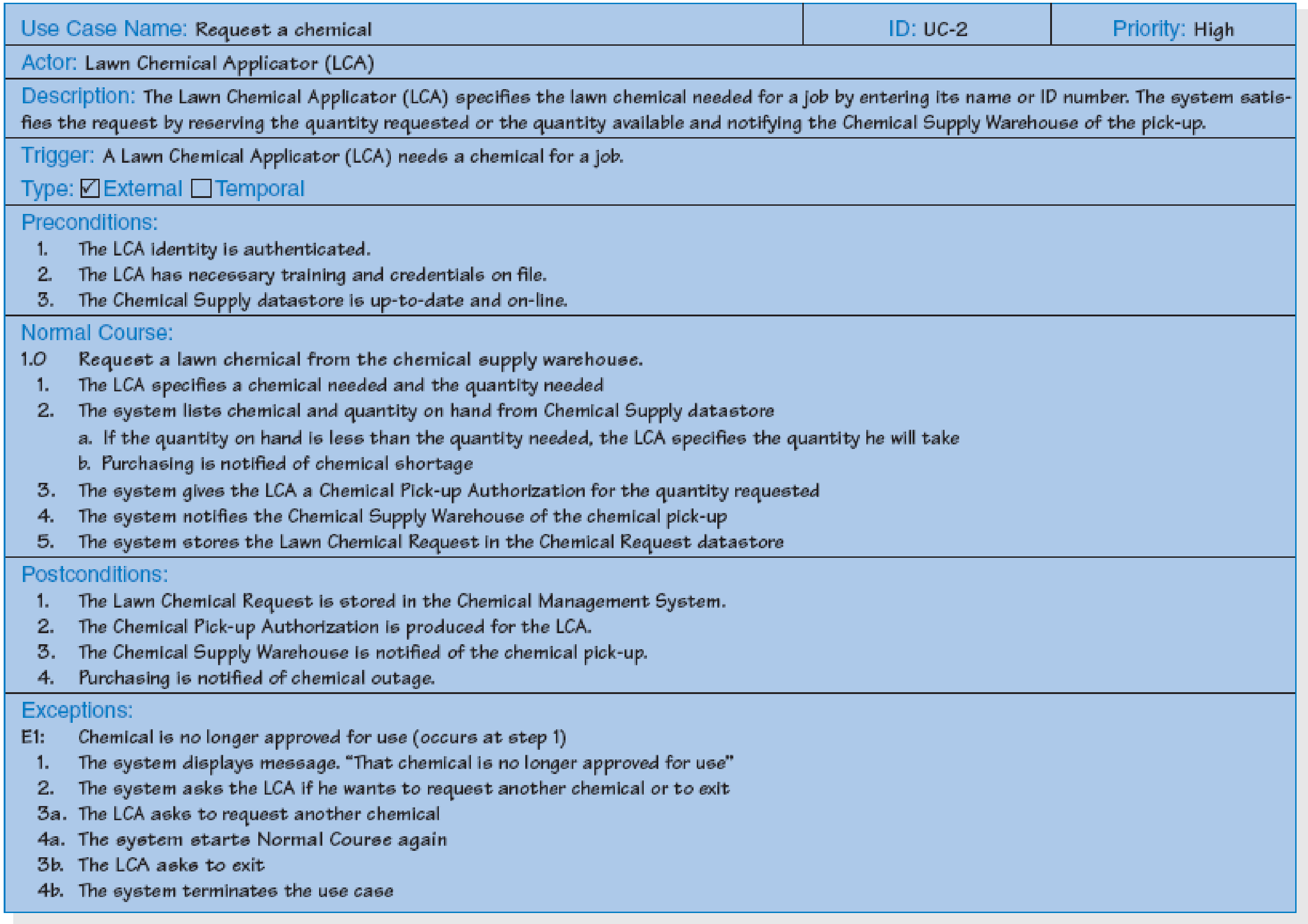
Alternative Use Case Formats

- A *full-dressed* use case is very thorough, detailed, and highly structured.
- The project team may decide that a more casual use case format is acceptable.

Alternative Use Case Formats

- The fully dressed use case is not always required, but does provide value in certain circumstances. Fully dressed use cases are especially valuable when:
    - User representatives are not closely engaged with the development team throughout the project.
    - The application is complex and has a high risk associated with system failures.
    - Comprehensive test cases will be based on the user requirements.
    - Collaborating remote teams need a detailed, shared understanding of the user requirements.

Example



Use Case Name: Request a chemical | ID: UC-2 | Priority: High

Actor: Lawn Chemical Applicator (LCA)

Description: The Lawn Chemical Applicator (LCA) specifies the lawn chemical needed for a job by entering its name or ID number. The system satisfies the request by reserving the quantity requested or the quantity available and notifying the Chemical Supply Warehouse of the pick-up.

Trigger: A Lawn Chemical Applicator (LCA) needs a chemical for a job.

Type: ☑ External □ Temporal

Preconditions:

1. The LCA identity is authenticated.
2. The LCA has necessary training and credentials on file.
3. The Chemical Supply datastore is up-to-date and on-line.

Normal Course:

1.0 Request a lawn chemical from the chemical supply warehouse.
1. The LCA specifies a chemical needed and the quantity needed
2. The system lists chemical and quantity on hand from Chemical Supply datastore
   a. If the quantity on hand is less than the quantity needed, the LCA specifies the quantity he will take
   b. Purchasing is notified of chemical shortage
3. The system gives the LCA a Chemical Pick-up Authorization for the quantity requested
4. The system notifies the Chemical Supply Warehouse of the chemical pick-up
5. The system stores the Lawn Chemical Request in the Chemical Request datastore

Postconditions:

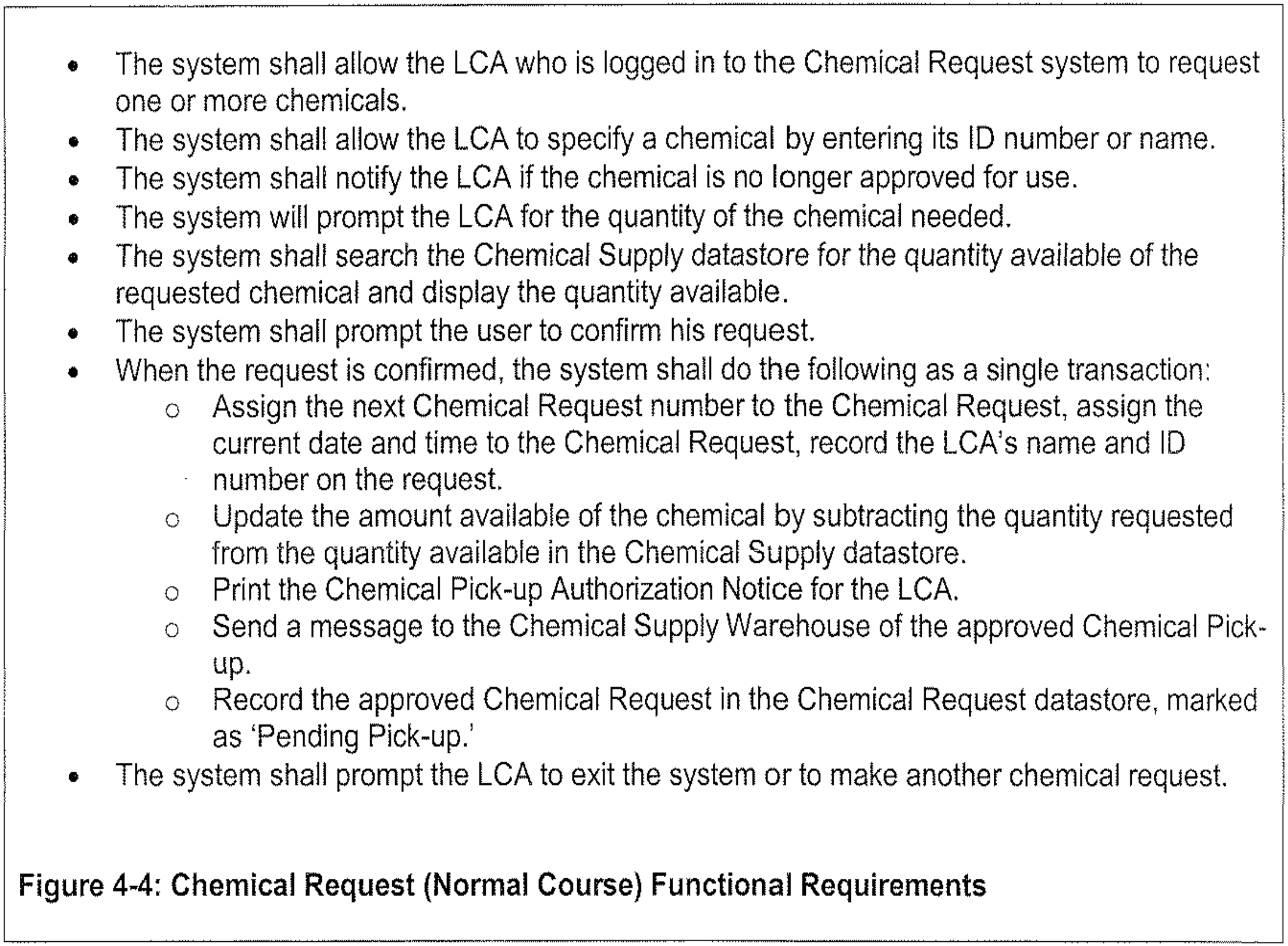
1. The Lawn Chemical Request is stored in the Chemical Management System.
2. The Chemical Pick-up Authorization is produced for the LCA.
3. The Chemical Supply Warehouse is notified of the chemical pick-up.
4. Purchasing is notified of chemical outage.

Exceptions:

E1: Chemical is no longer approved for use (occurs at step 1)
1. The system displays message. "That chemical is no longer approved for use"
2. The system asks the LCA if he wants to request another chemical or to exit
3a. The LCA asks to request another chemical
4a. The system starts Normal Course again
3b. The LCA asks to exit
4b. The system terminates the use case

Use Cases and the Functional Requirements

- **Use cases** are very **useful tools** to us to understand user requirements. However, use cases only convey the user's point of view.
- **Transforming** the **user's view** into the **developer's view** by creating **functional requirements** is one of the important contributions of system analyst.
- **The derived functional requirements give more information** to the developer about what the system must do.



- The system shall allow the LCA who is logged in to the Chemical Request system to request one or more chemicals.
- The system shall allow the LCA to specify a chemical by entering its ID number or name.
- The system shall notify the LCA if the chemical is no longer approved for use.
- The system will prompt the LCA for the quantity of the chemical needed.
- The system shall search the Chemical Supply datastore for the quantity available of the requested chemical and display the quantity available.
- The system shall prompt the user to confirm his request.
- When the request is confirmed, the system shall do the following as a single transaction:
  - Assign the next Chemical Request number to the Chemical Request, assign the current date and time to the Chemical Request, record the LCA's name and ID number on the request.
  - Update the amount available of the chemical by subtracting the quantity requested from the quantity available in the Chemical Supply datastore.
  - Print the Chemical Pick-up Authorization Notice for the LCA.
  - Send a message to the Chemical Supply Warehouse of the approved Chemical Pick-up.
  - Record the approved Chemical Request in the Chemical Request datastore, marked as 'Pending Pick-up.'
- The system shall prompt the LCA to exit the system or to make another chemical request.

Figure 4-4: Chemical Request (Normal Course) Functional Requirements

Building Use Cases

1- Identify the major use cases

2- Identify the Major Steps for Each Use Case

3- Identify Elements within Steps

4- Confirm the Use Case

Step 1: Identify the major use cases

Step	Activities	Typical Questions Asked
1. Identify the use cases.	Start a use case report form for each use case by filling in the name, description and trigger. If there are more than nine use cases, group them into packages.	Ask who, what, when, and where about the use cases (or tasks). What are the major tasks that are performed?

Step 2: Identify the major steps for each use case

Step	Activities	Typical Questions Asked
2- Identify the major steps within each use case.	For each use case, fill in the major steps needed to complete the task.	Ask how about each use case. What information/forms/reports do you need to perform this task? Who gives you these information/forms/reports? What information/forms/report does this produce and where do they go? How do you produce this report? How do you change the information on the report? How do you process forms? What tools do you use to do this step (e.g., paper, e-mail, phone)?

Step 3: Identify elements within steps

Step	Activities	Typical Questions Asked
3- Identify elements within steps.	For each step, identify its triggers and its inputs and outputs.	Ask how about each step. How does the person know when to perform this step? What forms/ reports/ data does this step produce? What forms/ reports/ data does this step need? What happens when this form/report/data is not available?

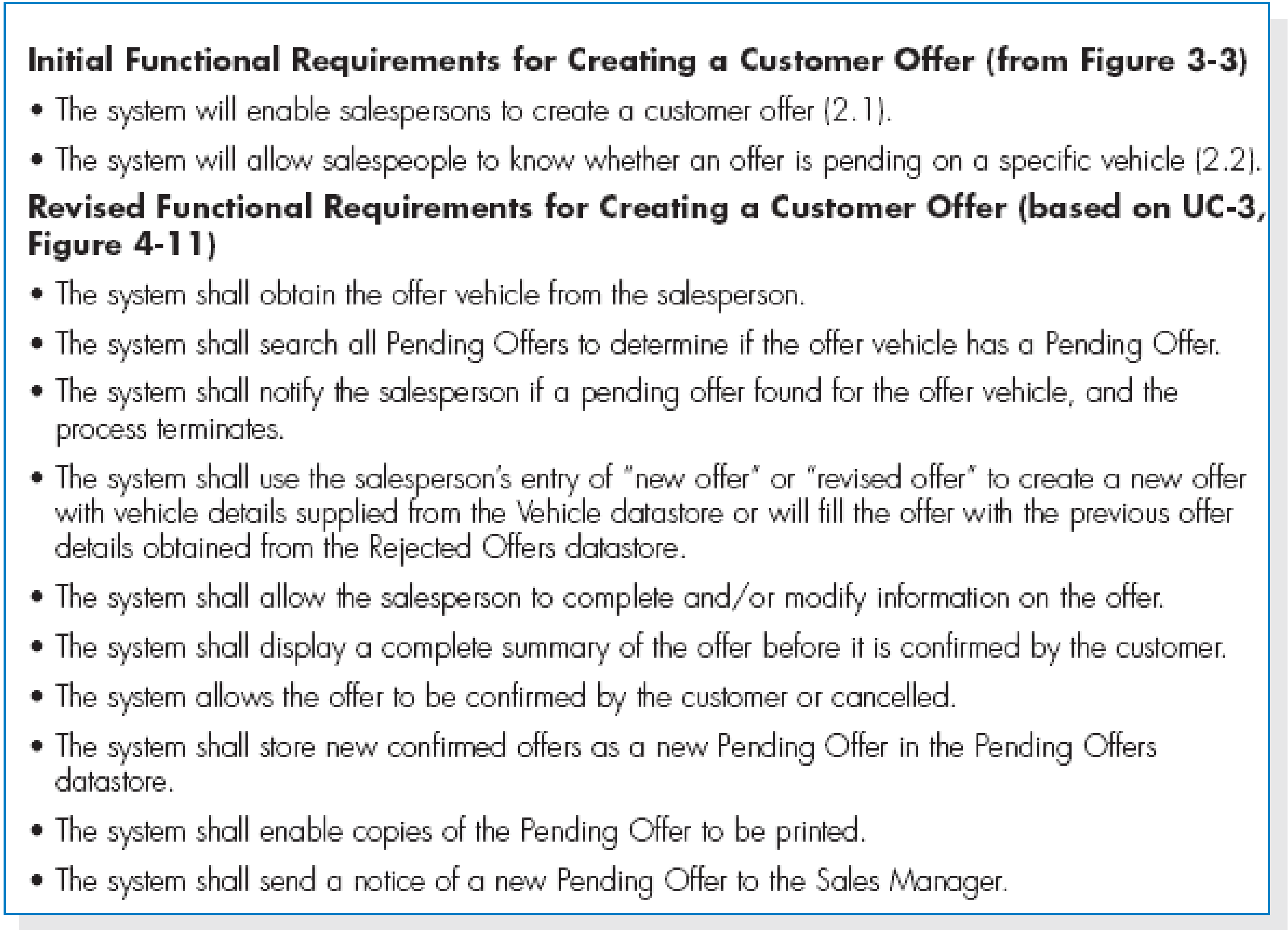
Step 4. Confirm the use case

Step	Activities	Typical Questions Asked
4- Confirm the use case.	For each use case, validate that it is correct and complete.	Ask the user to execute the process, using the written steps in the use case—that is, have the user role-play the use case.

Revise functional requirements based on use cases

- The functional requirements in the requirements definition may be modified to reflect the more detailed understanding and to provide insight to the development team on some “back-end” processing.

Example



Initial Functional Requirements for Creating a Customer Offer (from Figure 3-3)

- The system will enable salespersons to create a customer offer (2.1).
- The system will allow salespeople to know whether an offer is pending on a specific vehicle (2.2).

Revised Functional Requirements for Creating a Customer Offer (based on UC-3, Figure 4-11)

- The system shall obtain the offer vehicle from the salesperson.
- The system shall search all Pending Offers to determine if the offer vehicle has a Pending Offer.
- The system shall notify the salesperson if a pending offer found for the offer vehicle, and the process terminates.
- The system shall use the salesperson's entry of "new offer" or "revised offer" to create a new offer with vehicle details supplied from the Vehicle datastore or will fill the offer with the previous offer details obtained from the Rejected Offers datastore.
- The system shall allow the salesperson to complete and/or modify information on the offer.
- The system shall display a complete summary of the offer before it is confirmed by the customer.
- The system allows the offer to be confirmed by the customer or cancelled.
- The system shall store new confirmed offers as a new Pending Offer in the Pending Offers datastore.
- The system shall enable copies of the Pending Offer to be printed.
- The system shall send a notice of a new Pending Offer to the Sales Manager.

SUMMARY

- A use case contains all the information needed to build one part of a process model, expressed in an informal, simple way.
- When writing a use case,
  - - identify the triggering event,
  - - develop a list of the major steps,
  - - identify the input(s) and output(s) for every step,
  - - have the users role-play the use case to verify.