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# Use Case Analysis

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## SEEM 3430 Tutorial

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# Outline

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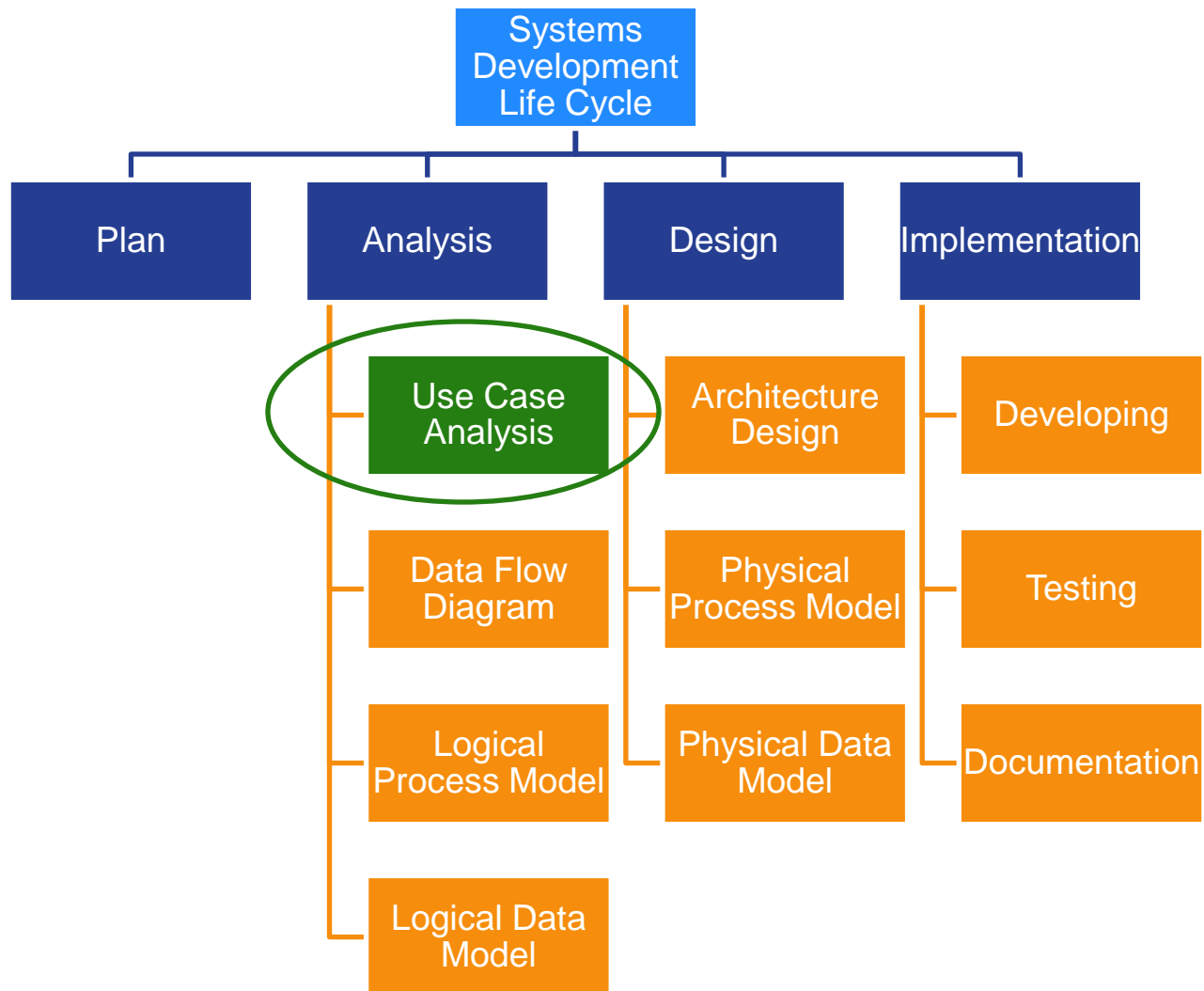
1. What is use case analysis?
  2. How to do use case analysis?
    - What is use-case diagram?
    - How to identify use cases?
    - How to write use cases?
  3. Examples
  4. Summary
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# What is use case analysis?

# Where are we?

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# Overview of Use Case Analysis

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A use case analysis is the primary form for gathering usage requirements for a new software program or task to be completed.

## **Primary Goals:**

- designing a system from the user's perspective
  - communicating system behavior in the user's terms
  - specifying all externally visible behaviors
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# What is a Use Case?

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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.

Use cases are a means of expressing user requirements.

Use cases are used extensively in the analysis phase.

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# Use Cases and the Functional Requirements

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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.

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# Use case analysis

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Use case analysis is important and useful technique not only in the **analysis phase**, but also in the **design phase** or even in the **implementation phase**!

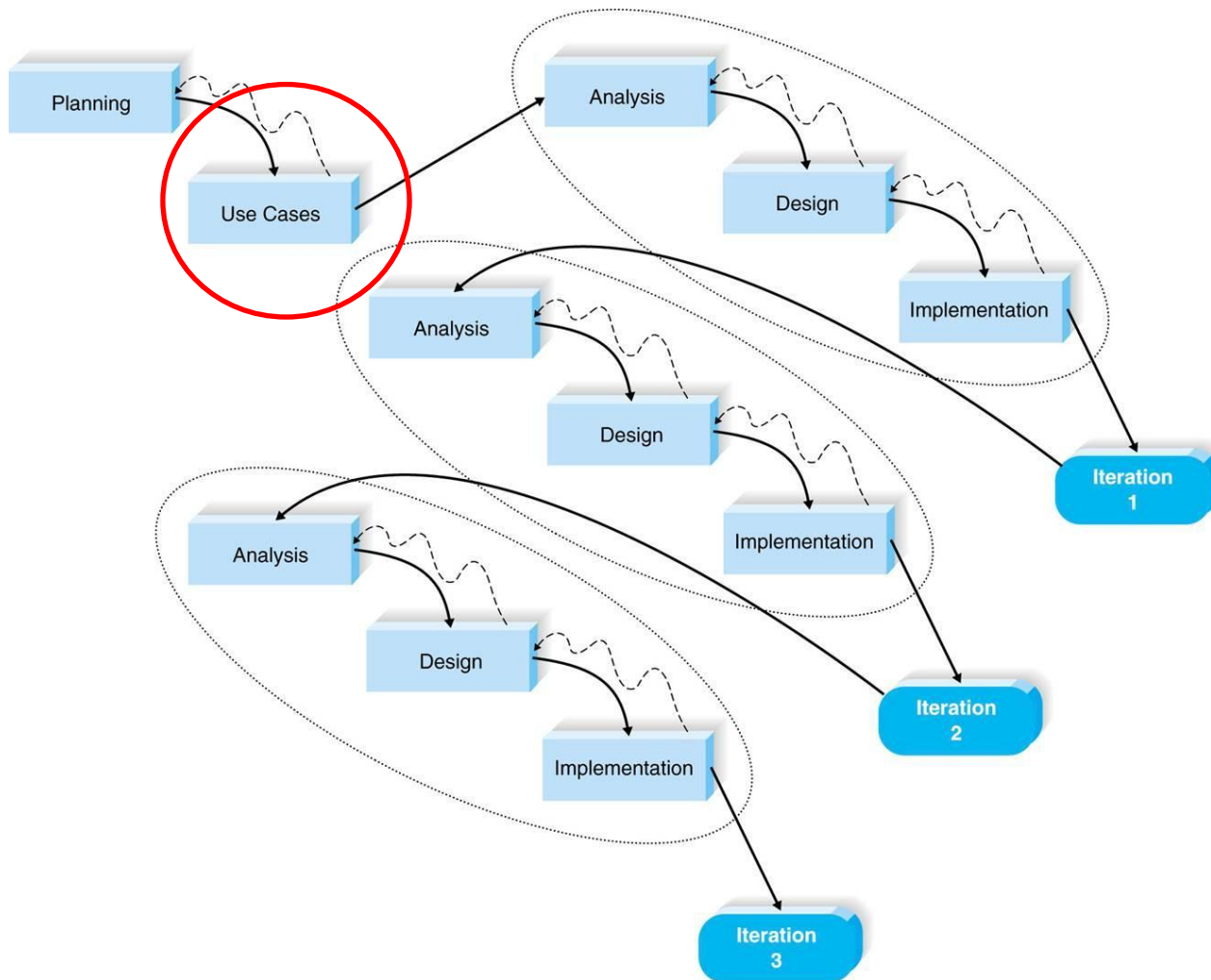
**Why?**

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# The Big Picture

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The use-case model serves as a **unifying thread** throughout system development. It is used as the primary specification of the **functional requirements** for the system, as the **basis for analysis** and design, as **an input to iteration planning**, as the **basis of defining test cases** and as the **basis for user documentation**.

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# How to do use case analysis?

# Two kinds of use case techniques

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## 1. Visual Modeling

Use case diagram: typically used in conjunction with the textual use case.

## 2. Textual Document Templates

### **Note:**

While a use case itself might drill into a lot of detail about every possibility, a use-case diagram can help provide a higher-level view of the system.

It has been said before that "Use case diagrams are the blueprints for your system". They provide the simplified and graphical representation of what the system must actually do.

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# Use Case Diagram

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A use-case diagram is used to **graphically depict a subset of the use-case model to simplify communications.**

**Much of the use-case model is in fact textual,** with the text captured in the use-case specifications that are associated with each use-case model element. These specifications describe the flow of events of the use case.



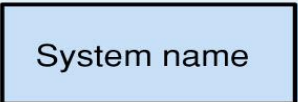

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# Use Case Diagram

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1. A **use case diagram** at its simplest is a representation of a user's interaction with the system and depicting the specifications of a use case.
  2. A use case diagram can **portray** the different types of users of a system and the various ways that they interact with the system.
  3. A use case diagram **summarizes** all of the use cases (for the part of the system being modeled) together in one picture
  4. Typically, the use case diagram is **drawn early** on in the SDLC.
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# Elements of a Use Case Diagram

Term and Definition	Symbol
<p>An actor</p> <ul style="list-style-type: none"><li>■ Is a person or system that derives benefit from and is external to the system.</li><li>■ Is labeled with its role.</li><li>■ Can be associated with other actors by a specialization/superclass association, denoted by an arrow with a hollow arrowhead.</li><li>■ Is placed outside the system boundary.</li></ul>	 <p>Actor role name</p>
<p>A use case</p> <ul style="list-style-type: none"><li>■ Represents a major piece of system functionality.</li><li>■ Can extend another use case.</li><li>■ Can use another use case.</li><li>■ Is placed inside the system boundary.</li><li>■ Is labeled with a descriptive verb–noun phrase.</li></ul>	 <p>Use case name</p>
<p>A system boundary</p> <ul style="list-style-type: none"><li>■ Includes the name of the system inside or on top.</li><li>■ Represents the scope of the system.</li></ul>	 <p>System name</p>
<p>An association relationship</p> <ul style="list-style-type: none"><li>■ Links an actor with the use case(s) with which it interacts.</li></ul>	

## More Words on Actor

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An actor might be a person, a company or organization, a computer program, or a computer system — hardware, software, or both.

They are not part of the system and are situated outside of the system boundary.

Actors may be both at input and output ends of a use case.

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# Relationships in Use Case Diagram

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You can now model the interactions between the users and the system by creating the relationships between the actors and the use cases.

1. Association
  2. Include (Use)
  3. Extend
  4. Generalization
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# Association Relationship

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A Use Case diagram illustrates a set of use cases for a system, i.e. the actors and the relationships between the actors and use cases.

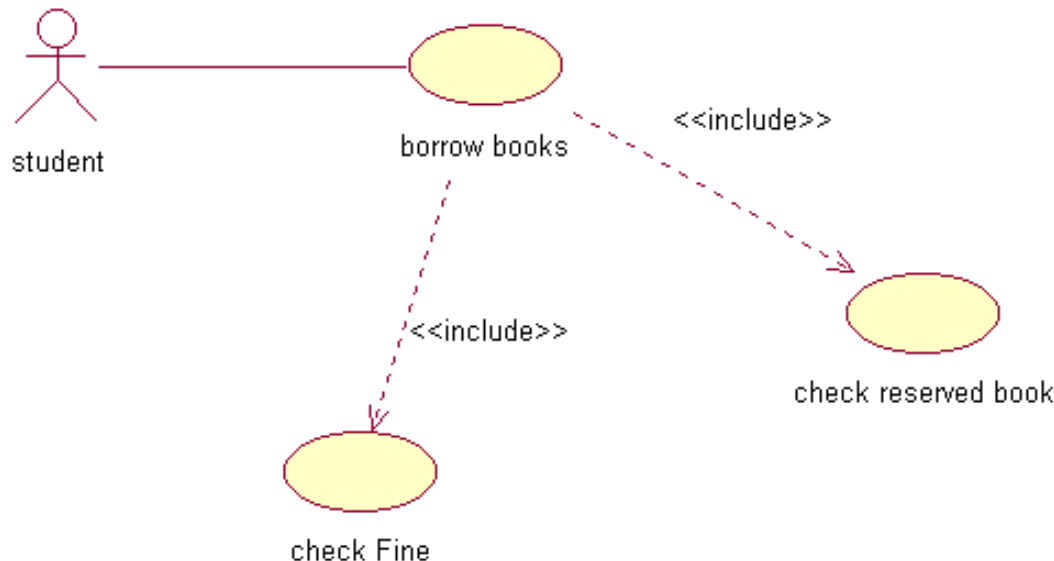


# Include Relationship

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The include relationship adds ***additional functionality*** not specified in the base use case.

<<include>> is used to **include common behavior** from an included use case into a base use case in order to support re-use of common behavior.



## Note:

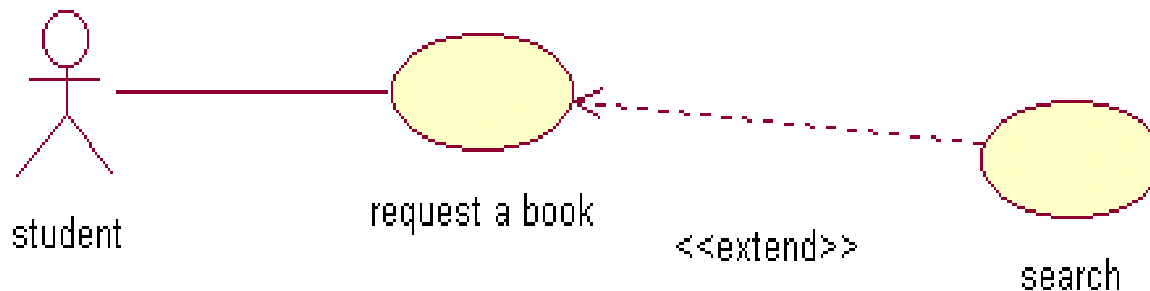
An include relationship connects a base use case (i.e. borrow books) to an inclusion use case (i.e. check Fine). An include relationship specifies how behaviour in the inclusion use case is used by the base use case.

# Extend Relationship

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The extend relationships are important because they show ***optional functionality*** or system behavior.

<<extend>> is used to include **optional behavior** from an extending use case in an extended use case.



## Notes:

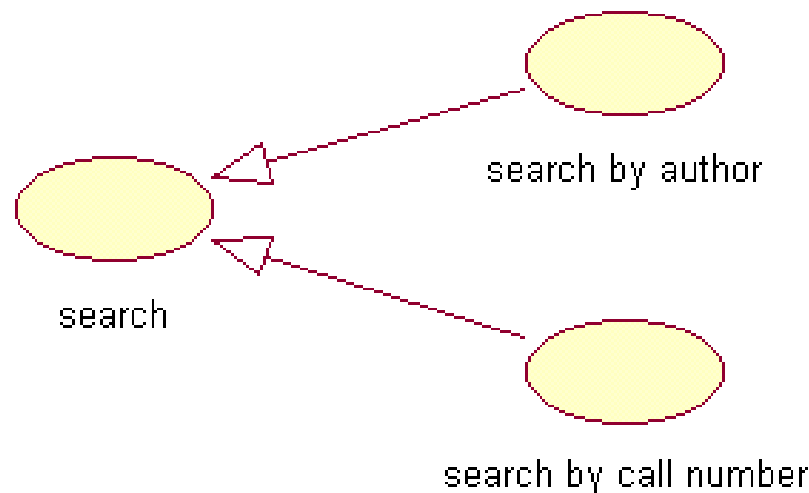
Notice the extend relationship between Request a book and Search. The extend relationship is significant because it shows optional functionality. If the student desires, he/she can search the book through the system. However, the student may only Request a book through the system without searching the book if the student knows the call number.

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# Generalization Relationship

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A generalisation relationship means that a child use case inherits the behaviour and meaning of the parent use case. The child may add or override the behaviour of the parent.

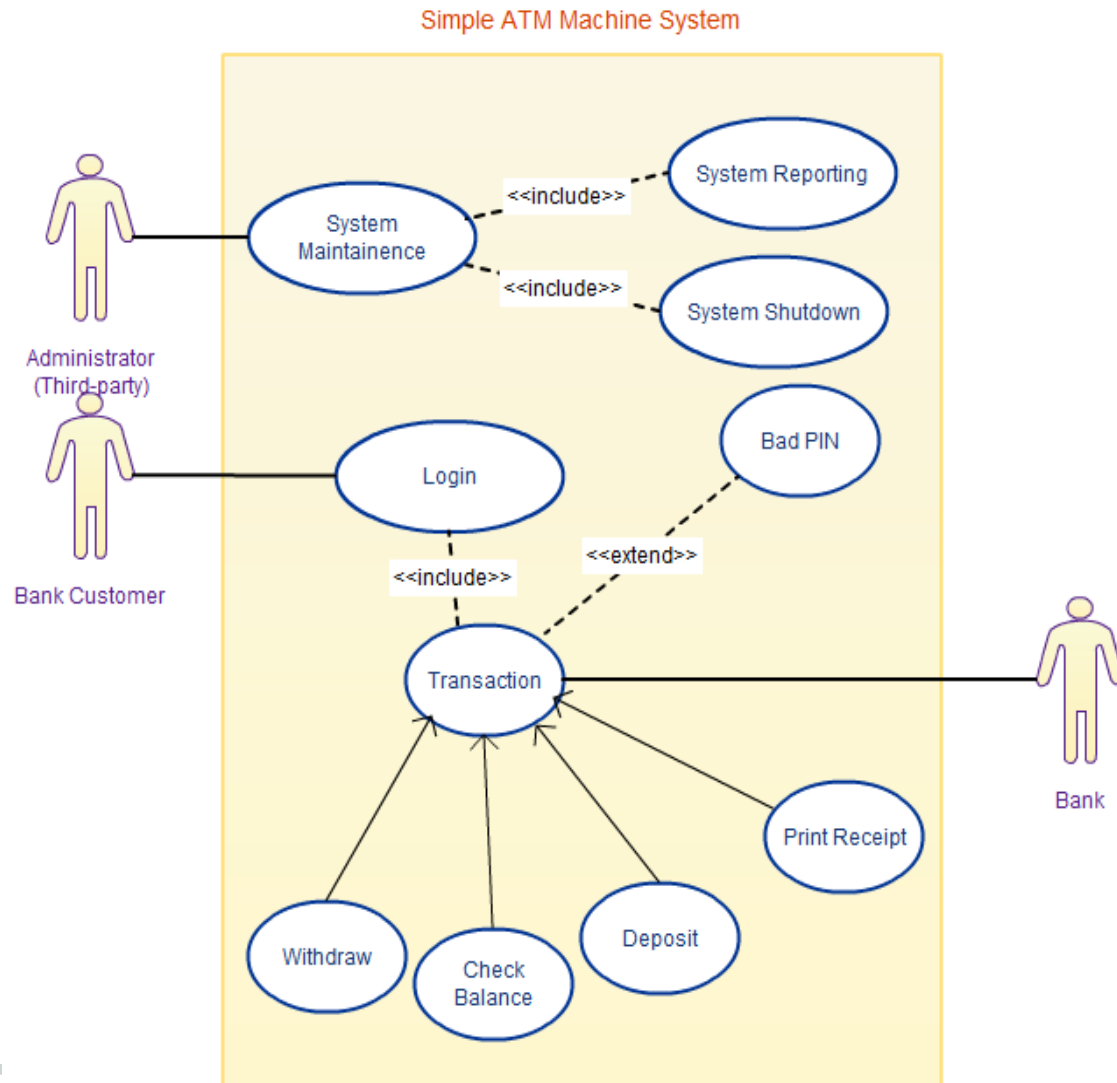


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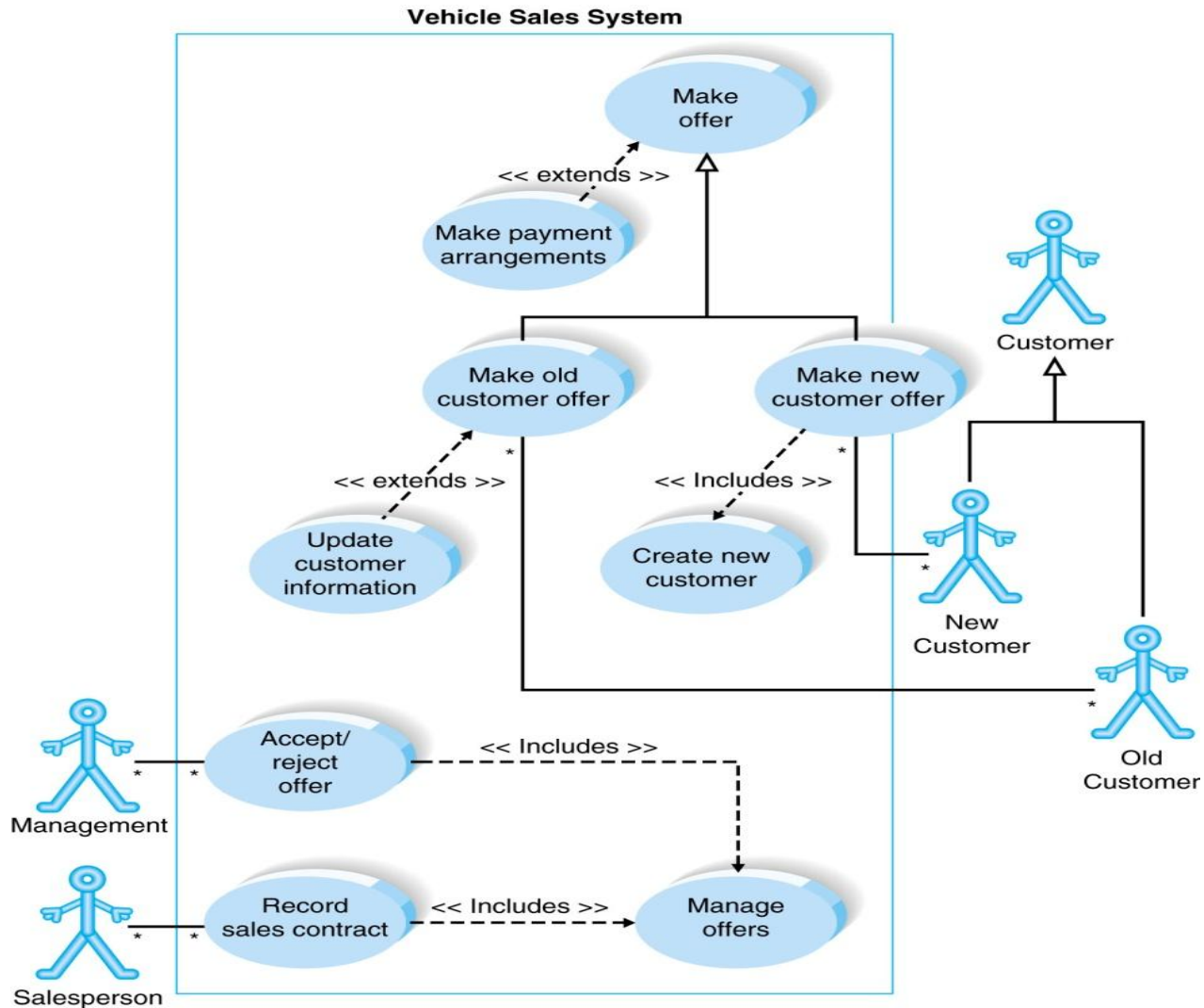
# Examples

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# An Example

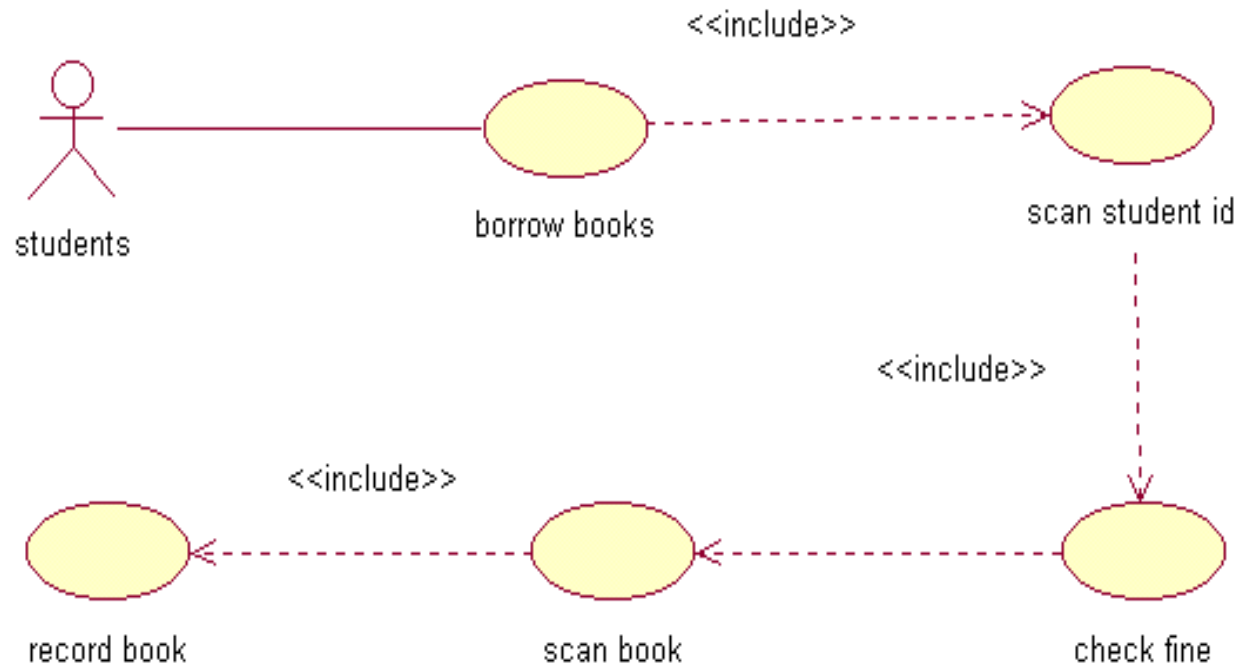


# Another Example



# More Examples

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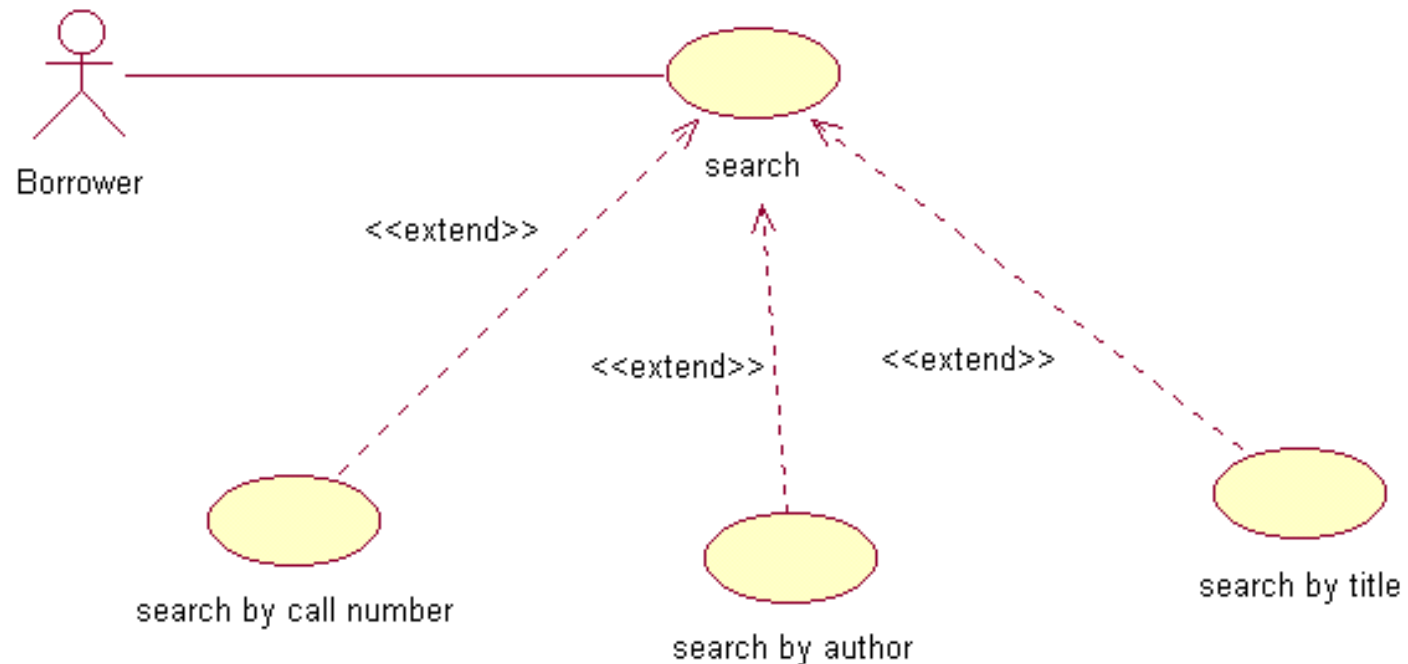
Bad!

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# More Examples

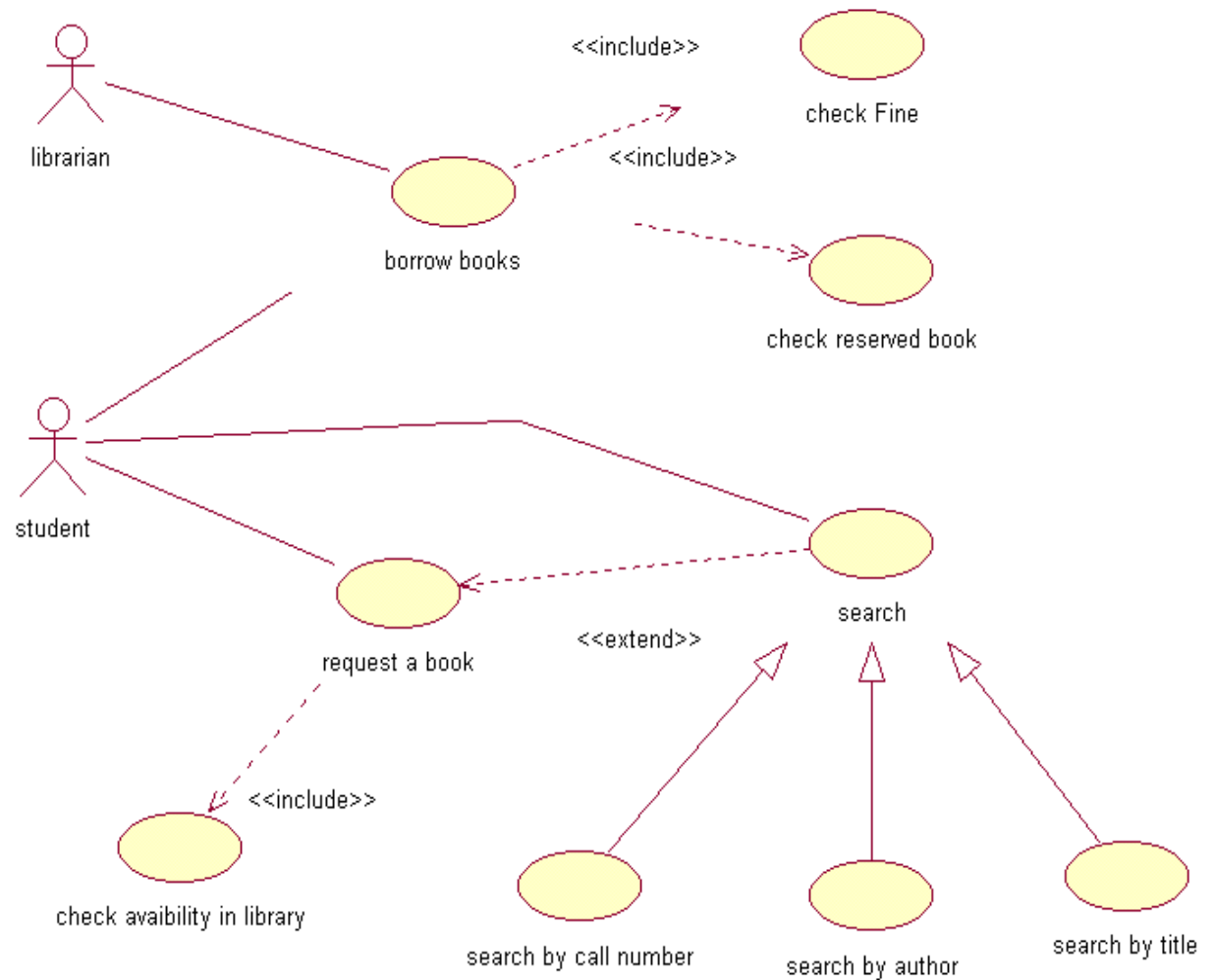
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Also Bad!

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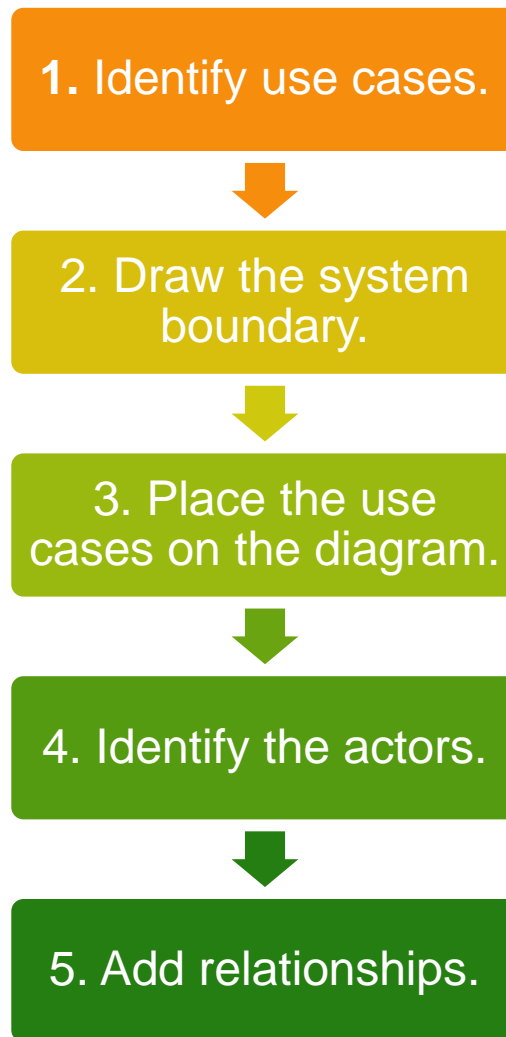
# More Examples



Good one!

# Steps in creating a use case diagram

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# How to identify use cases?

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There are two ways to identify Use Cases:

- Using the actors
    - identify the actors related to a system or organisation
    - for each actor, identify the processes it initiates or participates in
  - Using events
    - identify the external events that a system must respond to
    - relate the events to actors and use cases
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# Tips for use case diagram

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- Always structure and organize the use case diagram from the perspective of the actor.
  - Use cases should start off simple and at the highest view possible. Only then can they be refined and detailed further.
  - Use case diagrams are based upon functionality and thus should focus on the "what" and not the "how".
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# How to write use cases?

# Full-dressed template

## Major Parts:

1. Preconditions
2. Normal Course
3. Alternative Courses
4. Postconditions
5. Exceptions
6. Summary

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: <input checked="" type="checkbox"/> External <input type="checkbox"/> Temporal			
Preconditions: <div><div>1. The LCA identity is authenticated.</div><div>2. The LCA has necessary training and credentials on file.</div><div>3. The Chemical Supply database is up-to-date and on-line.</div></div>			
Normal Course: <div><div>1.0 Request a lawn chemical from the chemical supply warehouse.</div><div>1. The LCA specifies the desired lawn chemical</div><div>2. The system verifies the chemical is approved for usage</div><div>3. The system displays the quantity of the lawn chemical on hand</div><div>4. The LCA specifies the quantity needed</div><div>5. The system asks the LCA to confirm the request for the quantity needed or the quantity available (Alternative Course 1.1)</div><div>6. The system gives the LCA a Chemical Pick-up Authorization for the quantity requested</div><div>7. The system notifies the Chemical Supply Warehouse of the chemical pick-up</div><div>8. The system stores the Lawn Chemical Request in the Chemical Request database</div></div>		Information for Steps: <div><div>←</div>Chemical name or ID</div> <div><div>←</div>List of approved chemicals</div> <div><div>←</div>Quantity on hand</div> <div><div>←</div>Quantity needed</div> <div><div>←</div>Request confirmation</div> <div><div>→</div>Chemical Pick-up Authorization</div> <div><div>→</div>Chemical Pick-up Notice</div> <div><div>→</div>Lawn Chemical Request</div>	
Alternative Courses: <div><div>1.1 Quantity available is less than quantity needed (branch at step 5)</div><div>1. The system asks the LCA if he wants the quantity available or to cancel the request</div><div>2a. The LCA asks to take the quantity available</div><div>3a. The system changes the quantity requested to the quantity available</div><div>4a. The system gives the LCA a Chemical Pick-up Authorization for the quantity available</div><div>5a. The system notifies the Chemical Supply Warehouse of the chemical pick-up</div><div>6a. The system stores the Lawn Chemical Request in the Chemical Management System</div><div>7a. The system notifies Purchasing of the chemical outage</div><div>2b. The LCA asks to cancel the request</div><div>3b. The system terminates the use case</div></div>		<div><div>←</div>Request quantity available</div> <div><div>→</div>Chemical Pick-up Authorization</div> <div><div>→</div>Chemical Pick-up Notice</div> <div><div>→</div>Lawn Chemical Request</div> <div><div>→</div>Chemical Outage Notice</div> <div><div>←</div>Cancellation</div>	
Postconditions: <div><div>1. The Lawn Chemical Request is stored in the Chemical Management System.</div><div>2. The Chemical Pick-up Authorization is produced for the LCA.</div><div>3. The Chemical Supply Warehouse is notified of the chemical pick-up.</div><div>4. Purchasing is notified of chemical outage.</div></div>			
Exceptions: <div><div>E1: Chemical is no longer approved for use (occurs at step 2)</div><div>1. The system displays message, "That chemical is no longer approved for use"</div><div>2. The system asks the LCA if he wants to request another chemical or to exit</div><div>3a. The LCA asks to request another chemical</div><div>4a. The system starts Normal Course again</div><div>3b. The LCA asks to exit</div><div>4b. The system terminates the use case</div></div>			
Summary			
Inputs	Source	Outputs	Destination
Chemical name or ID List of approved chemicals Chemical quantity on hand Quantity needed Request confirmation Request quantity available or cancellation	LCA Lawn Chemicals Supply database Lawn Chemicals Supply database LCA LCA LCA	Chemical Pick-up Authorization Chemical Pick-up Notice  Lawn Chemical Request  Chemical Outage Notice	LCA  Chemical Supply Warehouse Chemical Request database Purchasing

# Alternative Use Case Formats

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

## Major parts:

1. Preconditions
2. Normal course
3. Postconditions
4. Exceptions

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: <input checked="" type="checkbox"/> External <input type="checkbox"/> Temporal		
Preconditions: <ol style="list-style-type: none"><li>1. The LCA identity is authenticated.</li><li>2. The LCA has necessary training and credentials on file.</li><li>3. The Chemical Supply datastore is up-to-date and on-line.</li></ol>		
Normal Course: <ol style="list-style-type: none"><li>1.0 Request a lawn chemical from the chemical supply warehouse.<ol style="list-style-type: none"><li>1. The LCA specifies a chemical needed and the quantity needed</li><li>2. The system lists chemical and quantity on hand from Chemical Supply datastore<ol style="list-style-type: none"><li>a. If the quantity on hand is less than the quantity needed, the LCA specifies the quantity he will take</li><li>b. Purchasing is notified of chemical shortage</li></ol></li><li>3. The system gives the LCA a Chemical Pick-up Authorization for the quantity requested</li><li>4. The system notifies the Chemical Supply Warehouse of the chemical pick-up</li><li>5. The system stores the Lawn Chemical Request in the Chemical Request datastore</li></ol></li></ol>		
Postconditions: <ol style="list-style-type: none"><li>1. The Lawn Chemical Request is stored in the Chemical Management System.</li><li>2. The Chemical Pick-up Authorization is produced for the LCA.</li><li>3. The Chemical Supply Warehouse is notified of the chemical pick-up.</li><li>4. Purchasing is notified of chemical outage.</li></ol>		
Exceptions: E1: Chemical is no longer approved for use (occurs at step 1) <ol style="list-style-type: none"><li>1. The system displays message. "That chemical is no longer approved for use"</li><li>2. The system asks the LCA if he wants to request another chemical or to exit<ol style="list-style-type: none"><li>3a. The LCA asks to request another chemical<ol style="list-style-type: none"><li>4a. The system starts Normal Course again</li></ol></li><li>3b. The LCA asks to exit<ol style="list-style-type: none"><li>4b. The system terminates the use case</li></ol></li></ol></li></ol>		

# Steps in writing use cases

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# Tips for Writing Use Cases

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## **1. Based on a goal.**

A use case describes how an actor uses the system to achieve a goal.

## **2. Complete or not complete.**

When an actor has performed the steps in a use case, the goal should be either 100% complete or 0% complete.

## **3. One person, one place, one time, one event.**

Try to write use cases that describe how one actor responds to one event in one place at one time.

## **4. Six to ten steps.**

Try to keep the main success scenario (aka primary flow) of a use case between six and ten steps. Use cases should make requirements easier to comprehend.

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# Summary

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Focus on use case analysis with two types of techniques:

## 1. Use case diagram

- a. Components: actors, relationships, use case, system boundary
- b. Exmples

## 2. Textual use case:

- a. Full dressed template
  - b. Alternative template
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# Take-away messages

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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.
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# Thank you!

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**Questions?**

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