

LECTURE 4

REQUIREMENTS

ANALYSIS

LEK HSIANG HUI

LEARNING OBJECTIVES

At the end of this lecture, you should understand:

- The activities in the analysis phase
- How to produce use case descriptions
- How to apply advanced use case features to use case diagrams and use case descriptions
- How to organize use cases in use case diagram

INTRODUCTION TO ANALYSIS PHASE

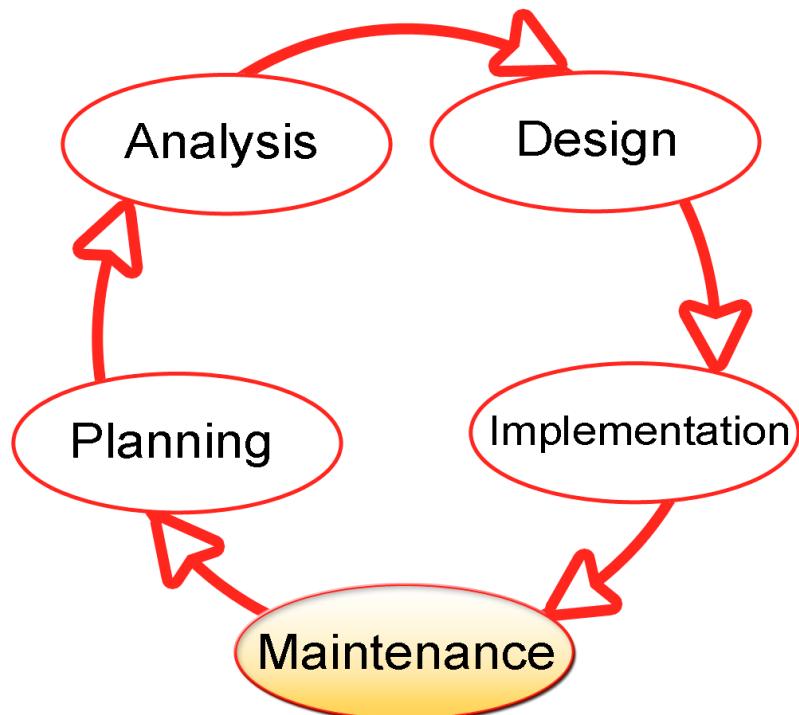
Introduction to Analysis Phase

Behavioral Modeling using Use Case Description

Advanced Use-Case Features

Organizing Use Cases

ANALYSIS PHASE



We can generalize SDLC into 5 different phases:

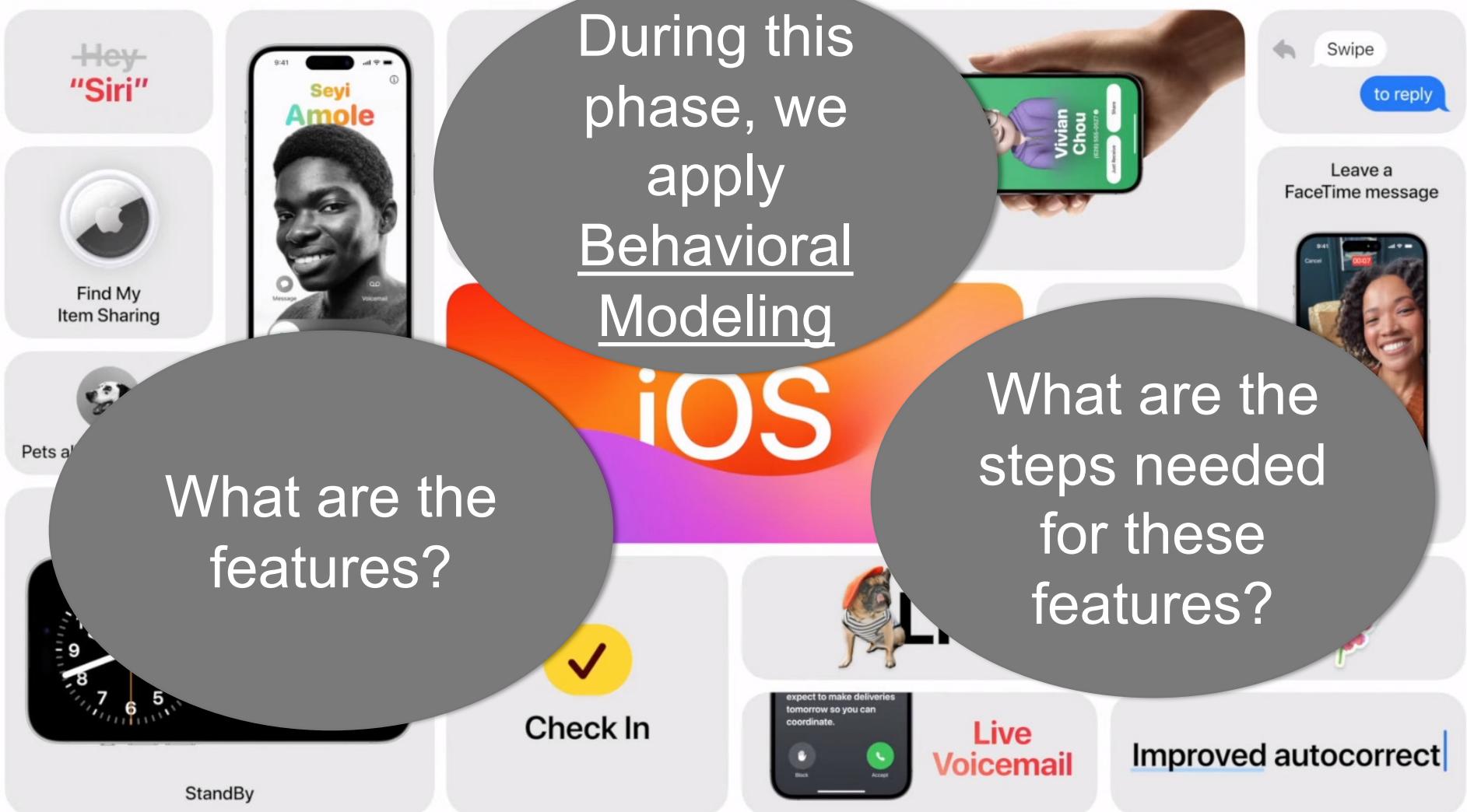
1. Planning
2. **Analysis**
3. Design
4. Implementation
5. Support/Maintenance

BEHAVIORAL MODELING

What are the features?

During this phase, we apply Behavioral Modeling

What are the steps needed for these features?



USE CASES

Use cases and use case diagrams are tools for discovering high-level system functionality

- However, they only provides very limited information

The next step is to convert use cases into **use case descriptions**

BEHAVIORAL MODELING USING USE CASE DESCRIPTION



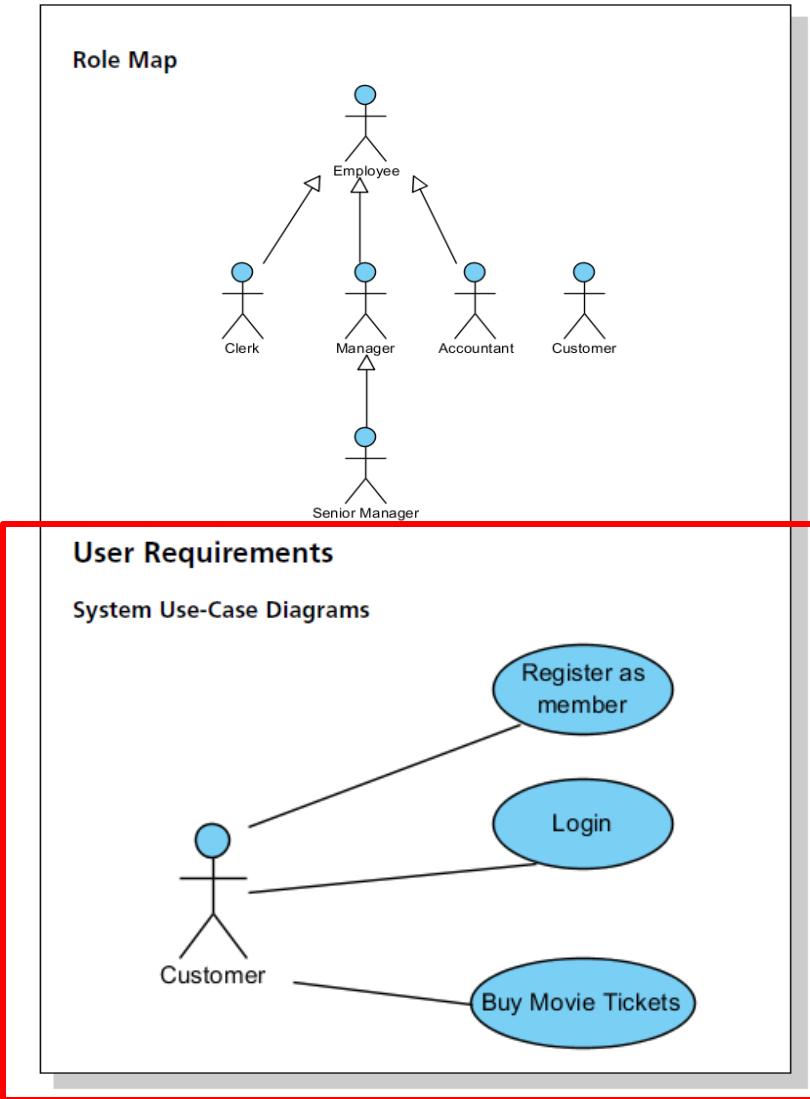
Introduction to Analysis Phase

Behavioral Modeling using Use Case Description

Advanced Use-Case Features

Organizing Use Cases

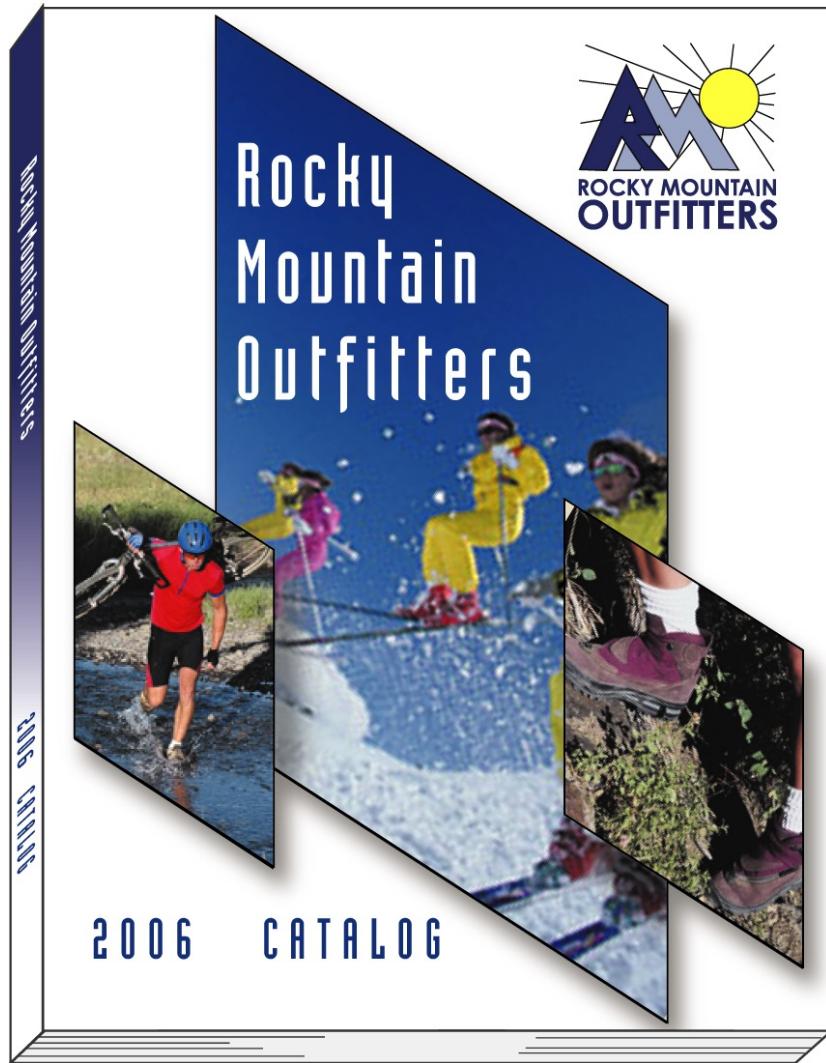
SYSTEM USE CASES



What we have
covered in
Lecture 3

Next thing is to
convert the
System Use
Cases to Use
Case Description

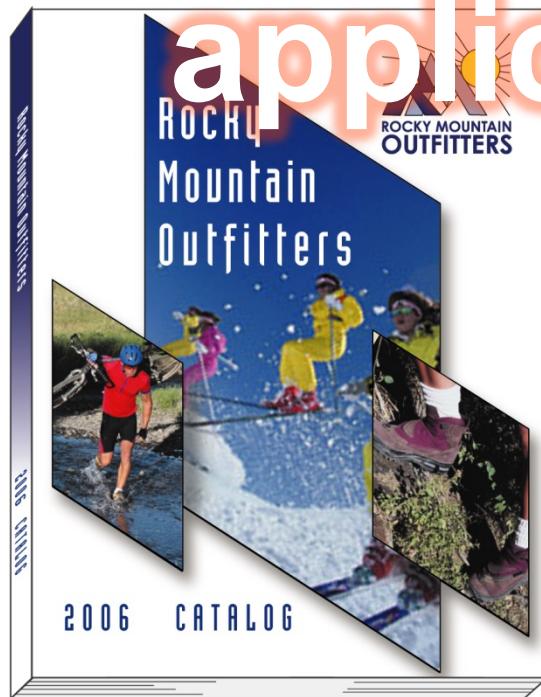
ROCKY MOUNTAIN OUTFITTER CASE STUDY

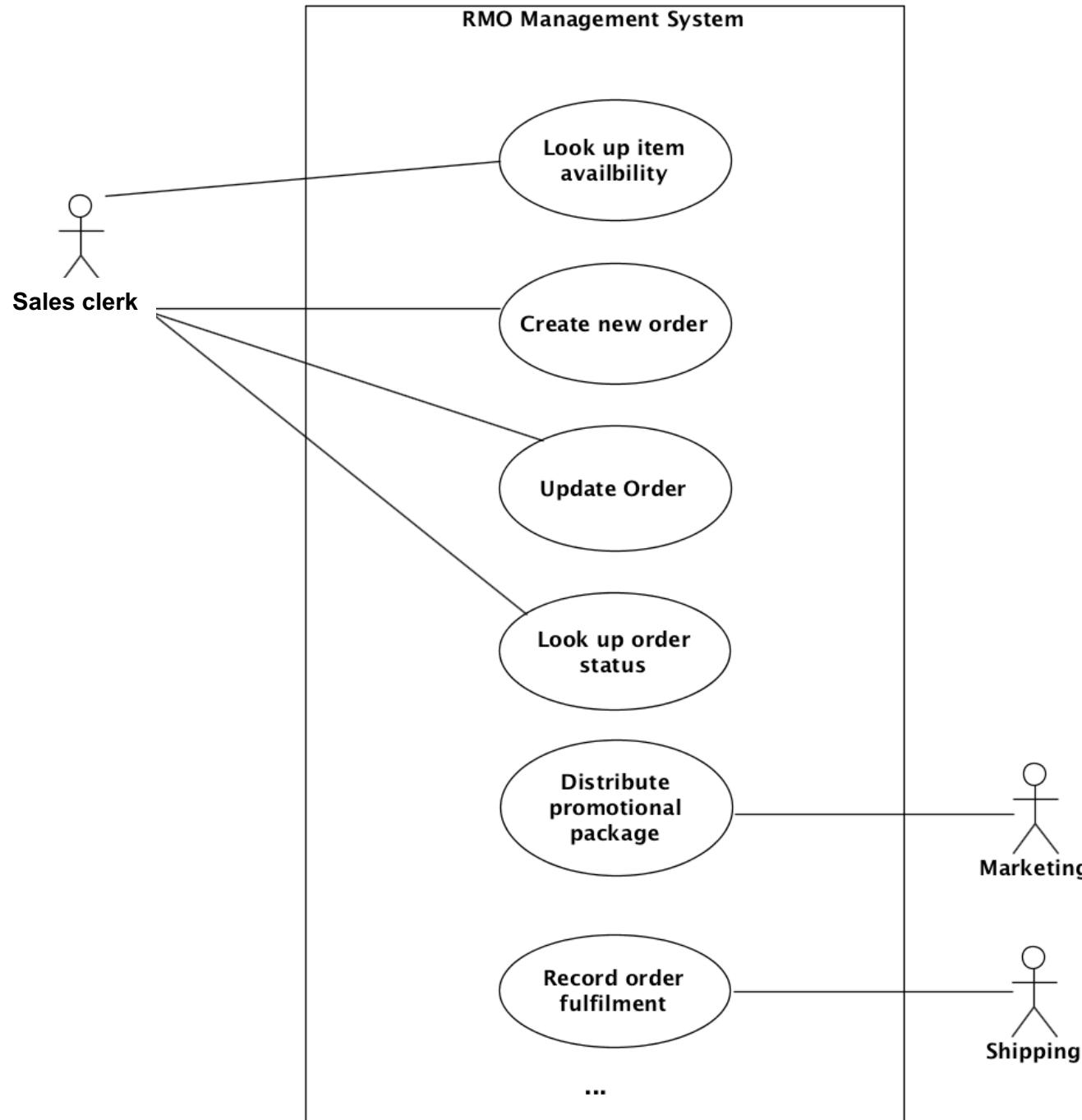


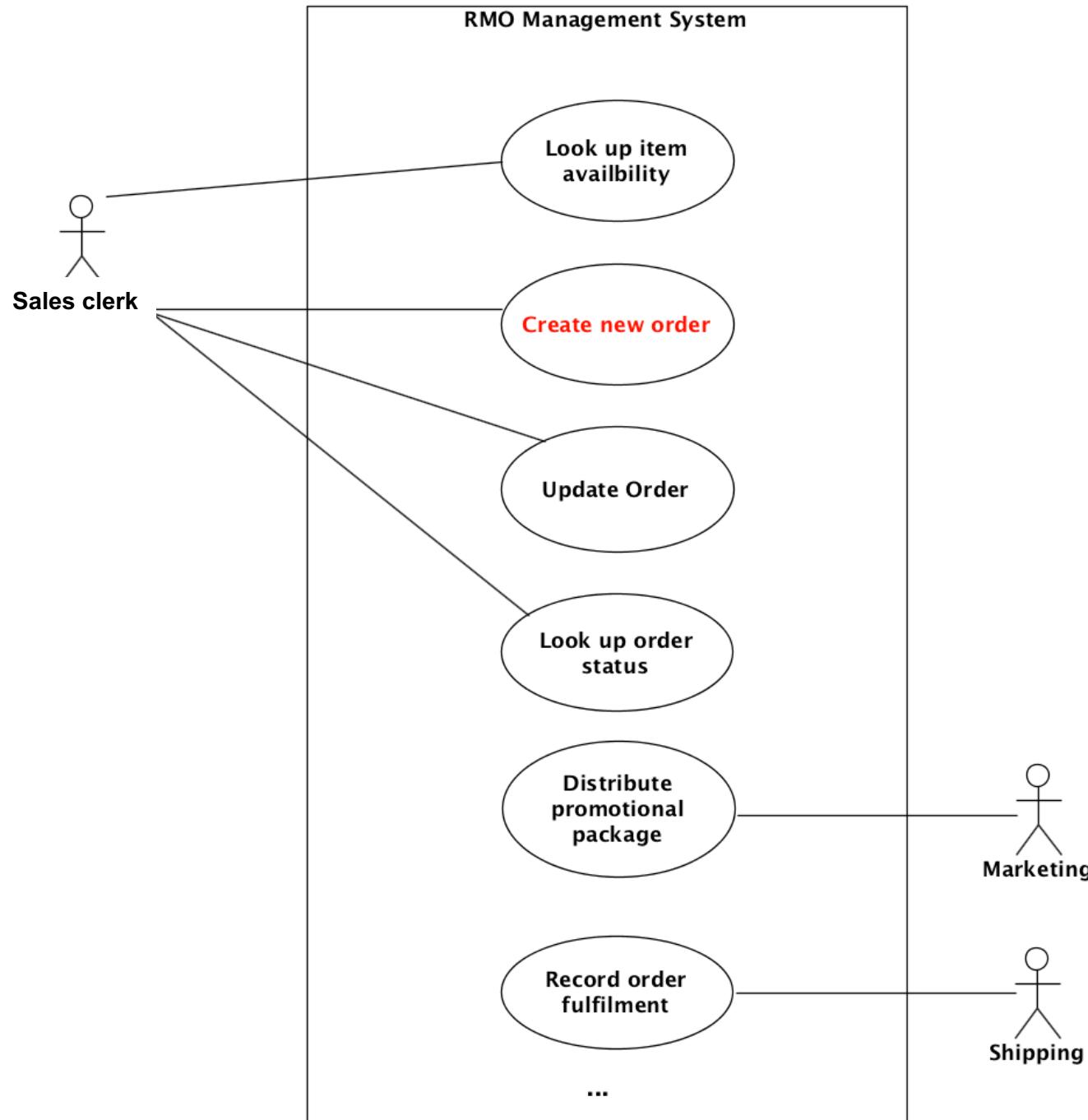
Rocky Mountain Outfitters (RMO) is a sports clothing distributor

- Significant regional distributor
- Employs more than 600 people
- \$100 million annual sales

What do you think are
some of the use cases
applicable to RMO?







CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order	
Triggering event	Clerk wants to create a new telephone order	
Brief description	When customer calls in to order, the order clerk and system verify customer information, create a new order, add items to the order, verify payment, create the order transaction, and finalize the order.	
Actors	Telephone sales clerk	
Pre-conditions	-	
Post-conditions	Order and order line items must be created.	
Flow of events	Actor	System

Exception conditions	...	

CREATE NEW ORDER

USE CASE DESCRIPTION

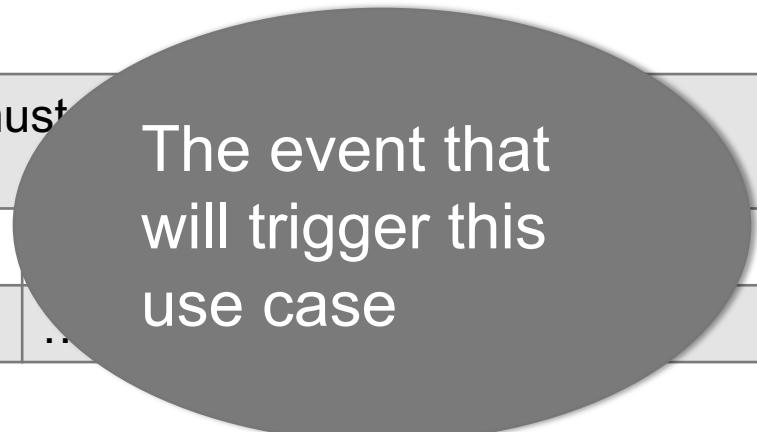
Use case name	Create new order				
Triggering event	Clerk wants to create a new telephone order				
Brief description	When customer calls in to order, the order clerk and system verify customer information, create a new order, add items to the order, verify payment, create the order transaction, and finalize the order.				
Actors	Telephone sales clerk				
Pre-conditions	-				
Post-conditions	Order and order line items must be created.				
Flow of events	<table border="1"><thead><tr><th>Actor</th><th></th></tr></thead><tbody><tr><td>...</td><td>...</td></tr></tbody></table>	Actor	
Actor					
...	...				
Exception conditions	...				

The use case
in the use
case diagram

CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order
Triggering event	Clerk wants to create a new telephone order
Brief description	When customer calls in to order, the order clerk and system verify customer information, create a new order, add items to the order, verify payment, create the order transaction, and finalize the order.
Actors	Telephone sales clerk
Pre-conditions	-
Post-conditions	Order and order line items must be created.
Flow of events	Actor
	...
Exception conditions	...



The event that will trigger this use case

CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order		
Triggering event	Clerk wants to create a new telephone order		
Brief description	When customer calls in to order, the order clerk and system verify customer information, create a new order, add items to the order, verify payment, create the order transaction, and finalize the order.		
Actors	Telephone sales clerk		
Pre-conditions	-		
Post-conditions	Order and order line item		
Flow of events	<table border="1"><thead><tr><th>Actor</th></tr></thead><tbody><tr><td>...</td></tr></tbody></table>	Actor	...
Actor			
...			
Exception conditions	...		



Give a more complete description to supplement the Triggering Event

CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order
Triggering event	Clerk wants to create a new telephone order
Brief description	When customer calls in to order, the order clerk and system verify customer information, create a new order, add items to the order, verify payment, create the order transaction, and finalize the order.
Actors	Telephone sales clerk
Pre-conditions	-
Post-conditions	Order and order line items
Flow of events	Actor
Exception conditions	...

The actor that will execute the use case (i.e. the person/system that will be interacting directly with the system)

CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order	
Triggering event	Clerk wants to create a new order.	
Brief description	When customer calls in to order, verify customer information, create a new order record, add items to the order, verify payment, create the order transaction, and finalize the order.	
Actors	Telephone sales clerk	
Pre-conditions	-	
Post-conditions	Order and order line items must be created.	
Flow of events	Actor	System

Exception conditions	...	

This defines the state of the system before this use case can be executed

CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order
Triggering event	Clerk wants to create a new order.
Brief description	When customer calls in to order, verify customer information, create a new order record, add items to the order, verify payment, create the order transaction, and finalize the order.
Actors	Telephone sales clerk
Pre-conditions	-
Post-conditions	Order and order line items must be created.
Flow of events	Actor
	...
System	
Exception conditions	...

This defines the state of the system after this use case is executed

CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order	
Triggering event	Clerk wants to create a new order.	
Brief description	When customer calls in to order, the clerk will ask for order information, verify customer information, create a new order, add items to the order, verify payment, create the order transaction, and finalize the order.	
Actors	Telephone sales clerk	
Pre-conditions	-	
Post-conditions	Order and order line items must be created.	
Flow of events	Actor	System

Exception conditions	...	

Series of interaction between the actor and the system

Use case name	Create new order	
...	...	
Flow of events	<p>Actor</p> <ol style="list-style-type: none"> 1. Enters customer details (name, phone number) supplied by customer 2. Initiates the creation of a new order 3. Searches for item that the customer wants 4. Adds item to order 5. Repeat step 3 and 4 until all items are added to the order 6. Clicks on “Complete Order” 7. Enters payment details (cc number, expiry date, CVV) and payment mode 	<p>System</p> <ol style="list-style-type: none"> 1.1 Verifies customer information 2.1 Creates a new order 3.1 Displays item information 4.1 Adds order item 6.1 Displays order summary 7.1 Verifies payment details 7.2 Create order transaction 7.3 Sends order confirmation email

FLOW OF EVENTS

We focus mainly on the interaction between the **actor** and the **system**

- Note that in this case, the actor (clerk) is just a proxy on the customer's behalf
- Even though the customer is the one telling the clerk the necessary information, the clerk is the one interacting with the system
- So the clerk (not the customer) is the actor

The flow of events focuses on documenting the steps

FLOW OF EVENTS

Other things to take note:

- The steps must be exhaustive
- The steps must also connected with each other in a logical manner
- For e.g., before the clerk adds the item, the system should show the item details (so that clerk is sure that it is the right item)
- Note that these steps will be used by the system design process later so it is important to be as detailed as possible

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

Actor	System
1. Searches for listings using keywords	

Another example

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
2. Selects an item, input quantity and add to shopping cart	

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
2. Selects an item, input quantity and add to shopping cart	2.1 Updates the current shopping cart by adding the item

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
2. Selects an item, input quantity and add to shopping cart	2.1 Updates the current shopping cart by adding the item
3. Repeat step 1 and 2 until all the items have been added	

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
2. Selects an item, input quantity and add to shopping cart	2.1 Updates the current shopping cart by adding the item
3. Repeat step 1 and 2 until all the items have been added	
4. Initiates check out	

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
2. Selects an item, input quantity and add to shopping cart	2.1 Updates the current shopping cart by adding the item
3. Repeat step 1 and 2 until all the items have been added	
4. Initiates check out	4.1 Displays item summary page

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

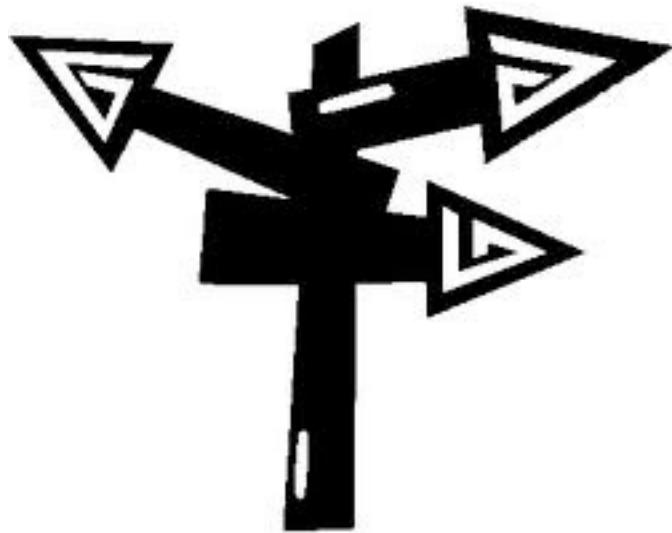
Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
2. Selects an item, input quantity and add to shopping cart	2.1 Updates the current shopping cart by adding the item
3. Repeat step 1 and 2 until all the items have been added	
4. Initiates check out	4.1 Displays item summary page
5. Enters credit card details (cc number, expiry date, CVV) and complete order	

SYSTEM USE CASE OF A TYPICAL E-COMMERCE SITE: BUY ITEMS

Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
2. Selects an item, input quantity and add to shopping cart	2.1 Updates the current shopping cart by adding the item
3. Repeat step 1 and 2 until all the items have been added	
4. Initiates check out	4.1 Displays item summary page
5. Enters credit card details (cc number, expiry date, CVV) and complete order	5.1 Displays order confirmation 5.2 Creates order transaction 5.3 Sends order confirmation email

ALTERNATE FLOW

ALTERNATE FLOWS



For documenting conditional scenarios

- More than one possible option
- User not logged in
- Depending on the customer type, system may want to react differently (sms if number is available, email if email is available, etc)
- etc

BUY ITEMS

Actor	Want to handle differently depending whether the user is logged in
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
2. Selects an item, input quantity and add to shopping cart	2.1 Updates the current shopping cart by adding the item
3. Repeat step 1 and 2 until all the items have been added	
4. Initiates check out	4.1 Displays item summary page
5. Enters credit card details (cc number, expiry date, CVV) and complete order	5.1 Displays order confirmation 5.2 Creates order transaction 5.3 Sends order confirmation email

BUY ITEMS

Actor	Want to handle differently depending whether the user is logged in
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
...	...
4. Initiates check out	4.1 Displays item summary page
5. Enters credit card details (cc number, expiry date, CVV) and complete order	5.1 Displays order confirmation 5.2 Creates order transaction 5.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords	1.1 Displays the listing associated with keywords
...	...
4. Initiates check out	4.1 Displays item summary page
...	...
6. Enters credit card details (cc number, expiry date, CVV) and complete order	6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 4. Initiates check out ... 6. Enters credit card details (cc number, expiry date, CVV) and complete order	1.1 Displays the listing associated with keywords ... 4.1 Displays item summary page ... 6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 4. Initiates check out 5. If the buyer is logged in, go to step 6 ... 6. Enters credit card details (cc number, expiry date, CVV) and complete order	1.1 Displays the listing associated with keywords ... 4.1 Displays item summary page ... 6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 5. If the buyer is logged in, go to step 6 ... 6. Enters credit card details (cc number, expiry date, CVV) and complete order	1.1 Displays the listing associated with keywords ... 6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 5. If the buyer is logged in, go to step 6 5a. If the buyer is not logged in, but is not a member, he/she enters his/her personal details to register as a new member ... 6. Enters credit card details (cc number, expiry date, CVV) and complete order	1.1 Displays the listing associated with keywords 6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 5. If the buyer is logged in, go to step 6 5a. If the buyer is not logged in, but is not a member, he/she enters his/her personal details to register as a new member	1.1 Displays the listing associated with keywords
5b. If the buyer is not logged in, but is a member, he/she enters login details	...
6. Enters credit card details (cc number, expiry date, CVV) and complete order	6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 5. If the buyer is logged in, go to step 6 5a. If the buyer is not logged in, but is not a member, he/she enters his/her personal details to register as a new member	1.1 Displays the listing associated with keywords ... 5a.1 Creates a new member record and save the record in database
5b. If the buyer is not logged in, but is a member, he/she enters login details	...
6. Enters credit card details (cc number, expiry date, CVV) and complete order	6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 5. If the buyer is logged in, go to step 6 5a. If the buyer is not logged in, but is not a member, he/she enters his/her personal details to register as a new member 5b. If the buyer is not logged in, but is a member, he/she enters login details 6. Enters credit card details (cc number, expiry date, CVV) and complete order	1.1 Displays the listing associated with keywords ... 5a.1 Creates a new member record and save the record in database 5a.2 Logs the user into the system and display the form for user to enter credit card details ... 6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 5. If the buyer is logged in, go to step 6 5a. If the buyer is not logged in, but is not a member, he/she enters his/her personal details to register as a new member	1.1 Displays the listing associated with keywords ... 5a.1 Creates a new member record and save the record in database 5a.2 Logs the user into the system and display the form for user to enter credit card details
5b. If the buyer is not logged in, but is a member, he/she enters login details	5b.1 Verifies the login details and log the user into the system ...
6. Enters credit card details (cc number, expiry date, CVV) and complete order	6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

BUY ITEMS

Actor	System
1. Searches for listings using keywords ... 5. If the buyer is logged in, go to step 6	1.1 Displays the listing associated with keywords ...
5a. If the buyer is not logged in, but is not a member, he/she enters his/her personal details to register as a new member	5a.1 Creates a new member record and save the record in database 5a.2 Logs the user into the system and display the form for user to enter credit card details
5b. If the buyer is not logged in, but is a member, he/she enters login details	5b.1 Verifies the login details and log the user into the system 5b.2 Logs the user into the system and display the form for user to enter credit card details
6. Enters credit card details (cc number, expiry date, CVV) and complete order	6.1 Displays order confirmation 6.2 Creates order transaction 6.3 Sends order confirmation email

CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order	
Triggering event	Create new telephone order.	
Brief description	When customer calls, get customer information, create order, verify payment, and then process the order.	
Actors	Telephone sales clerk	
Pre-conditions	-	
Post-conditions	Order and order line items must be created.	
Flow of events	Actor	System

Exception conditions	...	

Unexpected conditions which we cannot proceed further (i.e. cannot handle by alternate flow and have to terminate)

Use case name	Create new order	Credit card verification failed
...	...	
Flow of events	<p>Actor</p> <ol style="list-style-type: none"> 1. Enter customer details supplied by customer 2. Initiates the creation of a new order 3. Searches for item that the customer wants 4. Adds item to order 5. Repeat step 3 and 4 until all items are added to the order 6. Clicks on “Complete Order” 7. Enters payment details (cc number, expiry date, CVV) and payment mode 	<p>System</p> <ol style="list-style-type: none"> 1.1 Verifies customer information 2.1 Creates a new order 3.1 Displays item information 4.1 Adds order item 6.1 Displays order summary 7.1 Verifies payment details 7.2 Create order transaction 7.3 Sends order confirmation

CREATE NEW ORDER

USE CASE DESCRIPTION

Use case name	Create new order				
Triggering event	Clerk wants to create				
Brief description	When customer calls, verify customer info, enter the order, verify payment, finalize the order.				
Actors	Telephone sales clerk				
Pre-conditions	-				
Post-conditions	Order and order line items created				
Flow of events	<table border="1"><thead><tr><th>Actor</th><th>System</th></tr></thead><tbody><tr><td>...</td><td>...</td></tr></tbody></table>	Actor	System
Actor	System				
...	...				
Exception conditions	7.1 Credit card verification failed				

Why we have to terminate in this case?

Because verification is done with the bank later on (by that time the user might no longer be on that screen)

EXCEPTION CONDITIONS

Things that can be resolved by alternate flow should **not** be exception conditions

- When the exception conditions happen, the use case terminates immediately
- Examples of exception conditions: credit card payment failed, email notification failed to send (for a mailing list blast use case), more than 4 invalid login attempts, etc

Note that you must provide the **step number** where this exception will happen (mainly on the system column)

USE CASE DESCRIPTION

The text documentation may be augmented with:

- Related artifacts e.g. User Interface, Prompts and Messages, Business Rules, Class Diagrams, Information Items, Decision tables/trees

RELATED ARTIFACT

RELATED ARTIFACTS

The BRD also contains a “Related Artifacts” section where you can use to provide more information about some points in the use case

- E.g. One of the steps says “System validates eligibility”
- You want to inform what qualifies as eligible → add this in the related artifacts

RELATED ARTIFACTS

Benefits:

- Separate the details from the main use case
- Makes the use case description more complete

3 possible techniques

- Decision Tables
- Decision Tree
- Condition/Response Table

EXAMPLE OF A USE CASE WITH A DECISION TABLE

System use case: **Process Life Insurance Application**

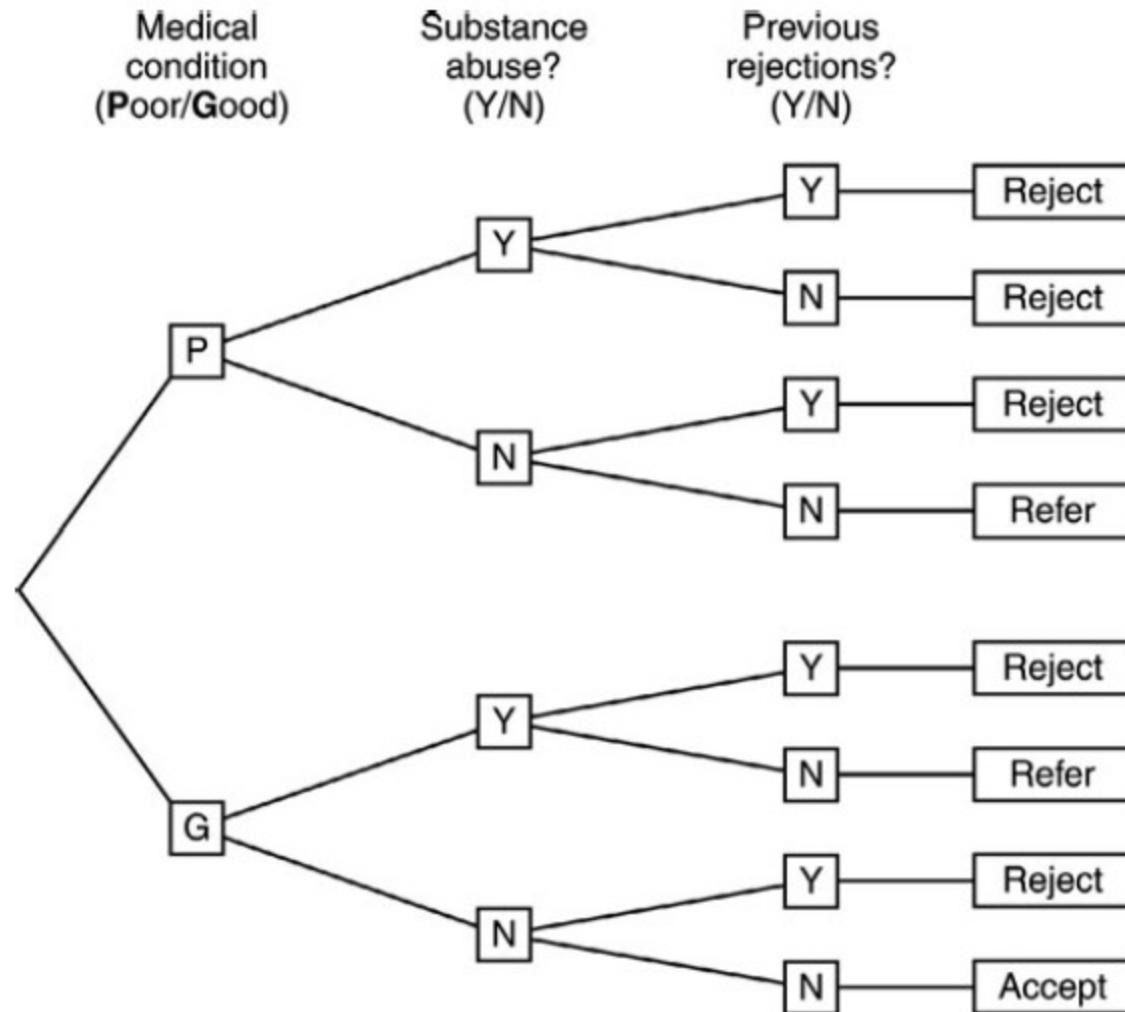
Actor	System
1. Enters application information ...	1.1 Validates eligibility (refer to section 12.1) ...

EXAMPLE OF A USE CASE WITH A DECISION TABLE

12.1 Validate Eligibility Decision Table

		1	2	3	4	5	6	7	8
CONDITION	Medical Condition (Poor/ Good/)	P	P	P	P	G	G	G	G
	Substance Abuse? (Y/N)	Y	Y	N	N	Y	Y	N	N
	Previous Rejections? (Y/N)	Y	N	Y	N	Y	N	Y	N
ACTION	Accept								X
	Reject	X	X	X		X		X	
	Refer				X		X		

DECISION TREES



CONDITION/RESPONSE TABLE

Actor	System
... 10. Enters income details 10.1 Determines tax bracket (see Appendix A) ...

Appendix A:

Tax bracket condition/response table:

Condition	Response
Under minimum	No tax payable
Minimum-\$18,000	Tax bracket A
\$18,000.01-\$60,000	Tax bracket B
\$60,000.01-\$500,000	Tax bracket C
Over \$5000,000	Tax bracket D

ADVANCED USE-CASE FEATURES

Introduction to Analysis Phase

Behavioral Modeling using Use Case Description

Advanced Use-Case Features

Organizing Use Cases

ADVANCED USE-CASE FEATURES

UNIFIED
MODELING
LANGUAGE



- UML also provides some advanced use-case features
- Increases reusability

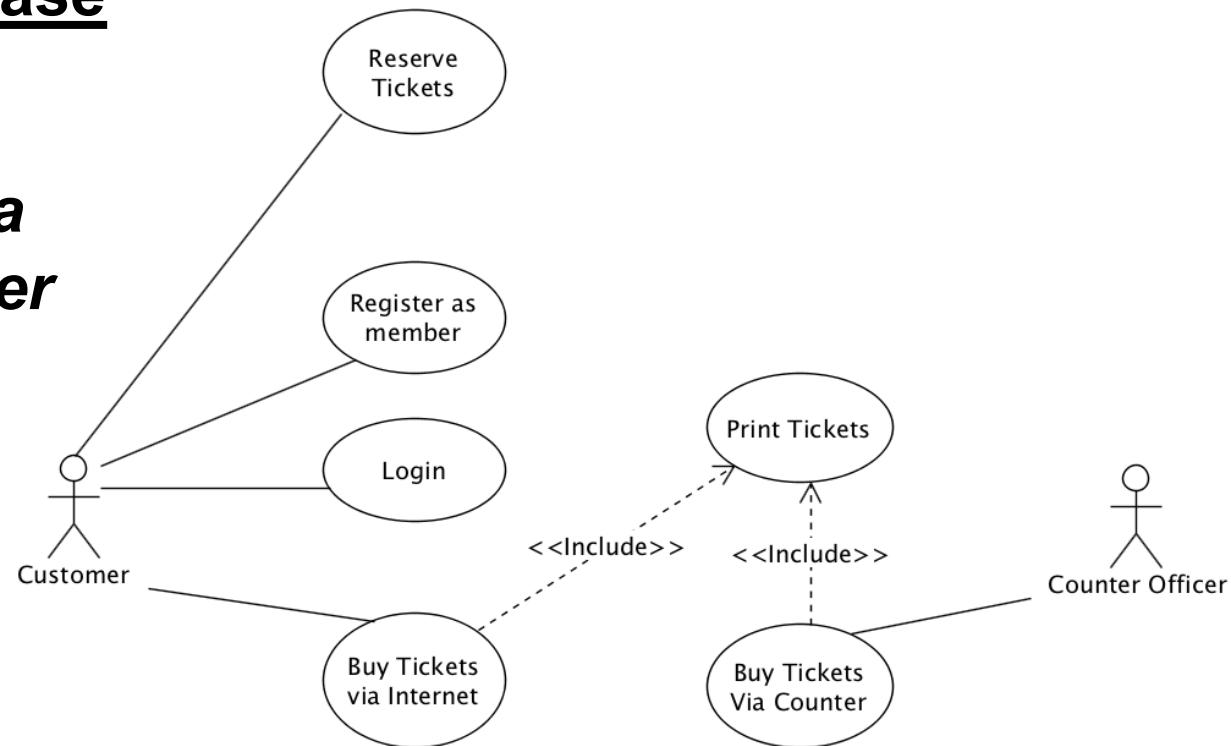
INCLUDE

An including use case invokes the included use case

Buy Tickets Via Internet/Counter

includes

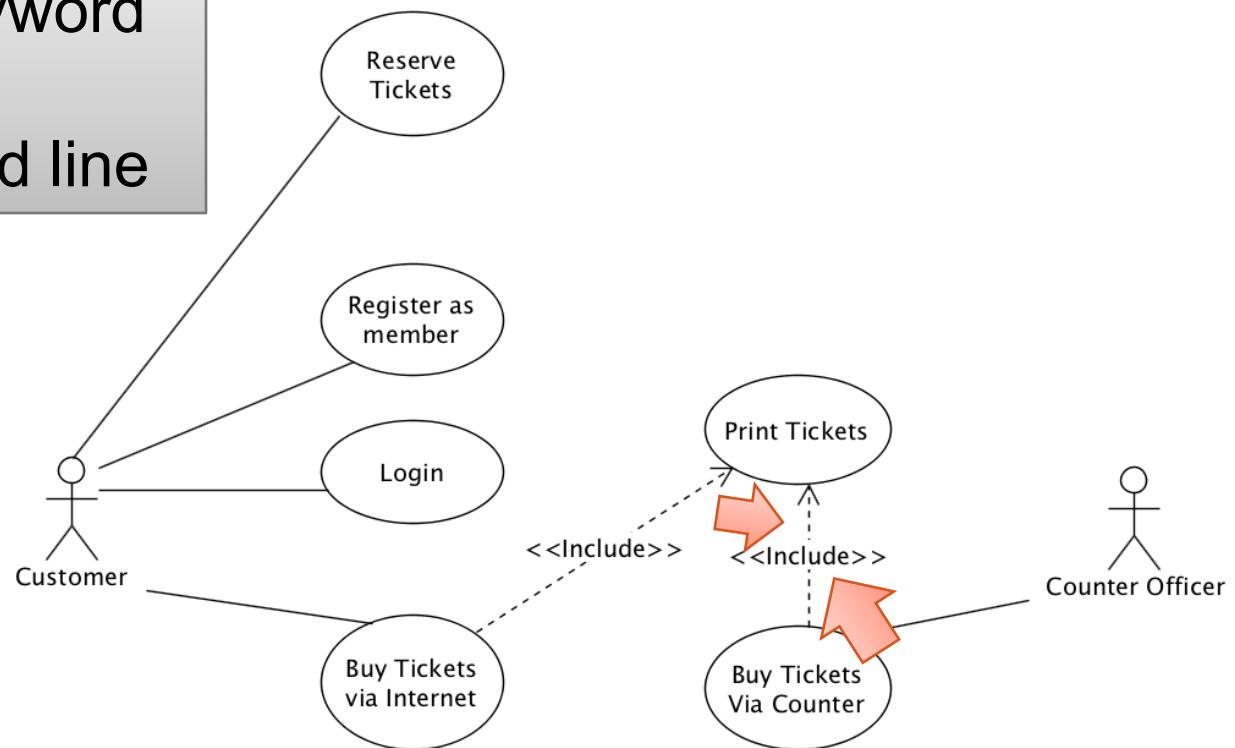
Print Tickets



INCLUDE

<<include>> keyword

Arrow with dotted line

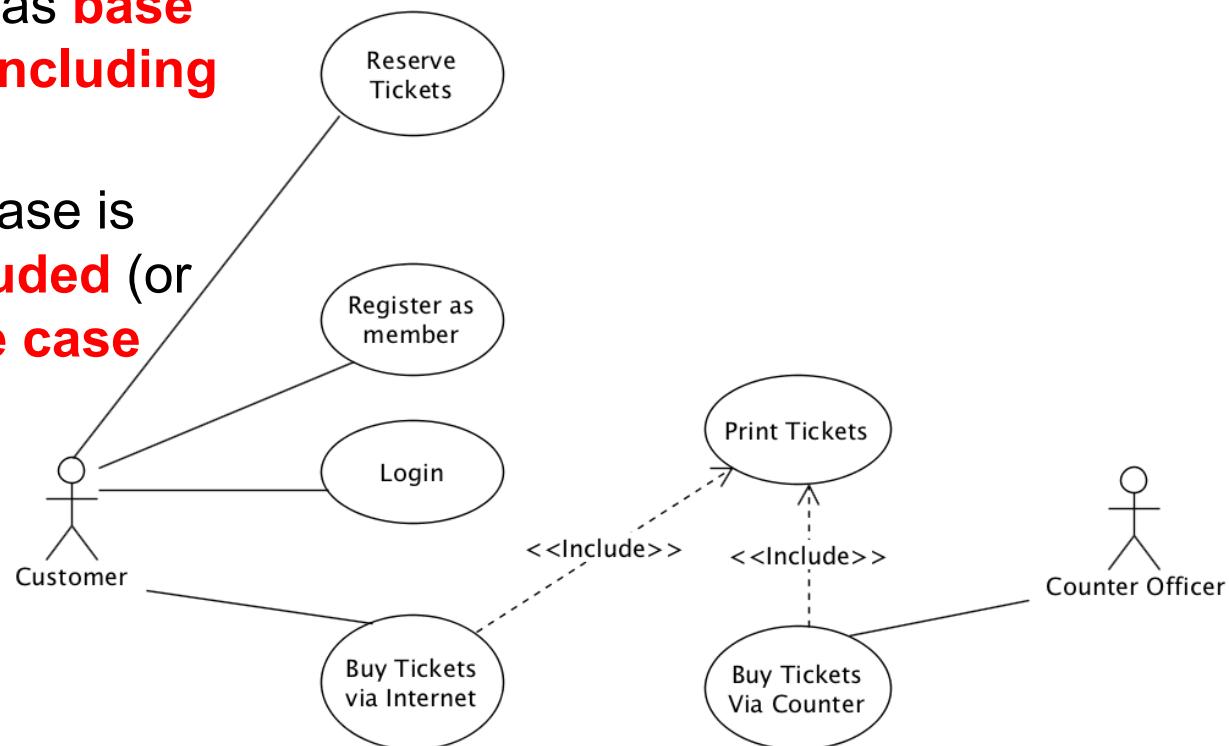


How does this help in reusability?

INCLUDE

Terminology

- The original use cases are referred to as **base use cases** or **including use cases**
- The new use case is called the **included** (or **inclusion**) **use case**

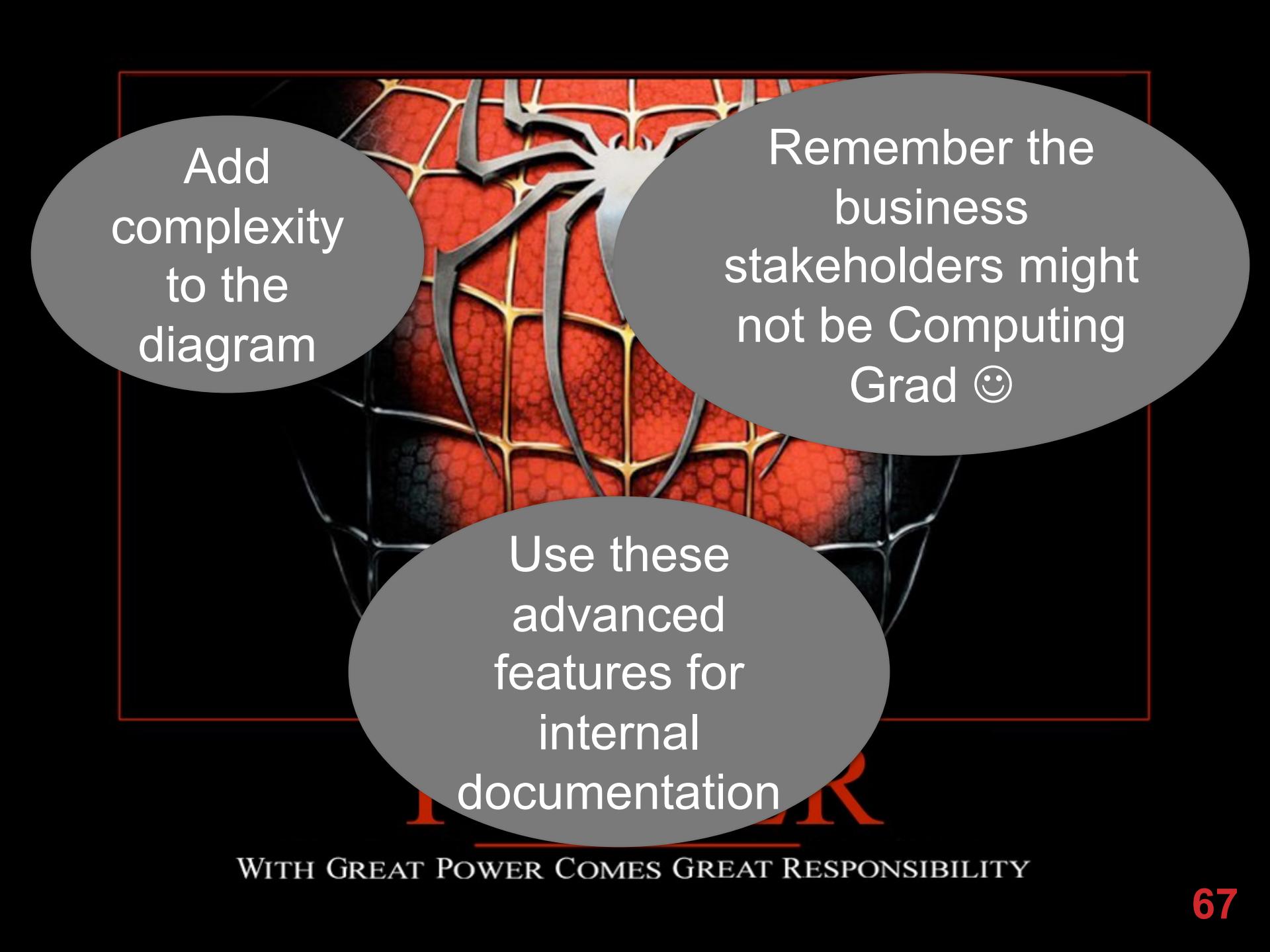


INCLUDE IN USE-CASE DOCUMENTATION

System Use Case: Make Reservation	
Actor	System
1. Selects a trip ...	1.1 Include (Check Available Seats Use Case) ...



System Use Case: Check Available Seats	
Actor	System
	<ol style="list-style-type: none">1. Verifies that seats are available2. Determines and displays the maximum number of seats for the trip3. Determines and displays the number of seats currently reserved ...

A close-up photograph of Spider-Man's suit, showing the red and blue spider-suit pattern and the metallic web-shooters on his wrists. Three grey speech bubbles are overlaid on the image, containing text related to the slide's message.

Add complexity to the diagram

Remember the business stakeholders might not be Computing Grad ☺

Use these advanced features for internal documentation

WITH GREAT POWER COMES GREAT RESPONSIBILITY

ORGANIZING USE CASES

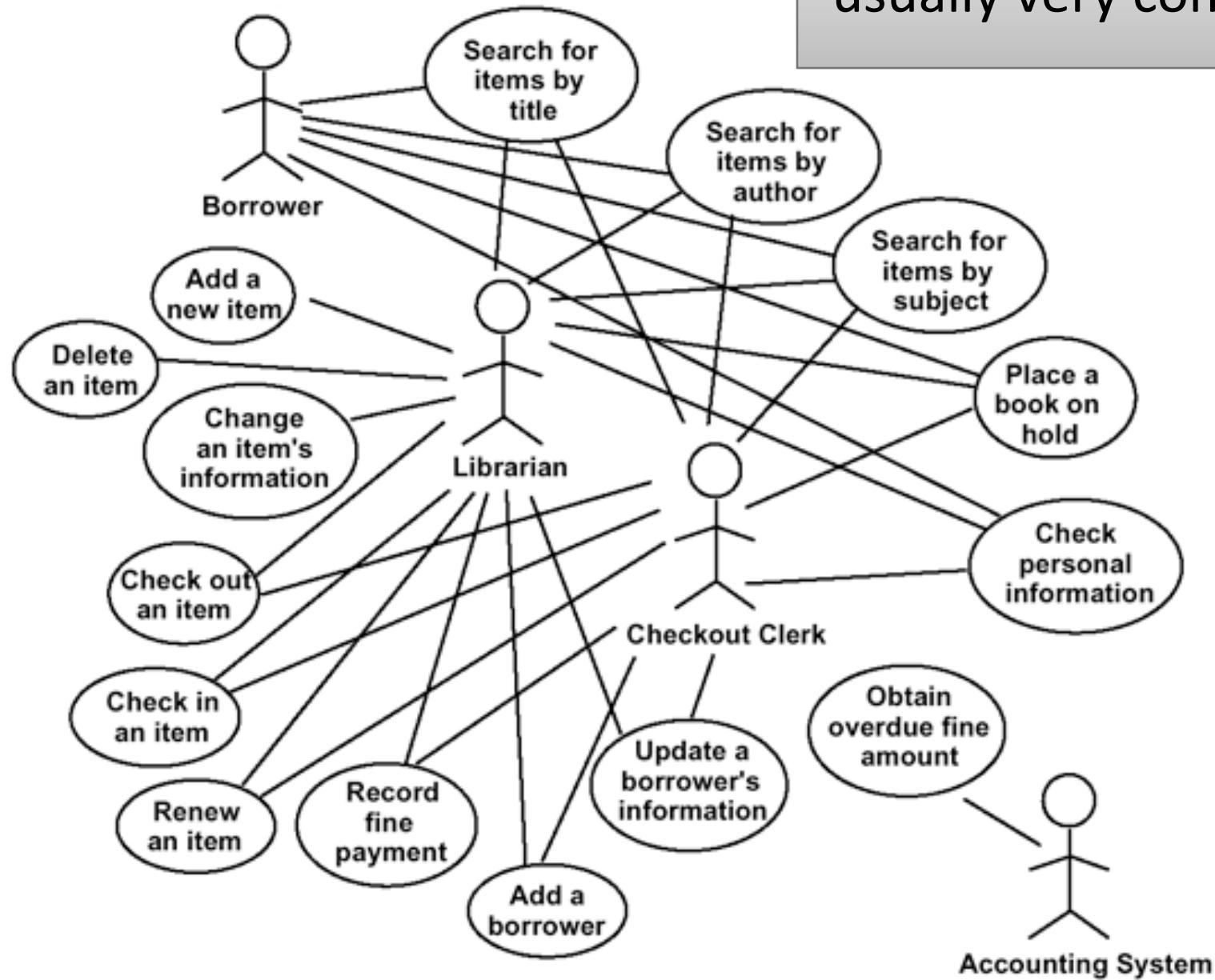
Introduction to
Analysis Phase

Behavioral
Modeling using
Use Case
Description

Advanced Use-
Case Features

Organizing Use
Cases

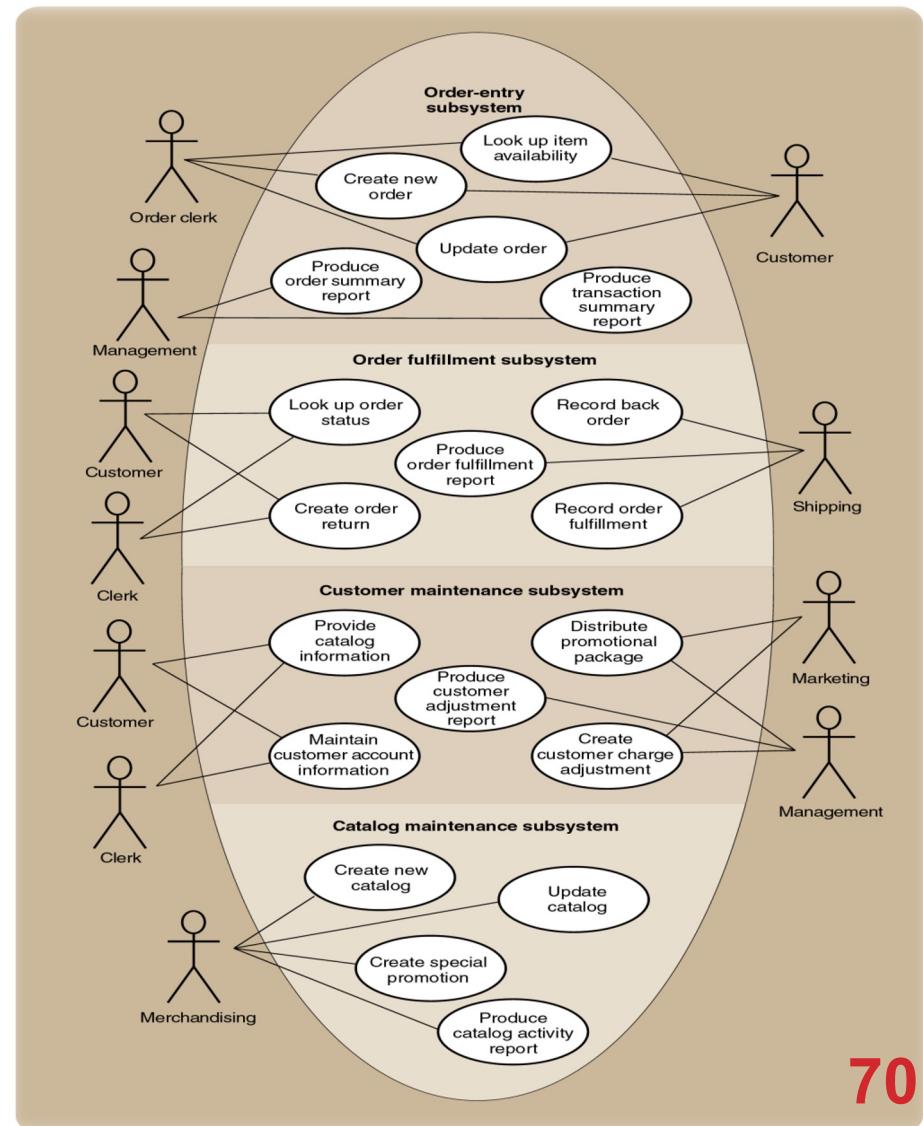
Real-world systems are usually very complicated



ORGANIZING USE CASES

Organize use cases by specific actor

Organize use cases by subsystem



A close-up photograph of a man with dark hair and glasses, wearing a grey shirt. He is holding a plain white rectangular card in front of his chest with both hands. His fingers are visible at the edges of the card. The background is a soft-focus green.

It's your turn...

TASK

Use Case Description Exercise

SUMMARY

Analyze behavior of system through behavioral modeling

**Different sections in Use Case Description
(especially the flow of events – behavior of system)**

**Advanced features of use case diagrams (include,
extends, inheritance)**

Organizing use cases

WHAT'S NEXT?

Enterprise System Architecture