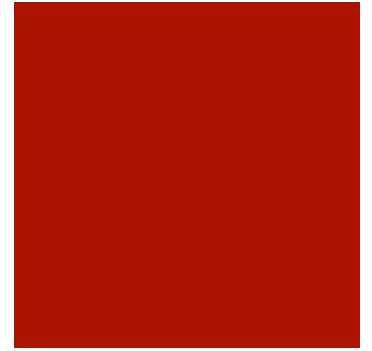# Use Cases to Requirements and Back Again

- Congo the Online Shop

Case Study: Online Shopping

- In order to demonstrate how this might work on a (semi) complex application, consider an online book store *Congo*.

- Congo follows the tried and true business model of having customers add products to a shopping cart, checking it out, paying, and shipping to an address.
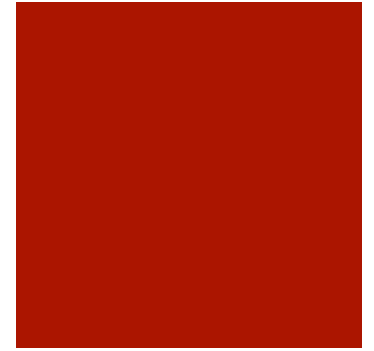
Online Shopping:
Initial Requirements

1. The user will be able to add products to the shopping cart.

2. The user will be able to view the contents of the shopping cart.

3. The user will be able to pay for the contents of their shopping cart.

4. The user will be able to choose an address to ship the products.

5. Congo's online inventory will be updated.

6. The warehouse will ship the order within 3 days of the order.

How do refine these requirements?

- Clearly this set of requirements is incomplete.

- They may have come from original elicitation sessions, been inherited, or ~~stolen~~ borrowed from other competitors.

- They may have come from a goal based analysis.

- We need to analyse these for gaps, identify different actors and determine what else the system must do.
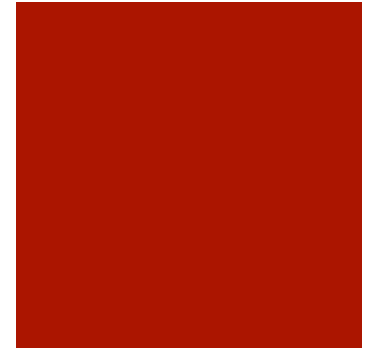
Use cases: Identify nouns

1. The **user** will be able to add **products** to the **shopping cart**.

2. The **user** will be able to view the contents of the **shopping cart**.

3. The **user** will be able to pay for the contents of their **shopping cart**.

4. The **user** will be able to choose an **address** to ship the products.

5. **Congo's** online **inventory** will be updated.

6. The **warehouse** will ship the order within 3 days of the order.

- Some of these nouns are actors.

- Those nouns that perform actions in the system are actors.

- How do we identify actors?
  - Look for verbs

Use cases: Identify actors

- Actors in this system include:
  - User – Too generic we can rename them to be a "Customer" based on their functionality
  - Warehouse – Is it the warehouse itself that is doing the shipping? Is there a shipping company we should worry about? Do we need more information?
  - Congo – Too broad; looking at what Congo does in the initial description, they are having just their inventory updated; let's designate a system actor to look after that: the Congo Inventory System (CIS)

  .

Use cases: Refine Requirements

1. The customer will be able to add products to the shopping cart.

2. The customer will be able to view the contents of the shopping cart.

3. The customer will be able to pay for the contents of their shopping cart.

4. The customer will be able to choose an address to ship the products.

5. The CIS inventory will be updated.

6. The Warehouse will ship the order within 3 days of the order.

- We have already refined the requirements a little bit.

- We now have a better list of actors for our system.

- Now what?
  - Identify actions that people will take.

Use cases: Identify actions

1. The customer will be able to **add products** to the shopping cart.

2. The customer will be able to **view the contents** of the shopping cart.

3. The customer will be able to **pay for the contents** of their shopping cart.

4. The customer will be able to **choose an address** to ship the products.

5. The CIS inventory will be **updated**.

6. The Warehouse will **ship the order** within 3 days of the order.

- Each of the actors do different things in the system.

- We can begin by deciding what broad use cases could represent this.

Use cases: Identify actions

Requirement	Use Cases
The customer will be able to add products to the shopping cart.	*Add product to cart (Customer)*
The customer will be able to view the contents of the shopping cart	*View cart contents (Customer)*
The customer will be able to pay for the contents of their shopping cart.	*Pay for cart (Customer)*
The customer will be able to choose an address to ship the products.	*Choose address (Customer)*
The CIS inventory will be updated.	*Update inventory (CIS)*
The Warehouse will ship the order within 3 days of the order.	*Ship order (Warehouse)*

Use Case Analysis

- We can begin writing use cases; however, some basic analysis can already be completed.

- We begin asking questions about the use cases that we have in comparison to information we have collected from our stakeholders.
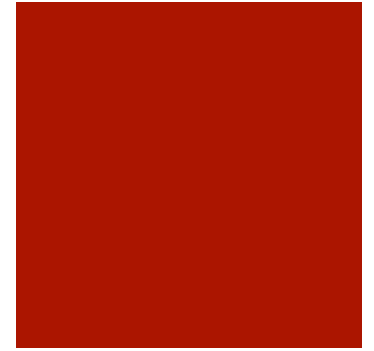
Analysis: Do we have all the actors?

- First begin by asking if there are any actors missing:
  - Example:
    - The customer adds to their cart, the cart contents must be updated. Is there a system actor responsible for updating the contents? Are *we* responsible for that actor (i.e. do we have to create a system to do that)?

- If we identify an actor, we add it to the list and we start identifying new use cases for those actors.

Congo: Actor analysis

- There is no existing shopping cart system, so we must develop it; we will need more detail in our requirements for this, and we add a couple of initial use cases *Update contents* and *Empty*.

- There is an existing Warehouse Inventory system that will be used; therefore we can assume the Warehouse shipping an item to be sufficient detail. We should record this in our requirements somewhere.

- There is an existing CIS, so we can assume "Updating inventory" is sufficient detail, we do not need to explain how the inventory will be updated. Similarly for the payment system.

Use cases: Update actors

Requirement	Use Cases
The customer will be able to add products to the shopping cart.	*Add product to cart (Customer)* ***Update Contents (Cart)***
The customer will be able to view the contents of the shopping cart	*View cart contents (Customer)*
The customer will be able to pay for the contents of their shopping cart.	*Pay for cart (Customer)* ***Empty (Cart)***
The customer will be able to choose an address to ship the products.	*Choose address (Customer)*
The CIS inventory will be updated.	*Update inventory (CIS)*
The Warehouse will ship the order within 3 days of the order.	*Ship order (Warehouse)*

Analysis: Examine Pre-conditions / Triggers

- Are there any assumptions in your use cases regarding events that have occurred previously?
  - Example:
    - The user is allowed to choose an address. This implies that there is more than one address.
    - We are missing a use case where the user can add addresses.

Use cases: Update for pre-conditions / triggers

Requirement	Use Cases
The customer will be able to add products to the shopping cart.	*Add product to cart (Customer)* *Update Contents (Cart)*
The customer will be able to view the contents of the shopping cart	*View cart contents (Customer)*
The customer will be able to pay for the contents of their shopping cart.	*Pay for cart (Customer)* *Empty (Cart)*
The customer will be able to choose an address to ship the products.	*Choose address (Customer)* ***Enter Address (Customer)***
The CIS inventory will be updated.	*Update inventory (CIS)*
The Warehouse will ship the order within 3 days of the order.	*Ship order (Warehouse)*

Analysis: Examine Pre-conditions/Triggers

- Some pre-conditions may not even relate to the actor being examined:
  - Example:
    - The Warehouse is to ship things within a certain amount of time; how does it know what to ship? How does it know when the period of time begins? It is triggered by receiving an order.
    - The CIS must send the order through to the Warehouse before the warehouse can execute.

Use cases: Update for pre-conditions / triggers

| Requirement	Use Cases
The customer will be able to add products to the shopping cart.	*Add product to cart (Customer)* *Update Contents (Cart)*
The customer will be able to view the contents of the shopping cart	*View cart contents (Customer)*
The customer will be able to pay for the contents of their shopping cart.	*Pay for cart (Customer)* *Empty (Cart)*
The customer will be able to choose an address to ship the products.	*Choose address (Customer)* *Enter Address (Customer)*
The CIS inventory will be updated.	*Update inventory (CIS)*
The Warehouse will ship the order within 3 days of the order.	***Send order (CIS)*** *Ship order (Warehouse)*

Analysis: Examine complexity

- Use cases are intended to represent atomic actions in the system. Are any of the use cases doing too much?
  - Example:
    - The customer pays for items in the cart. Looking back at the elicitation it turns out that they can pay through Paypal or Credit Card.
    - These are pretty different actions, so we can split payment so that it has two additional sub cases that can be included in the payment use case.

Use cases: Update for complexity

Requirement	Use Cases
The customer will be able to add products to the shopping cart.	*Add product to cart (Customer)* *Update Contents (Cart)*
The customer will be able to view the contents of the shopping cart	*View cart contents (Customer)*
The customer will be able to pay for the contents of their shopping cart.	*Pay for cart (Customer)* **Pay by Paypal (Customer)** **Pay by Credit Card (Customer)** *Empty (Cart)*
The customer will be able to choose an address to ship the products.	*Choose address (Customer)* *Enter Address (Customer)*
The CIS inventory will be updated.	*Update inventory (CIS)*
The Warehouse will ship the order within 3 days of the order.	*Send order (CIS)* *Ship order (Warehouse)*

Use Cases: Resulting Diagram
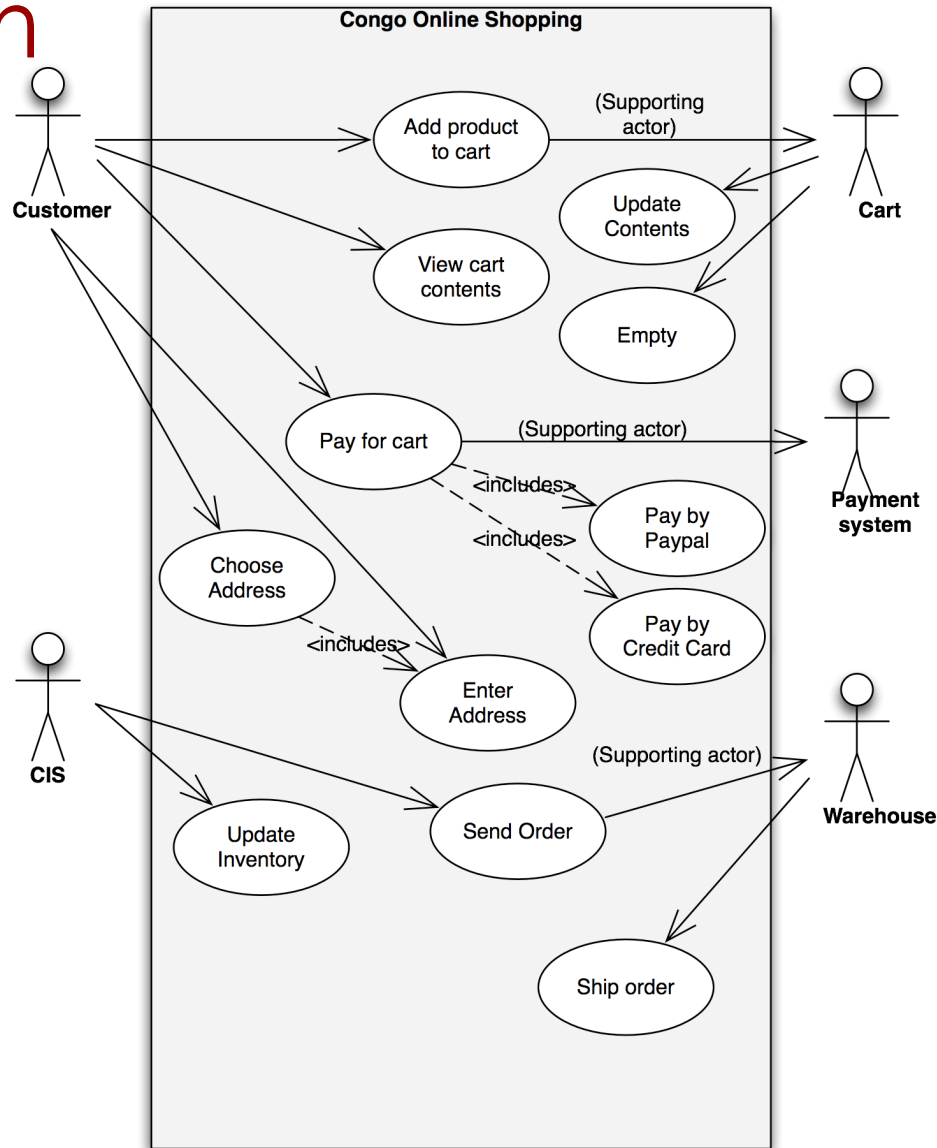
Analysis: Examine scenarios

- Turning the analysis of complexity on its head, are there situations where one higher level use case could provide us with a view of a number of use cases?
  - Example:
    - A series of steps for placing an order could be grouped in a scenario called "Place order" for the customer.
    - It involves viewing the cart, choosing (or entering) an address and paying for it.

Analysis: Examining scenarios

- Scenarios provide us with a number of pieces of information:
  - Control flow (when a things sent from one actor to another – good for checking triggers and pre-conditions/post-conditions)
  - More actors
  - Shared use cases (things performed over and over)
  - Uncovering assumptions
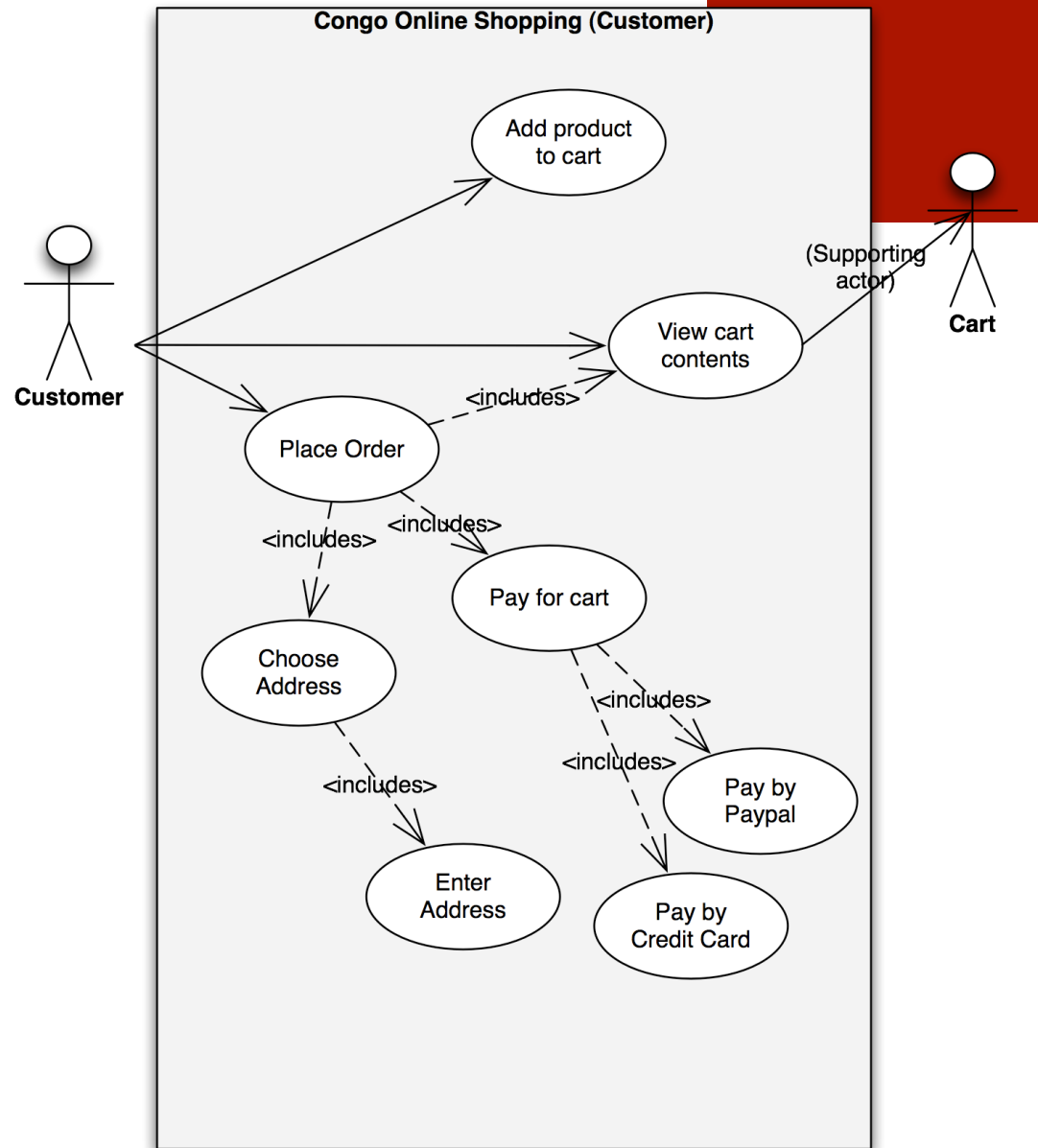
Analysis: Examine assumptions

- By far the hardest part is trying to pick out those things that are being assumed in use cases and existing requirements.

- Some are functional:
  - Can the user view details about a product?
  - Can the customer check the status of their order?
  - Customers expect deliveries to be confirmed on arrival.

- Often these are non-functional.
  - Customers expect their payments to be secure.
  - CIS needs to be updated within hours.

- The only way to find these is to look closely at the sources of data where the requirements came from.

Use cases: Update for assumptions

Requirement	Use Cases
The customer will be able to add products to the shopping cart.	*Add product to cart (Customer)* *Update Contents (Cart)* ***View Item (Customer)***
The customer will be able to view the contents of the shopping cart	*View cart contents (Customer)*
The customer will be able to pay for the contents of their shopping cart.	*Pay for cart (Customer)* *Pay by Paypal (Customer)* *Pay by Credit Card (Customer)* *Empty (Cart)* ***Place order (Customer)***
The customer will be able to choose an address to ship the products.	*Choose address (Customer)* *Enter Address (Customer)*
The CIS inventory will be updated.	*Update inventory (CIS)*
The Warehouse will ship the order within 3 days of the order.	*Send order (CIS)* *Ship order (Warehouse)* ***Get confirmation (Customer)*** ***Check order status (Customer)***

Use cases:
Congo Customer

Congo Online Shopping (Customer)

- Add product to cart
- View cart contents
- Place Order
- Pay for cart
- Choose Address
- Enter Address
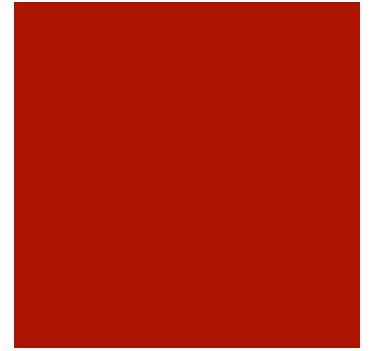- Pay by Paypal
- Pay by Credit Card

<includes>

Customer

Cart

(Supporting actor)

Specification

- With the analysis started, we can go back and update some of our requirements.
  - We can add requirements.
  - We can add sub requirements
  - We can add some of the non-functional aspects.

Online Shopping:
Revised Requirements

1. The Customer will be able to view the details of a specific product.

2. The Customer will be able to add products to the shopping cart.

3. The Shopping cart will update its contents to include items added by the Customer.

4. The Customer will be able to view the contents of the shopping cart.

5. The Customer will be able to pay for the contents of their shopping cart.

Online Shopping: Revised Requirements

6. The Customer will be able to pay for the contents of the shopping cart by Paypal or by Credit card.

7. The Customer will be able to enter an address to which the products should be shipped.

8. The Customer will be able to choose from a selection of addresses to which products can be shipped.

9. The CIS inventory will be update the inventory by removing the items from the order.

10. The warehouse will ship the order within 3 days of the order.

Summary

- Analysis tools such as use cases are ways to refine requirements.

- Much of the analysis comes from looking at your models, your data and your requirements and asking questions.

- Only practice will allow you to answer the questions well.

- Analysis does not stop with one iteration, often you will need many different tools to refine your requirements.