

CS708 – Software Requirement Engineering

Solution to Assignment 3

Instructions to Solve Assignments

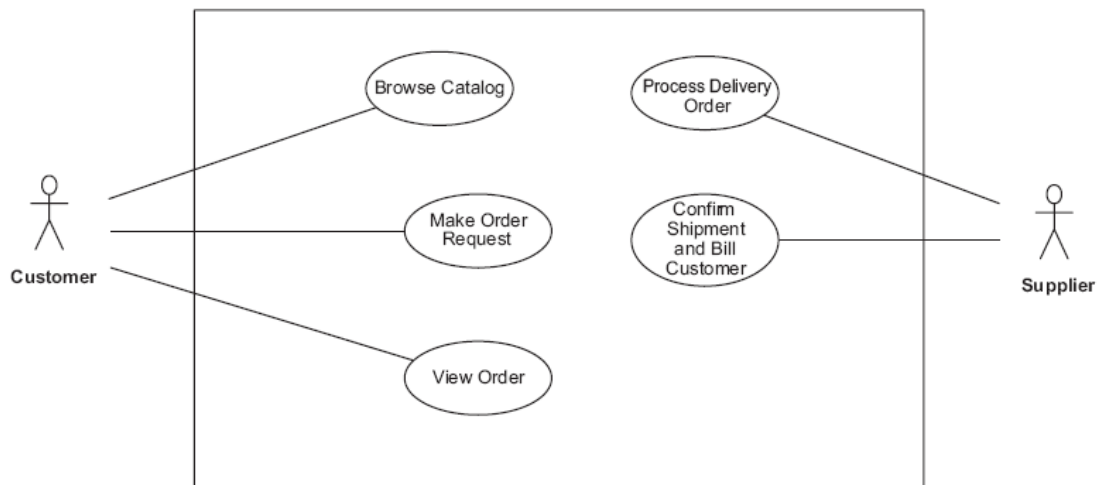
The purpose of assignments is to give you hands on practice. It is expected that students will solve the assignments themselves. Following rules will apply during the evaluation of assignment.

- Cheating from any source will result in zero marks in the assignment.
- Any student found cheating in any two of the assignments submitted will be awarded "F" grade in the course.
- No assignment after due date will be accepted.

Question 1: Total Points (10+20=30)

In the Web-based Online Shopping System, customers can request to purchase one or more items from the supplier. The customer provides personal details, such as address and credit card information. This information is stored in a customer account. If the credit card is valid, a delivery order is created and sent to the supplier. The supplier checks the available inventory, confirms the order, and enters a planned shipping date. When the order is shipped, the customer is notified and the customer's credit card account is charged.

(a) Draw use case model for this system.



(b) Give use case description for each of the use case identified in part (a).

[Use case description includes: *Use case name, Summary, Actors, Preconditions, Main sequence, Alternative sequence and Postconditions*]

Use Case Description for Browse Catalog

Use case name: Browse Catalog

Summary: Customer browses World Wide Web catalog, views various catalog items from the supplier's catalog, and selects items from the catalog.

Actor: Customer

Precondition: Customer browser is linked to supplier catalog Web site.

Main sequence:

1. Customer requests to browse catalog.
2. System displays catalog information to customer.
3. Customer selects items from catalog
4. System displays an itemized list containing each item description and price, as well as the total price.

Alternative sequence: Step 3: Customer does not select item and exits.

Postcondition: System has displayed list of selected catalog items.

Use Case Description for Make Order Request

Use case name: Make Order Request

Summary: Customer enters an order request to purchase catalog items. The customer's credit card is checked for validity and sufficient credit to pay for the requested catalog items.

Actor: Customer

Precondition: Customer has selected one or more catalog items

Main sequence:

1. Customer provides order request and customer account Id to pay for purchase.
2. System retrieves customer account information, including the customer's credit card details.
3. System checks the customer's credit card for the purchase amount and, if approved, creates a credit card purchase authorization number.
4. System creates a delivery order containing order details, customer Id, and credit card authorization number.
5. System confirms approval of purchase and displays order information to customer.

Alternative sequences:

Step 2: If customer does not have an account, the system prompts the customer to provide information in order to create a new account. The customer can either enter the account information or cancel the order.

Step 3: If authorization of the customer's credit card is denied (e.g., invalid credit card or insufficient funds in the customer's credit card account), the system prompts the customer to enter a different credit card number. The customer can either enter a different credit card number or cancel the order.

Postcondition: System has created a delivery order for the customer.

Use Case Description for Process Delivery Order

Summary: Supplier requests a delivery order; system determines that the inventory is available to fulfill the order, and displays the order.

Actor: Supplier

Precondition: Supplier needs to process a delivery order and a delivery order exists.

Main sequence:

1. Supplier requests next delivery order.
2. System retrieves and displays delivery order.
3. Supplier requests inventory check on items for delivery order.

4. System determines that items are available in inventory to satisfy delivery order and reserves items.
5. System displays inventory information to Supplier and confirms that items are reserved.

Alternative sequence: Step 4: If item is out of stock, system displays warning message.

Postcondition: System has reserved inventory items for delivery order.

Use Case Description for Confirm Shipment and Bill Customer

Summary: Supplier prepares the shipment manually and then confirms that the delivery order is ready for shipment. System notifies customer that order is being shipped. System charges customer's credit card for purchase and commits inventory items removal.

Actor: Supplier

Precondition: Inventory items have been reserved for customer delivery order.

Main sequence:

1. Supplier prepares shipment manually and identifies that delivery order is ready to ship.
2. System retrieves customer account information, including the invoice and customer's credit card details.
3. System updates inventory to confirm purchase.
4. System charges customer's credit card for purchase and creates a credit card charge confirmation number.
5. System updates delivery order information with credit card charge confirmation.
6. System sends email confirmation to customer.
7. System displays confirmation to the supplier to complete shipment of the delivery order.

Postcondition: System has committed inventory, charged customer, and sent confirmation.

Question 2: Total Points (10+20=30)

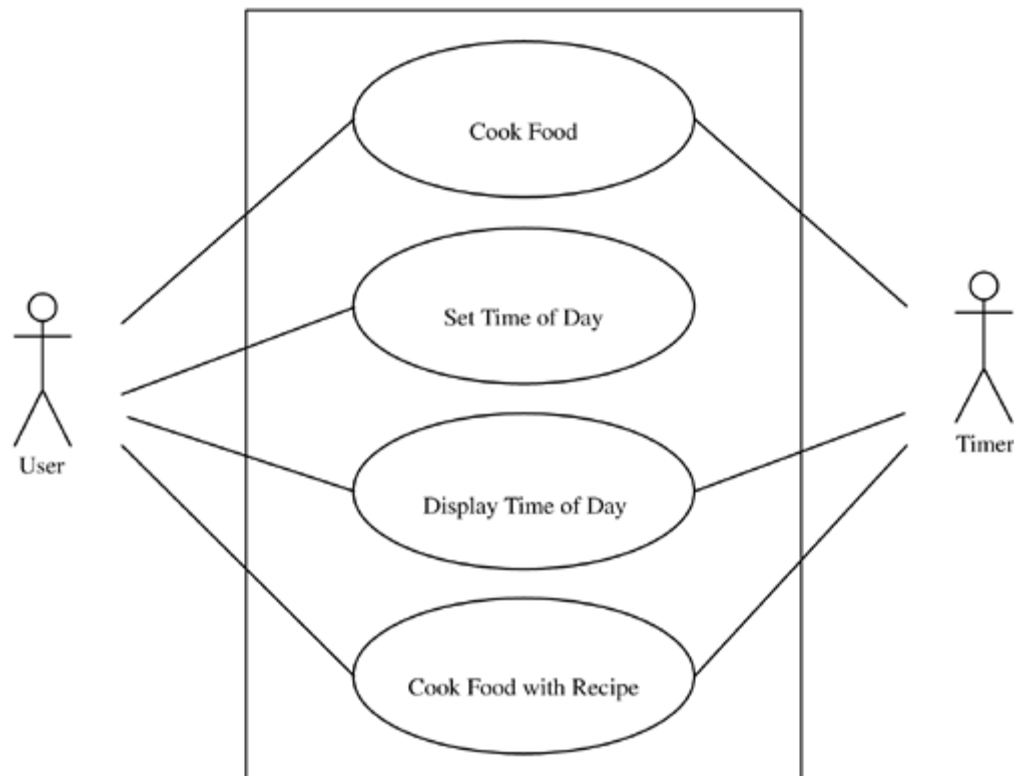
The manufacturer of the microwave oven product line is an original equipment manufacturer with an international market. The microwave oven will form the basis of this product line, which will offer options from basic to top-of-the-line.

The basic microwave oven system has input buttons for selecting Cooking Time, Start, and Cancel, as well as a numeric keypad. It also has a display to show the cooking time left. In addition, the oven has a microwave heating element for cooking the food, a door sensor to sense when the door is open, and a weight sensor to detect if there is an object in the oven. Cooking is possible only when the door is closed and when there is something in the oven.

Options available for more-advanced ovens are a beeper to indicate when cooking is finished, a light that is switched on when the door is open and when food is being cooked, and a turntable that turns during cooking. The microwave oven displays messages to the user such as prompts and warning messages. Because the oven is to be sold around the world, it must be able to vary the display language. The default language is English, but other possible languages are French, Spanish, German, and Italian. The basic oven has a one-line display; more-advanced ovens can have multi-line displays. Other options include a time-of-day clock, which needs the multi-line display option.

The top-of-the-line oven has a recipe cooking feature, which needs an analog weight sensor in place of the basic Boolean weight sensor, the multi-line display feature, and a multi-level power feature (high, medium, low) in place of the basic on/off power feature. Vendors can configure their microwave oven systems of choice from a wealth of optional and alternative features, although feature dependency constraints must be obeyed.

(a) Draw use case model for this system.



(b) Give use case description for each of the use case identified in part (a).

Use Case Description for Cook Food

Summary: User puts food in oven, and microwave oven cooks food.

Actor: User (primary), Timer (secondary).

Precondition: Inventory items have been reserved for customer delivery order.

Main sequence:

1. User opens the door, puts food in the oven, and closes the door.
2. User presses the Cooking Time button.
3. System prompts for cooking time.
4. User enters the cooking time on the numeric keypad and presses Start.
5. System starts cooking the food.
6. System continually displays the cooking time remaining.
7. Timer elapses and notifies the system.
8. System stops cooking the food and displays the end message.
9. User opens the door, removes the food from the oven, and closes the door.
10. System clears the display.

Alternative sequence:

Step 1: User presses Start when the door is open. System does not start cooking.

Step 4: User presses Start when the door is closed and the oven is empty. System does not start cooking.

Step 4: User presses Start when the door is closed and the cooking time is equal to zero. System does not start cooking.

Step 6: User opens door during cooking. System stops cooking. User removes food and presses Cancel, or user closes door and presses Start to resume cooking.

Step 6: User presses Cancel. System stops cooking. User may press Start to resume cooking. Alternatively, user may press Cancel again; system then cancels timer and clears display.

Postcondition: Microwave oven has cooked the food.

Use Case Description for Set Time of Day

Summary: User sets time-of-day clock.

Actor: User.

Precondition: Microwave oven is idle.

Main sequence:

1. User presses Time of Day (TOD) button.
2. System prompts for time of day.
3. User enters the time of day (in hours and minutes) on the numeric keypad.
4. System stores and displays the entered time of day.
5. User presses Start.
6. System starts the time-of-day timer.

Alternative sequence:

Step 1, 3: If the oven is busy, the system will not accept the user input.

Step 5: The user may press Cancel if the incorrect time was entered. The system clears the display.

Postcondition: TOD clock has been set.

Use Case Description for Display Time of Day

Summary: System displays time of day.

Actor: Timer (primary actor), User (secondary actor).

Precondition: TOD clock has been set (by Set Time of Day use case).

Main sequence:

1. Timer notifies system that one second has elapsed.
2. System increments TOD clock every second, adjusting for minutes and hours.
3. System updates the display with time of day every minute.

Postcondition: TOD clock has been updated (every second) and time of day displayed (every minute).

Use Case Description for Cook Food with Recipe

Summary: User puts food in microwave oven and cooks food, using recipe.

Actor: User (primary), Timer (secondary).

Precondition: Microwave oven is idle.

Main sequence:

1. User opens the door, puts food in the oven, and closes the door.
2. User presses the desired recipe button from the recipe buttons on the keypad.
3. System displays the recipe name. Recipe has name, power level (p), fixed time (t1), and time per unit weight (t2).
4. User presses the Start button.
5. System starts cooking the food for a time given by the following equation: Cooking Time = $t1 + w * t2$, where t1 and t2 are times specified in the recipe and w is the weight of the item, and the power level p is specified in the recipe.
6. System continually displays the cooking time remaining.
7. Timer elapses and notifies the system.
8. System stops cooking the food and displays the end message.
9. User opens the door, removes the food from the oven, and closes the door.
10. System clears the display.

Alternative sequence:

Step 1: User presses Start when the door is open. System does not start cooking.

Step 4: User presses Start when the door is closed and the oven is empty. System does not start cooking.

Step 4: User presses Start when the door is closed and a recipe has not been chosen. System does not start cooking.

Step 4: User presses Cancel. System cancels recipe and clears display.

Step 6: User opens the door during cooking. System stops cooking. User removes food and presses Cancel, or user closes the door and presses Start to resume cooking.

Step 6: User presses Cancel. System stops cooking. User may press Start to resume cooking. Alternatively, user may press Cancel again; system then cancels the recipe and clears the display.

Step 7: If the recipe has more than one step, system completes one step, cooking food for the computed time and specified power level, and then proceeds to the next step.

Postcondition: Microwave oven has cooked the food using the recipe.

Question 3: Total Points (10+10=20)

The paper "**A semiotic analysis of unified modeling language graphical notations**" suggests new graphical notations for UML. Read the paper and answer the following questions:

- (a) What was the problem with old UML notations?
- (b) What are the advantages of using the suggested new notations?

Solution:

Research-paper based question.

Question 4: Total Points (10+10=20)

Read the paper "**Are use case and class diagrams complementary in requirements analysis? An experimental study on use case and class diagrams in UML**" and answer the following questions:

- (a) What are the informational roles and values of use case diagrams and class diagrams in the context of requirements analysis?
- (b) Is there any complementary effect between use case diagrams and class diagrams, i.e., does the usage of both models result in a more complete understanding of the problem domain?

Solution:

Research-paper based question.