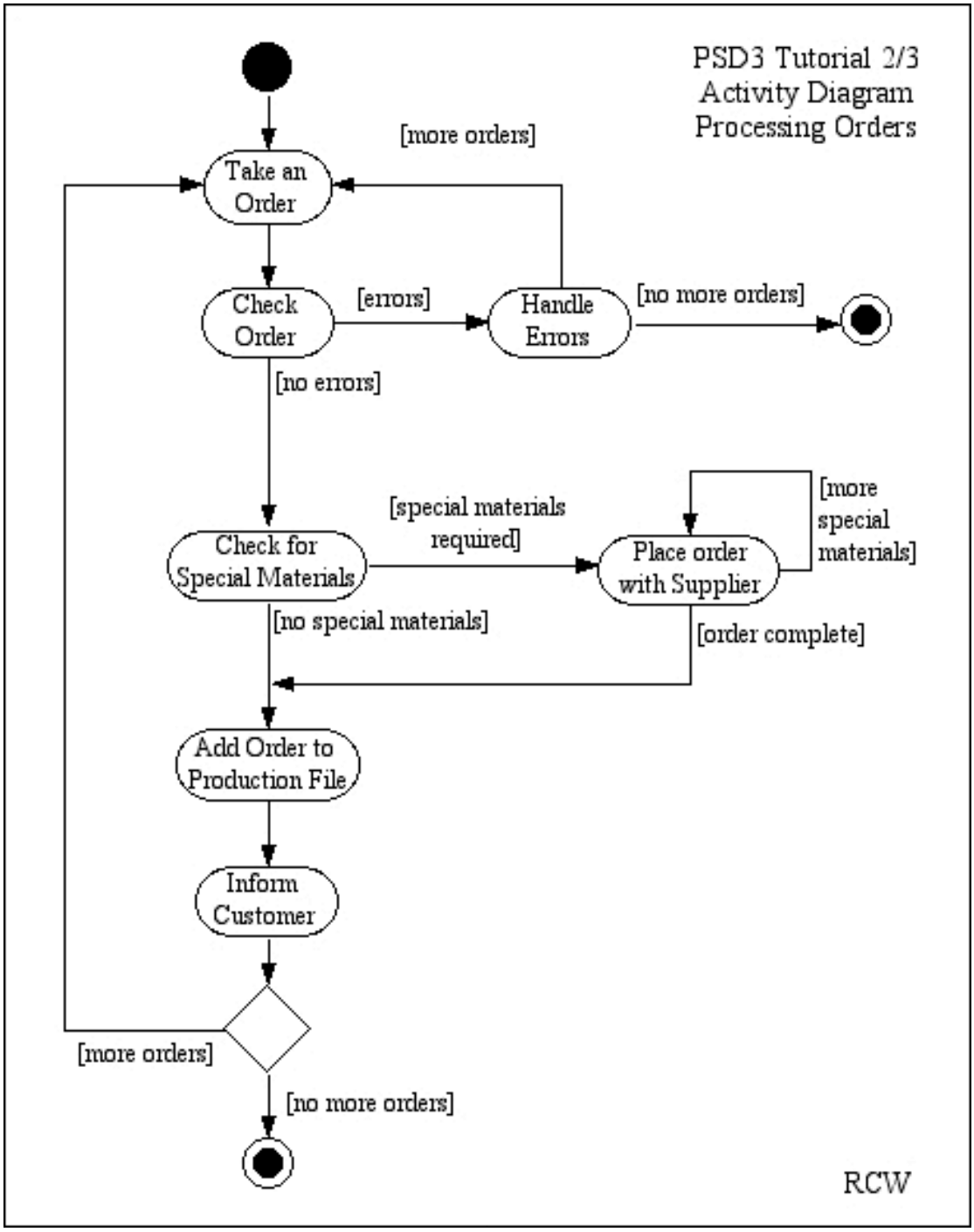
Tutorial 3: Use Cases and Activity Diagrams – Sample Solution

(a) An activity diagram for the first part of the process.



(b) Basic Use Cases (without extensions) defined using pseudocode.

Process Order

```
Sales representative enters details of new order
while special materials required that are not in stock
    place order for special materials with supplier
endwhile
add order to production list
schedule delivery date
if customer has e-mail address
    e-mail customer giving projected delivery date
else
    generate letter to customer giving projected delivery date
endif
```

I have assumed that one customer order may require more than one type of special materials, so I have included a loop to possibly place special orders with several suppliers. Some checking of orders has taken place outside the system but when the sales representative enters the details of new orders we will want to add checking (e.g. all required fields completed, correct formats for numbers, etc.) but this can be specified when we have established the structure of an order.

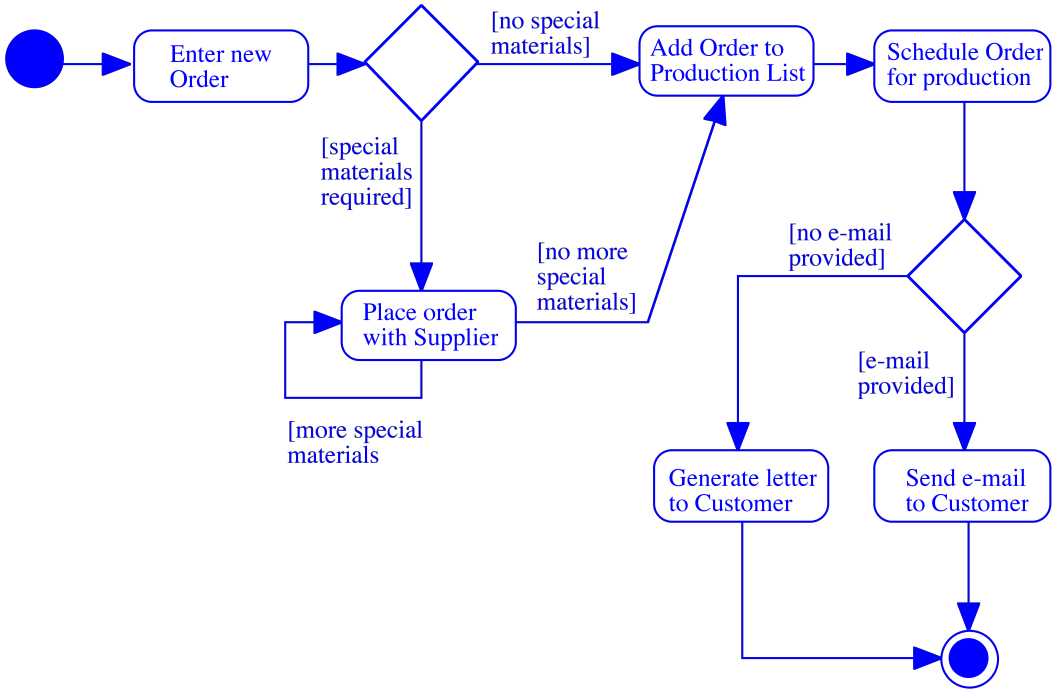
Manufacture Order

```
Workshop requests next order for manufacture
if order on holding list ready for manufacture then
    issue order to Workshop
else
    take next order from production list
    while order cannot be manufactured
        add order to holding list
        if customer has e-mail address
            e-mail customer advising of delay
        else
            generate letter to customer informing of delay
        endif
        take next order from production list
    endwhile
    issue order to Workshop
endif
```

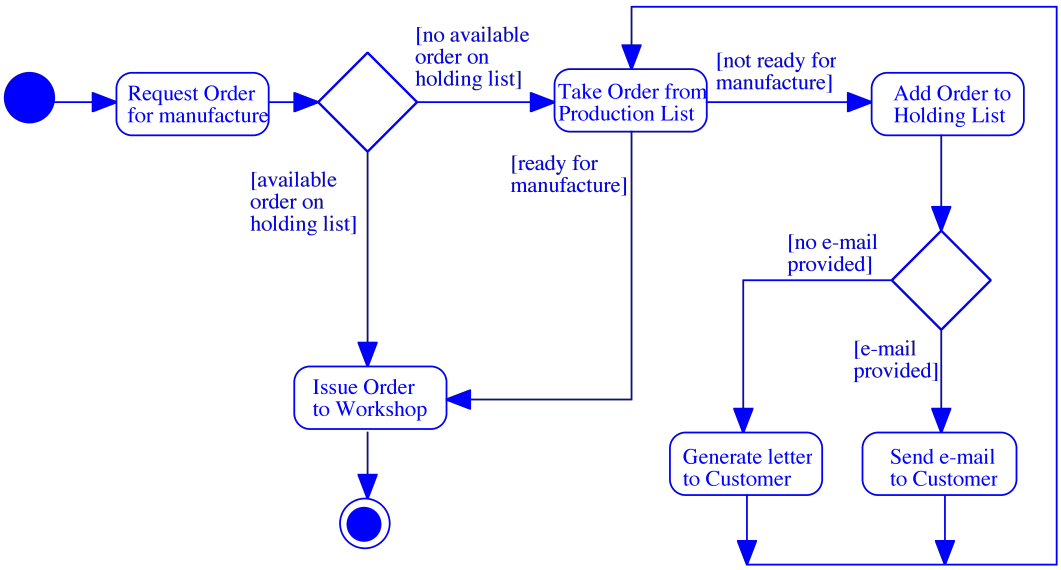
You might consider trying to make the two notifications to the Customer into an <<include>> use case but the contents of the e-mail and letter are different and use cases cannot be parameterised.

Activity Diagrams defining basic Use Cases

Process Order



Manufacture Order



Use Cases definitions for solution with <<extend>> use cases

Process Order

Sales representative enters details of new order
Special Materials Extension Point
add order to production list
schedule delivery date
if customer has e-mail address
    e-mail customer giving projected delivery date
else
    generate letter to customer giving projected delivery date
endif

Order Special Materials

If special materials required and not in stock at Special Materials Extension Point:
repeat
    place order for special materials with supplier
until all special materials ordered

Manufacture Order

Workshop requests next order for manufacture
if order on holding list ready for manufacture then
    issue order to Workshop
else
    take next order from production list
    Delayed Order Extension Point
    issue order to Workshop
endif

Delayed Order

If order cannot be manufactured at Delayed Order Extension Point:
repeat
    add order to holding list
    if customer has e-mail address
        e-mail customer advising of delay
    else
        generate letter to customer informing of delay
    endif
    take next order from production list
until order can be manufactured

Note. These are examples of the mechanism for using <<extend>>. The size (complexity) of these use case does not really justify the use of <<extend>>, even though they have low occurrence special cases.

(c) Scenarios

Scenarios (or 'instances') define one path through a use case. The normal case, where there are no exceptional circumstances or errors is sometimes called the 'happy day' scenario. Scenarios are useful for two reasons: they can be used to build up the overall logic of the use case and 'desk checking' the specification; and they can be used to define test cases to test the developed software.

For the basic **Process Order** use case, we could consider the following scenarios:

{Happy day 1 – customer has e-mail}

Order requires no special materials
The order is added to the production list
A delivery date is scheduled
Customer has e-mail address and a message is generated giving delivery date

{Happy day 2 – customer without e-mail}

Order requires no special materials
The order is added to the production list
A delivery date is scheduled
Customer does not have an e-mail address and a letter is generated giving delivery date

{Check that special materials in stock are correctly handled}

Order requires special materials that are in stock
The order is added to the production list
A delivery date is scheduled
Customer has e-mail address and a message is generated giving delivery date

{One lot of special materials not in stock}

Order requires special materials that are not in stock
Special materials order is placed with supplier
The order is added to the production list
A delivery date is scheduled
Customer does not have an e-mail address and a letter is generated giving delivery date

{More than one lot of special materials required from different suppliers}

Order requires special materials from more than one supplier that are not in stock
Several special materials orders are placed with different suppliers
The order is added to the production list
A delivery date is scheduled
Customer has e-mail address and a message is generated giving delivery date

Note. If (when) checking of validity of order entry is added then that will generate many more possible test cases.

You could follow the same process identifying scenarios for the **Manufacture Order** use case – left as an exercise. You should find a problem when there are no orders that can currently be manufactured!