CS2062 Object Oriented Software Development

Lecture 6

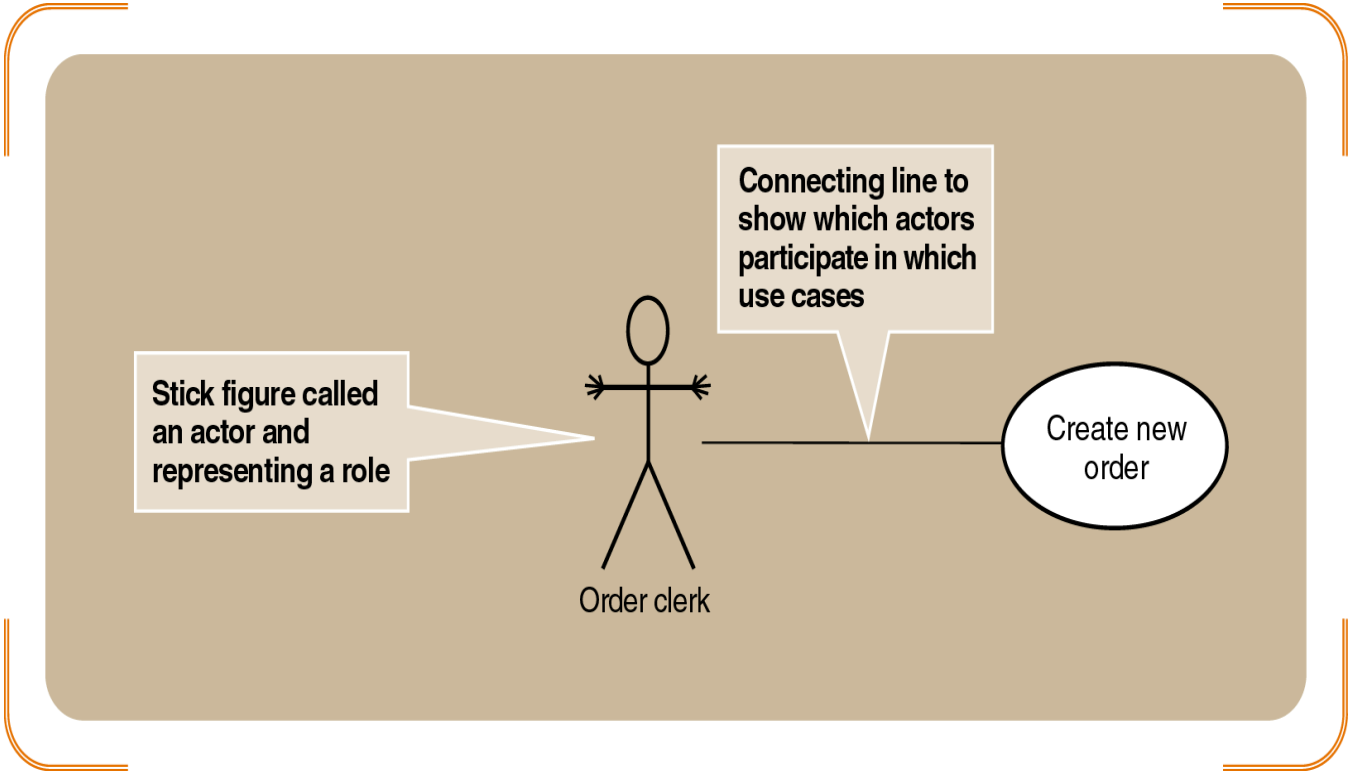
Use Case Modeling

System Processes—A Use Case/Scenario View

- Define use cases into two tiers:
  - Overview level derived from:
    - Event table and use case diagrams
  - Detailed level derived from combination of:
    - Use case description
    - Activity diagram
    - Sequence diagram

The Use Case Diagram

- Notation for use case diagrams
  - Simple stick figure represents an actor
  - Actor's hands indicate direct system access
  - Use case itself symbolized by an oval
  - Connecting lines match actors to use cases
- Actors may also be other system interfaces
  - May be represented with stick figure or rectangle



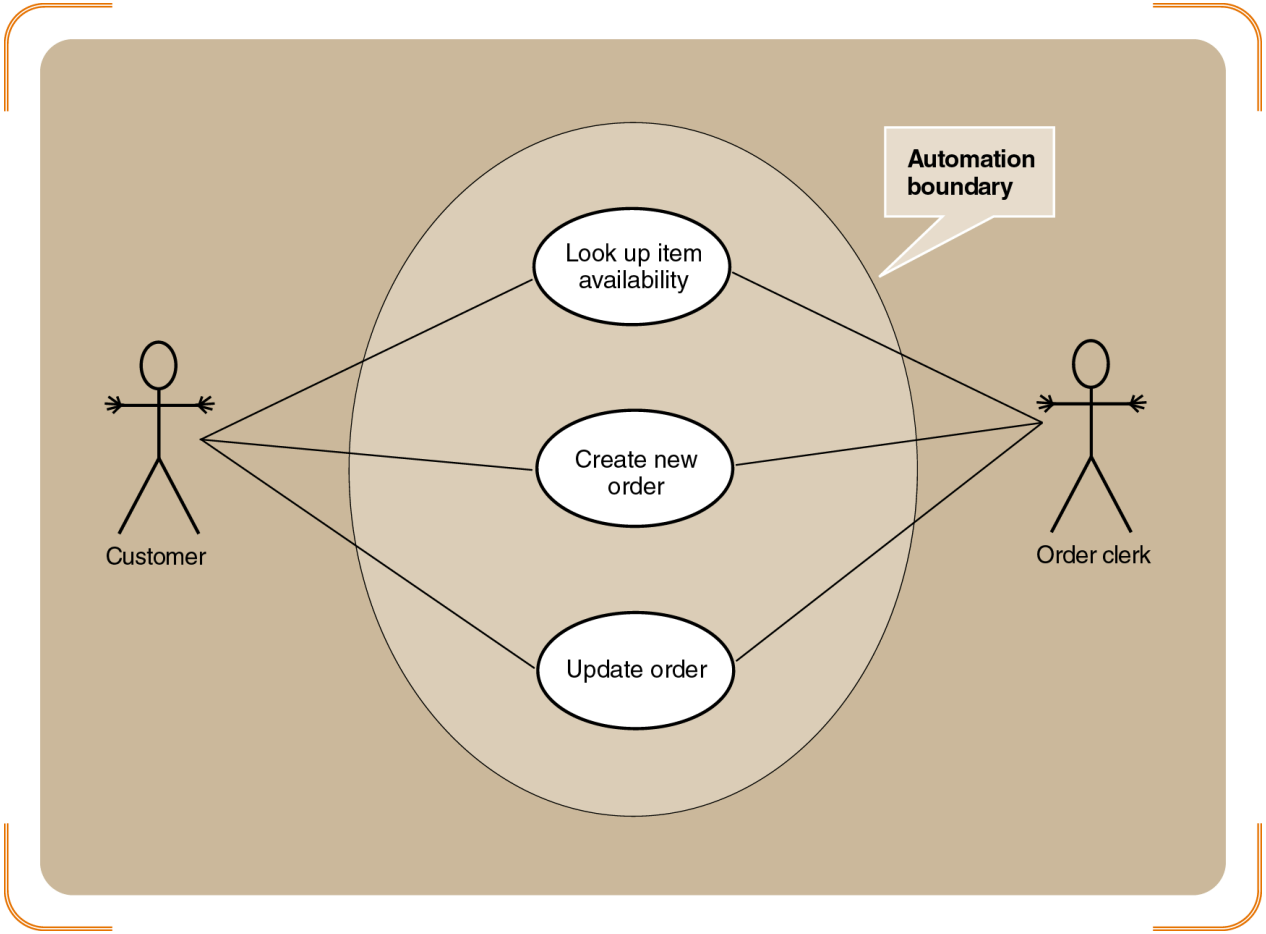
A Simple Use Case with an Actor

Use Cases and Actors

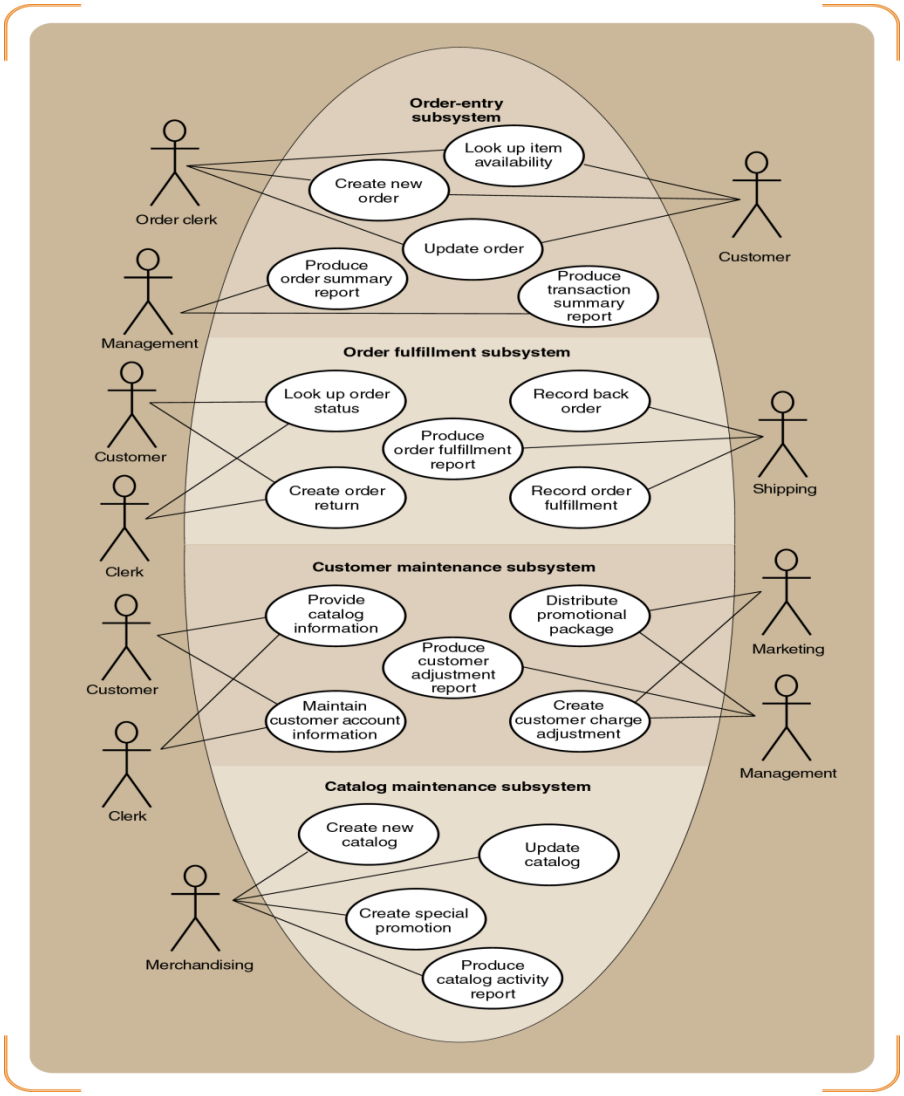
- Source
  - Person or thing initiating the business event
  - Must be external to the system
- Actor
  - Person or thing that touches the system
  - Lies outside of automation boundary
- Identifying actors at the right level of detail
  - Assume actors (even non-human types) have hands
  - Use case is a goal that the actor wants to achieve

Automation Boundary and Organization

- Expand use case diagrams with other actors and use cases
- Relationship line: allows each actor to interact with each use case
- Automation boundary
  - Line drawn around the entire set of use cases
  - Defines interface between actors and computer system



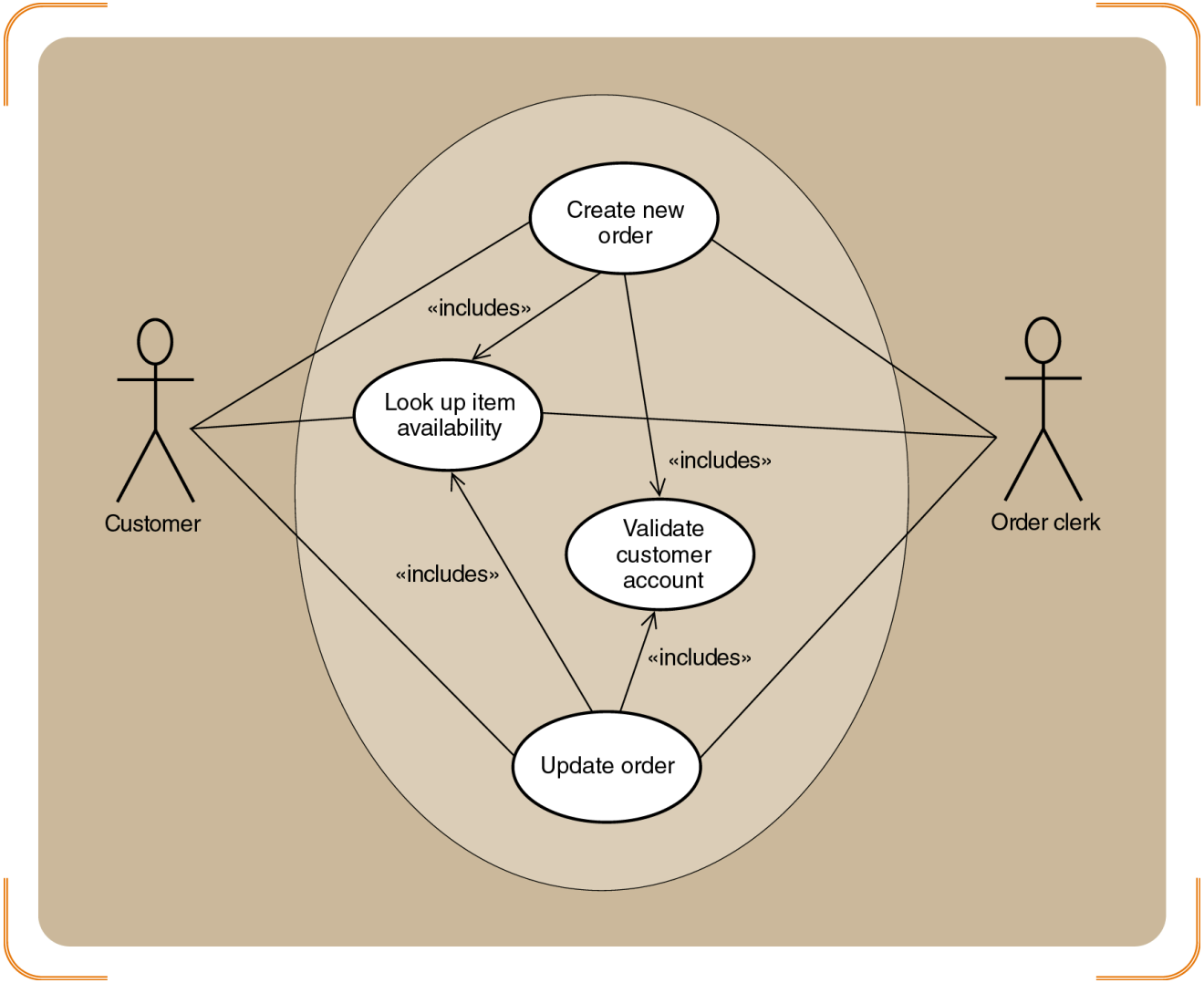
A Use Case Diagram Showing a System Boundary



A Use Case Diagram of the Customer Support System (by Subsystem)

« Includes » Relationships

- «includes» or «uses» relationship
  - Use case calling services of common subroutine
  - Common subroutine itself becomes additional use case
- The base use case CANNOT be completed without the included use case
- Examples: “Validate customer account” and “Look Up Item Availability”
- Notation
  - Relationship denoted by connecting line with arrow
  - Direction of the arrow indicates major/minor cases



An Example of the Order-entry Subsystem With «Includes» Use Cases

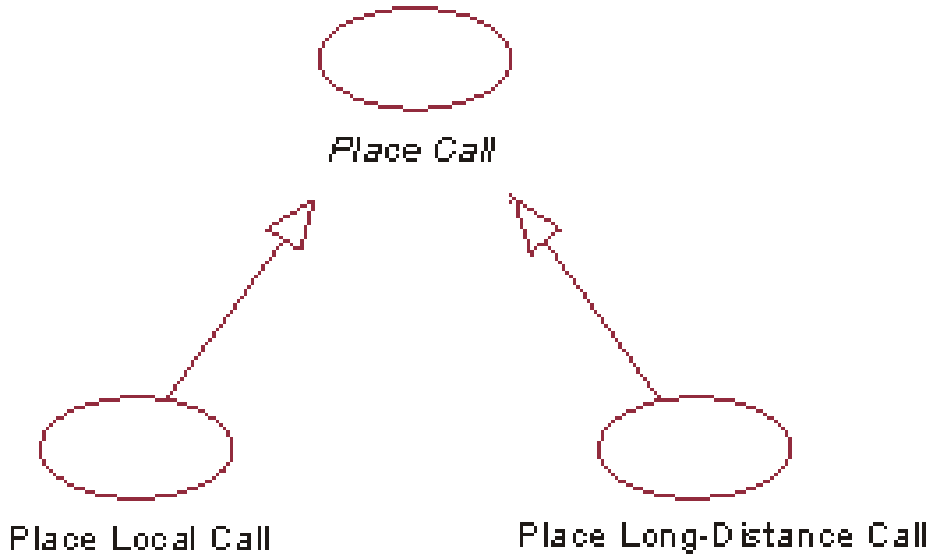
« Extends » Relationships

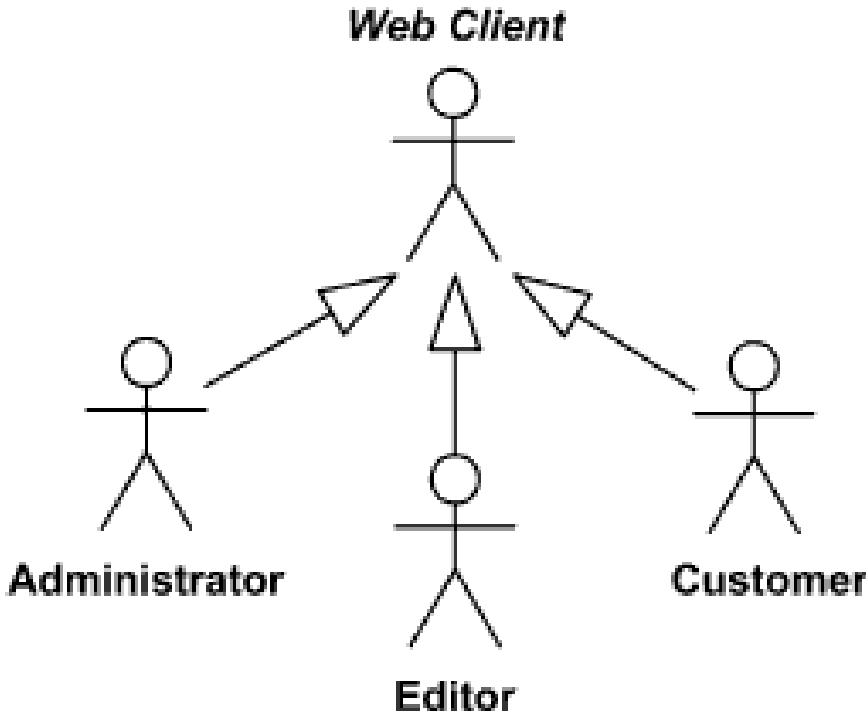
- Similar to includes, but the base use case CAN be completed without the extending use case
- E.g. “order product“ and “view item details”

<<includes>> and <<extends>>

- When to use: when the sub-use case has to be connected to more than one use case and/or actor
- Notation: Let's use dashed arrows
  - Includes: From base use case to included use case
  - Extends: From extending use case to base use case

Use Case Generalization





Developing a Use Case Diagram

- Two ways to identify additional use cases
  - Divide one large use case into two
  - Define another use case based on a common subroutine
- Distinguish between temporal and state events
- Iterative process translates business events to use cases
  - [1] Identify the actors and roles for each use case
  - [2] Extract system response to business events
- Data of system stabilizes after completion of the goal

Example

- You are developing a system for the check-in counter of an airport. Your client has provided the following description:

"A passenger can walk-in to the check-in counter and check himself in by producing his passport and ticket to the officer-in-duty. Optionally, passenger can also do online check-in. However, in both cases, the boarding pass will be given at the check-in counter by the officer-in-duty. "

Use Case Detailed Descriptions

- Use cases have internal complexity
  - Sequence of steps to execute business process
  - Several variations may exist within single use case
    - Valid variation known as scenario
  - Example: “Create new order” varies from phone to Internet order
- Work with variety of diagrams and descriptions for each use case

Use Case Detailed Descriptions (continued)

- Use case descriptions written at (3) levels of detail
  - Brief description
    - Summary statement conjoined to activity diagram
  - Intermediate description
    - Expands brief description with internal flow of activities
  - Fully Developed Description
    - Expands intermediate description for richer view

***Create new order* description**

When the customer calls 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.

Brief Description of Create New Order Use Case

Flow of activities for scenario of *Order Clerk creates telephone order*

Main Flow:

1. Customer calls RMO and gets order clerk.
2. Order clerk verifies customer information. If a new customer, invoke *Maintain customer account information* use case to add a new customer.
3. Clerk initiates the creation of a new order.
4. Customer requests an item be added to the order.
5. Clerk verifies the item and adds it to the order.
6. Repeat steps 4 and 5 until all items are added to the order.
7. Customer indicates end of order; clerk enters end of order; system computes totals.
8. Customer submits payment; clerk enters amount; system verifies payment.
9. System finalizes order.

Exception Conditions:

1. If an item is not in stock, then customer can
   a. choose not to purchase item, or
   b. request item be added as a back-ordered item.
2. If customer payment is rejected due to bad-credit verification, then
   a. order is canceled, or
   b. order is put on hold until check is received.

Intermediate Description of Telephone Order Scenario for Create New Order Use Case

Use Case Detailed Descriptions (continued)

- Fully developed use case description
  - Superset of intermediate and brief descriptions
  - Consists of eleven compartments
  - User, actor, stakeholder, EBP, and conditions identified

Use Case Name:	Create new order	
Scenario:	Create new telephone order	
Triggering Event:	Customer telephones RMO to purchase items from the catalog.	
Brief Description:	When customer calls 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	
Related Use Cases:	Includes: *Check item availability*	
Stakeholders:	Sales department: to provide primary definition Shipping department: to verify that information content is adequate for fulfillment Marketing department: to collect customer statistics for studies of buying patterns	
Preconditions:	Customer must exist. Catalog, Products, and Inventory items must exist for requested items.	
Postconditions:	Order and order line items must be created. Order transaction must be created for the order payment. Inventory items must have the quantity on hand updated. The order must be related (associated) to a customer.	
Flow of Events:	**Actor**	**System**
	1. Sales clerk answers telephone and connects to a customer.	
	2. Clerk verifies customer information.	
	3. Clerk initiates the creation of a new order.	3.1 Create a new order.
	4. Customer requests an item be added to the order.	
	5. Clerk verifies the item (*Check item availability* use case).	5.1 Display item information.
	6. Clerk adds item to the order.	6.1 Add an order item.
	7. Repeat steps 4, 5, and 6 until all items are added to the order.	
	8. Customer indicates end of order; clerk enters end of order.	8.1 Complete order. 8.2 Compute totals.
	9. Customer submits payment; clerk enters amount.	9.1 Verify payment. 9.2 Create order transaction. 9.3 Finalize order.
Exception Conditions:	2.1 If customer does not exist, then the clerk pauses this use case and invokes *Maintain customer information* use case. 2.2 If customer has a credit hold, then clerk transfers the customer to a customer service representative. 4.1 If an item is not in stock, then customer can a. choose not to purchase item, or b. request item be added as a back-ordered item. 9.1 If customer payment is rejected due to bad-credit verification, then a. order is canceled, or b. order is put on hold until check is received.	

Fully Developed Description of Telephone Order Scenario for Create New Order Use Case