LAB-03

BPMN
Resource Perspective and Events

Lecturer: Andrea MARRELLA

Objectives of this lecture

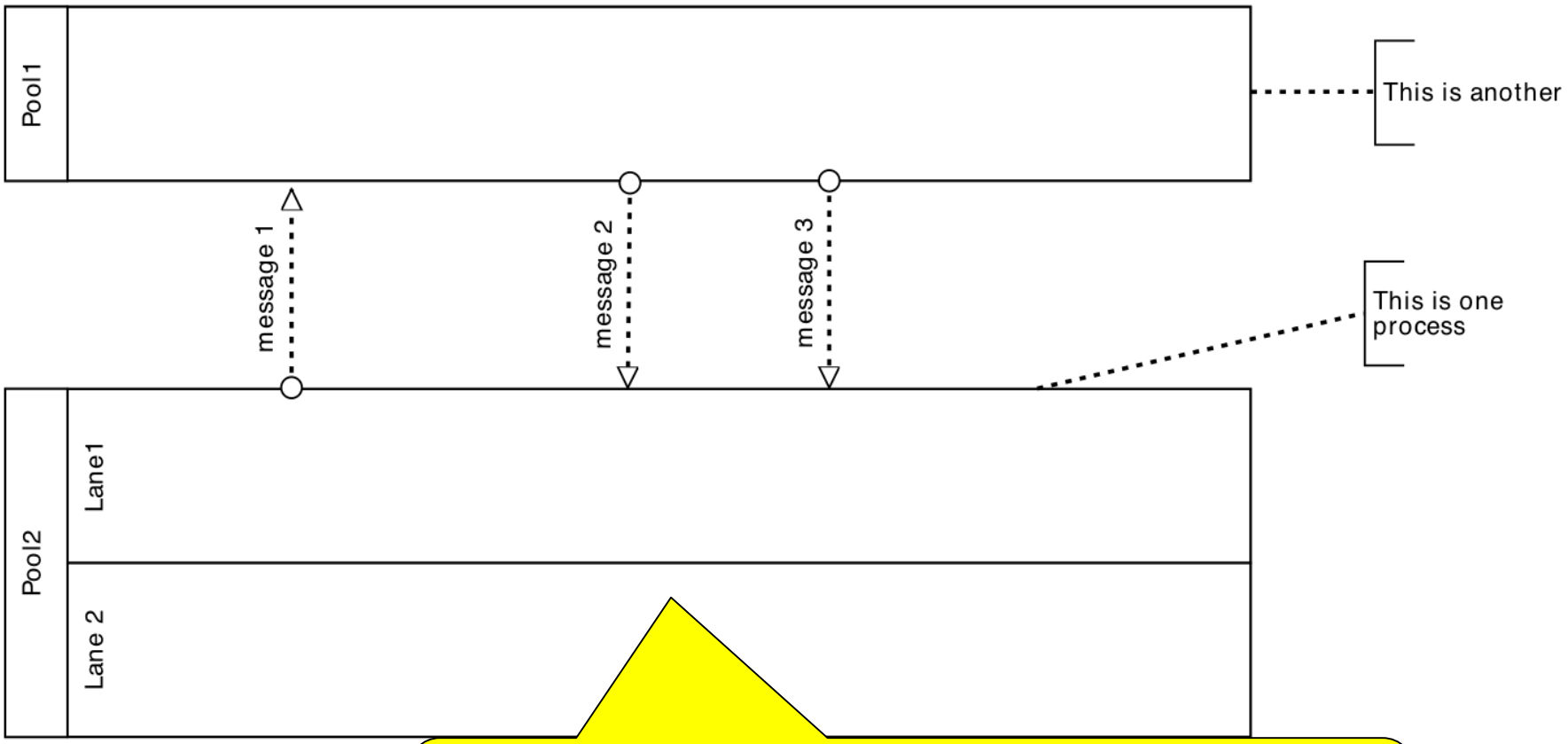
- Recap:
  - Pools, Swimlanes and Message Flows
  - BPMN events and event-based gateways
  - Example Processes
- Classroom exercises

Recap: Pools and Lanes \1

- Two abstractions to represent organisational elements in BPMN:
  - **Resource:** Anything or anyone involved in the performance of a process activity. It can be a human actor, an equipment or a software system.
    - The resource perspective of a process is interested in **active resources**.
    - For example, a database **is not a valid resource**, since it is **passive**. On the contrary, a web service invoking a database is **active**.
  - **Resource class:** Set of resources with shared characteristics, e.g., Clerks, Managers, Insurance Officers, etc.
- In BPMN, ***resource classes*** are captured using ***pools*** and ***lanes***.
  - **Pools** represent **independent** organizational entities, e.g., *Customer is independent from the Supplier.*
    - Independent means that **pools do not share any common system that allows them to communicate implicitly**. Communication happens explicitly through the use of **messages**.
  - **Lanes** represent **multiple resource classes in the same organizational space** (i.e., in the same pool) and sharing common systems.
    - *The Sales Department and the Marketing Department of the same company may be represented in the same pool, but in different lanes.* **They can communicate directly**.

ools and Lanes \2

In practice, **each pool** represents a **distinct process** and **each set of resource classes has its own pool**.

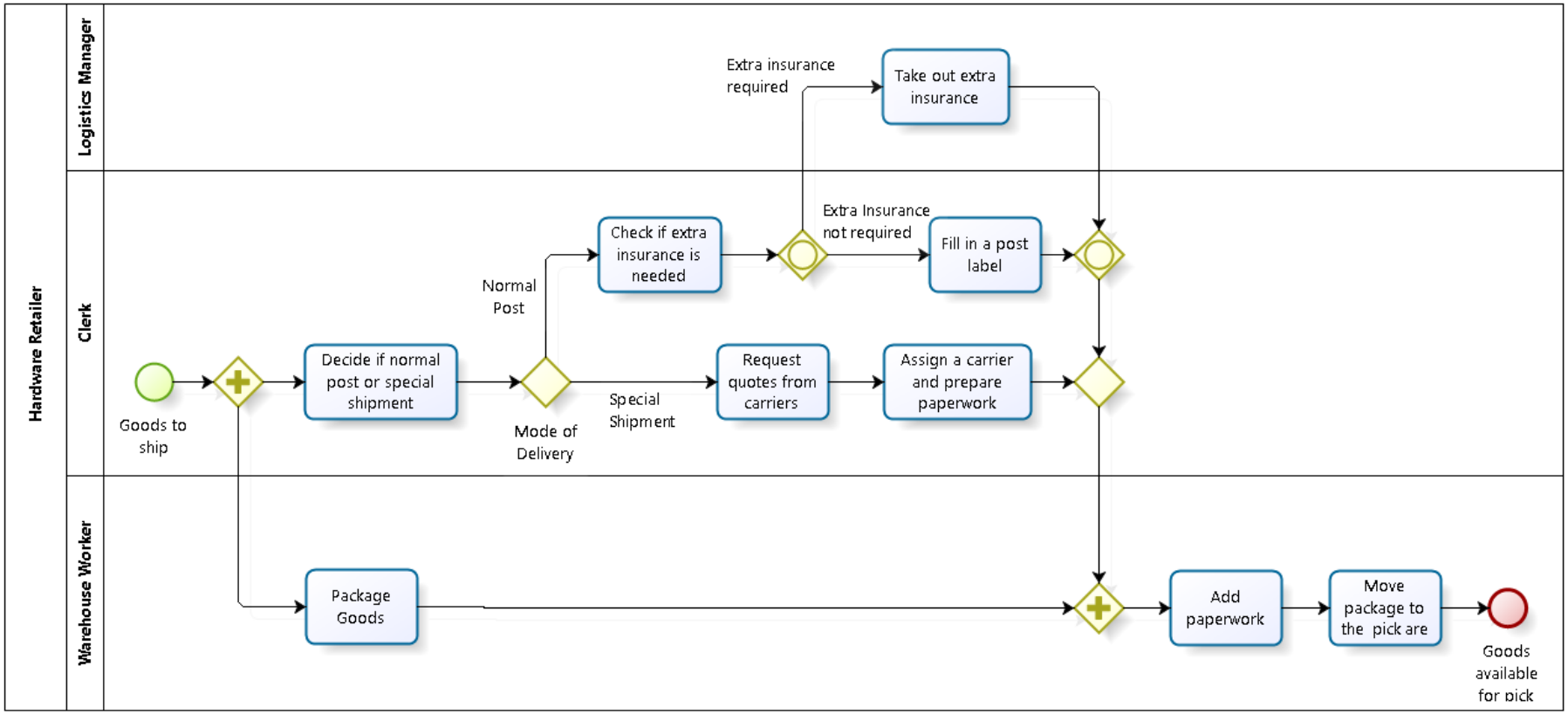


In each pool we may have multiple lanes, often assumed to represent **internal business roles** within a process. Lanes actually provide a generic mechanism for partitioning the objects within a pool.

Exercise: Shipment of a hardware retailer

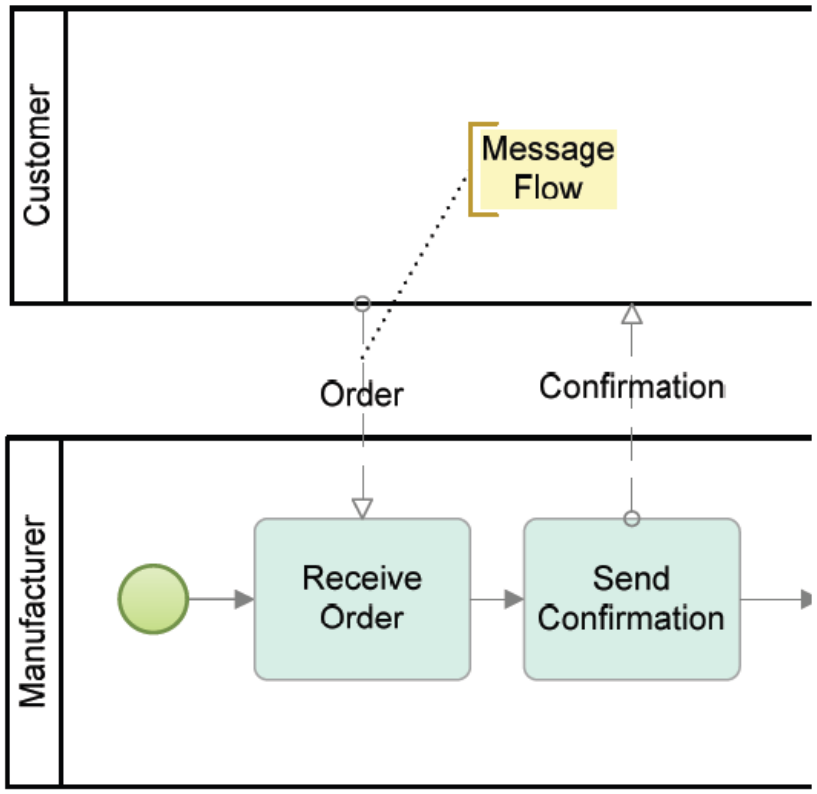
- The process defines the steps that a hardware retailer has to fulfill before some ordered good can actually be shipped to a customer (therefore, the process of the customer is not of interest).
- When there are some goods to ship, first of all a clerk has to decide whether the goods require a normal postal or a special shipment. In the meanwhile, a warehouse worker can already start packaging the goods.
- If the customer needs a special shipment, the clerk requests quotes from different carriers, then assigns a carrier and prepares the paperwork. But if a normal post shipment is fine, the clerk needs to check if an extra insurance is necessary.
- If that extra insurance is required, the logistics manager has to take out that insurance. In any case, the clerk has to fill in a postal label for the shipment.
- Finally, the warehouse manager collects the paperwork and moves the packaged goods to pick area.

Solution


Hardware Retailer
Logistics Manager
Clerk
Warehouse Worker
Extra insurance required
Take out extra insurance
Extra Insurance not required
Check if extra insurance is needed
Fill in a post label
Normal Post
Goods to ship
Decide if normal post or special shipment
Mode of Delivery
Special Shipment
Request quotes from carriers
Assign a carrier and prepare paperwork
Package Goods
Add paperwork
Move package to the pick are
Goods available for pick

Recap: Message Flows

- Message flow defines the messages/communications between **two separate participants** (shown as pools) of the diagram.



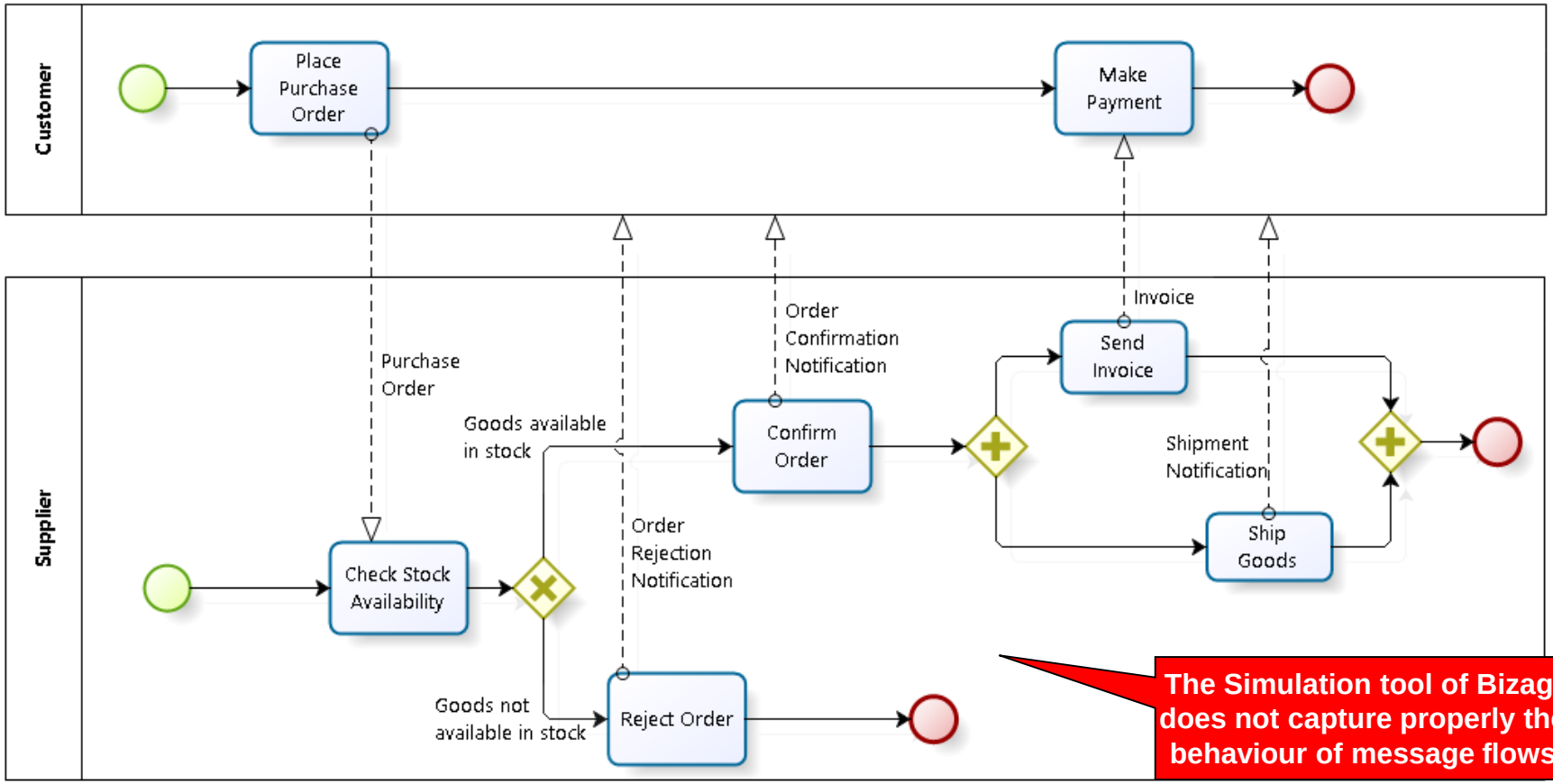
- Message flow must always occur between two separate pools and **cannot connect two objects within a single pool**.
- Message flows can connect elements in one pool with elements in another pool (or with the boundaries of the second pool).
- Sequence flow ***cannot cross a pool boundary*** - i.e., a process is fully contained within a pool.

Exercise: Order Management Process

- The process is started when a customer places a purchase order to a supplier.
- The purchase order has to be checked by the supplier against the stock availability of the product(s).
- Depending on stock availability the purchase order may be confirmed or rejected.
- If the purchase order is confirmed, the goods requested are shipped and an invoice is sent to the customer.
- The customer then makes the payment.

Solution

In the **Order Management process** there are **two resources classes**; the *customer* and the *supplier*. They are located in different pools, since they communicate by means of ***messages***.



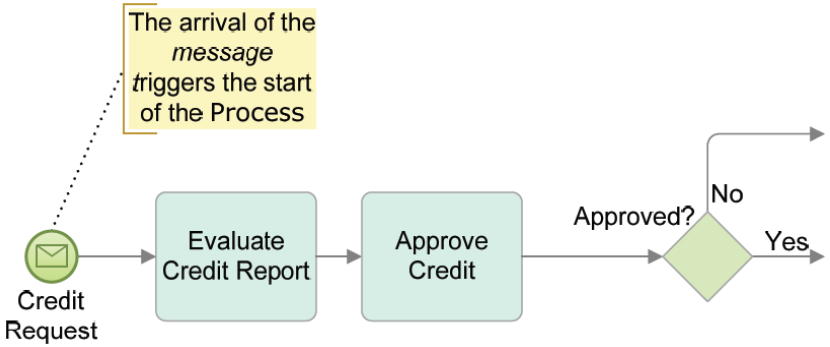
The Simulation tool of Bizagi does not capture properly the behaviour of message flows.

When a message flow **ends in a boundary of a pool**, it means ***we do not want to really model what happens with that message***. For example, when an order has been rejected, we do not really care what the customer does with that message.

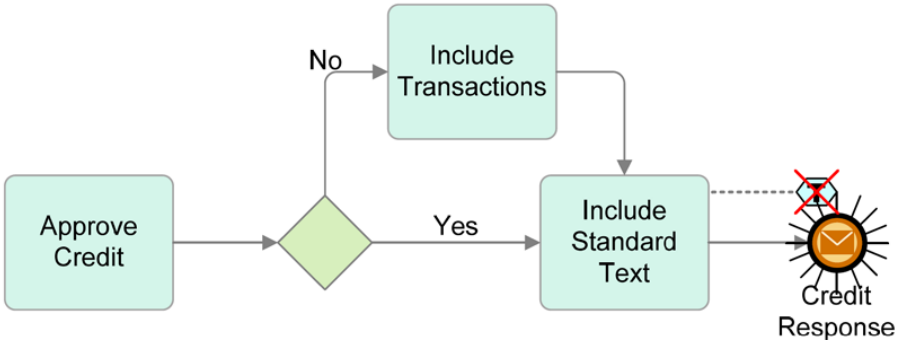
On the contrary, when the supplier sends an invoice to the customer, s/he **wants** that the customer receives the messages and proceeds with the payment.

Recap: Message Start/End Events

- A **Message Start Event** represents a situation where ***a process is triggered*** by the **reception of a message**.

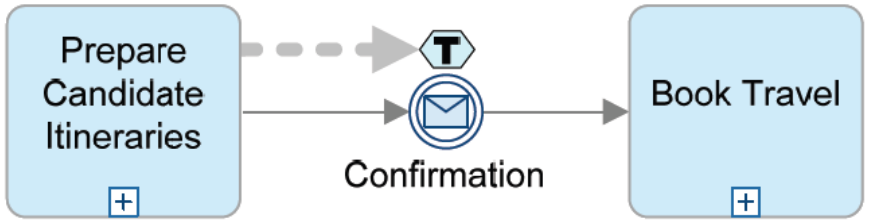


- A **Message End Event** indicates that the ***ending of a process path*** results in sending a message to another process.



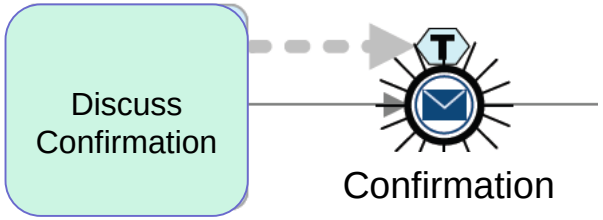
When a token reaches the Message End Event, the ***message is sent*** and the ***token is consumed***.

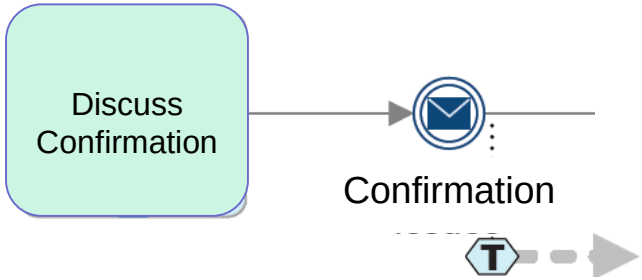
Recap: Message Intermediate Events

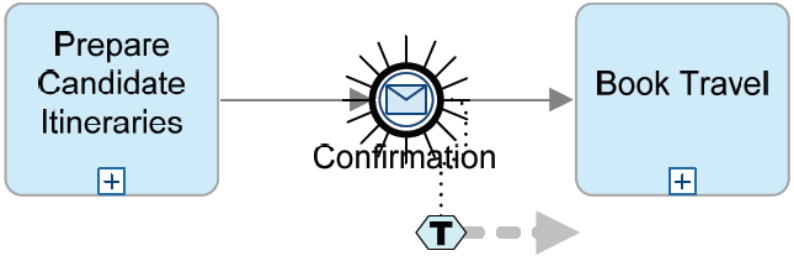


- *When a token arrives at a **catching Message Intermediate Event**, the process waits until a message arrives.*

- *When a token arrives at a **throwing Message Intermediate Event**, it immediately triggers the event, which sends the message to a specific participant.*





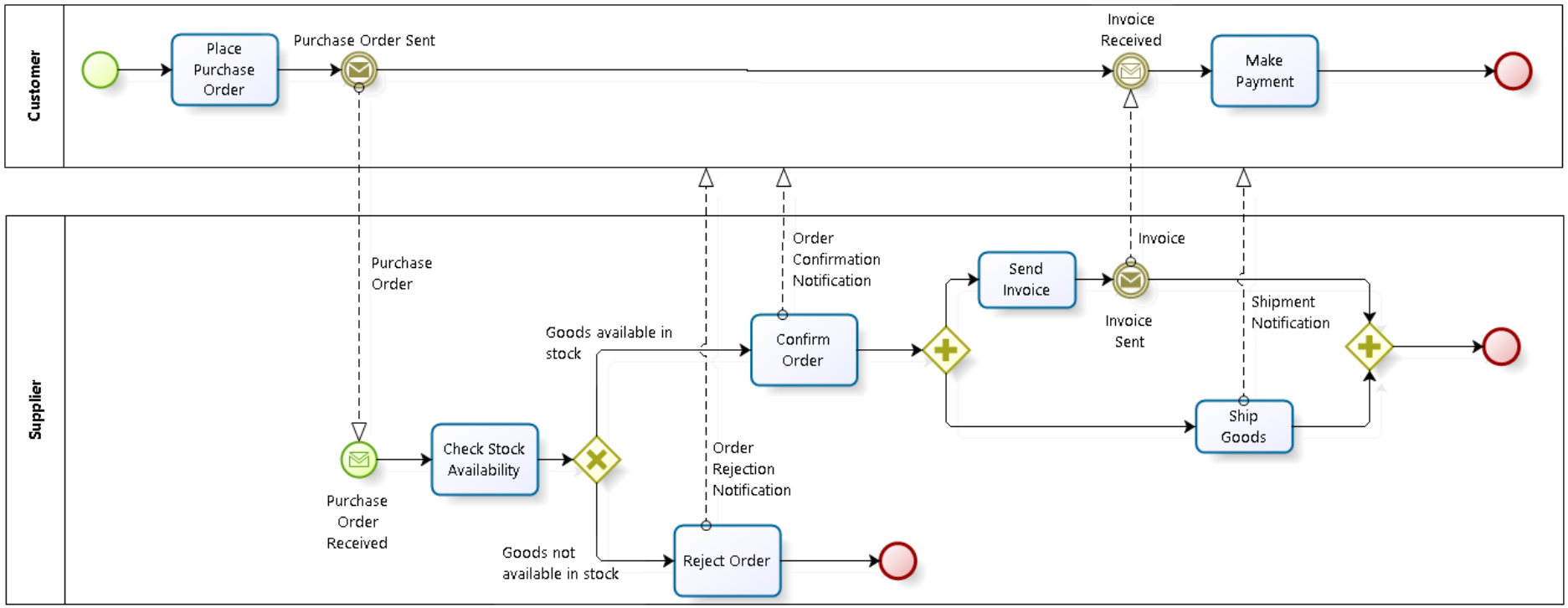


*If a token is waiting at the **catching Message Intermediate Event** and the message arrives, then the event triggers.*

Exercise

- Modify the Order Management Process by inserting the required message events to represent the **relevant** exchange of messages within the process.

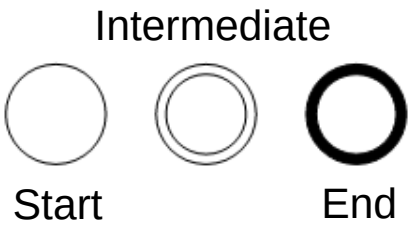
Order Management Process with Message Events



The Simulation tool of Bizagi captures perfectly the behaviour of message flows connected to message events.

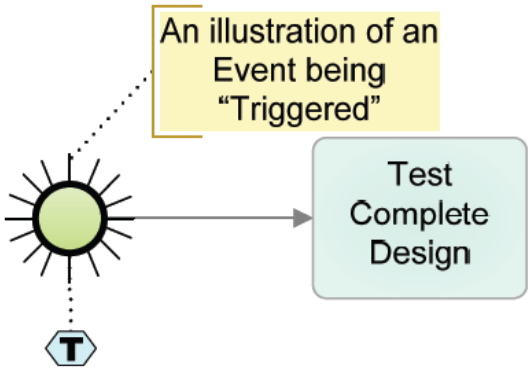
Recap: BPMN Events

- An **event** is something that "happens instantaneously" during the course of a business process. It can ***start***, ***delay***, ***interrupt***, or ***end*** the flow of the process.



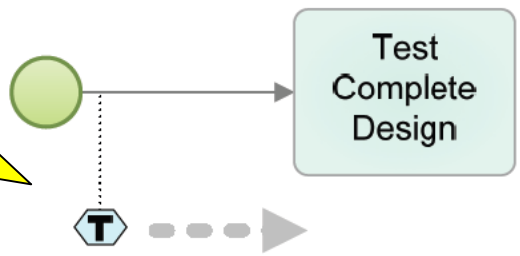
- A **Start Event** indicates the ***circumstances*** triggering the start of a process.
  - These circumstances, such as the arrival of a message or a timer "going-off," are called **triggers**.
  - They can only have **outgoing sequence flows.** They are of kind ***"catching".***
- An **End Event** indicate different categories of ***results*** for the process.
  - A result is something that occurs **at the end of a particular path** of the process (for example, a message is sent, or a signal is broadcast).
  - They can only have **incoming sequence flows.** They are of kind ***"throwing".***
- An **Intermediate Event** indicates where something happens/occurs after a process has started and before it has completed.
  - They can be of kind ***"catching"*** or ***"throwing".***

Start and End Events Behaviour

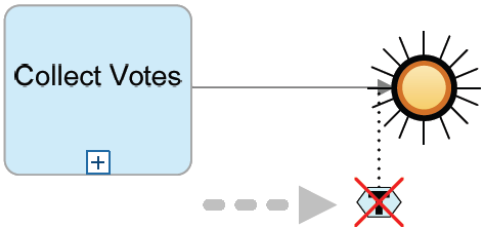


Start events are where the flow of a process starts, and, thus, are where ***tokens are created***.

When the start event **triggers** and the token is generated, the token will then **exit the start event** and ***travel down the outgoing sequence flow***.

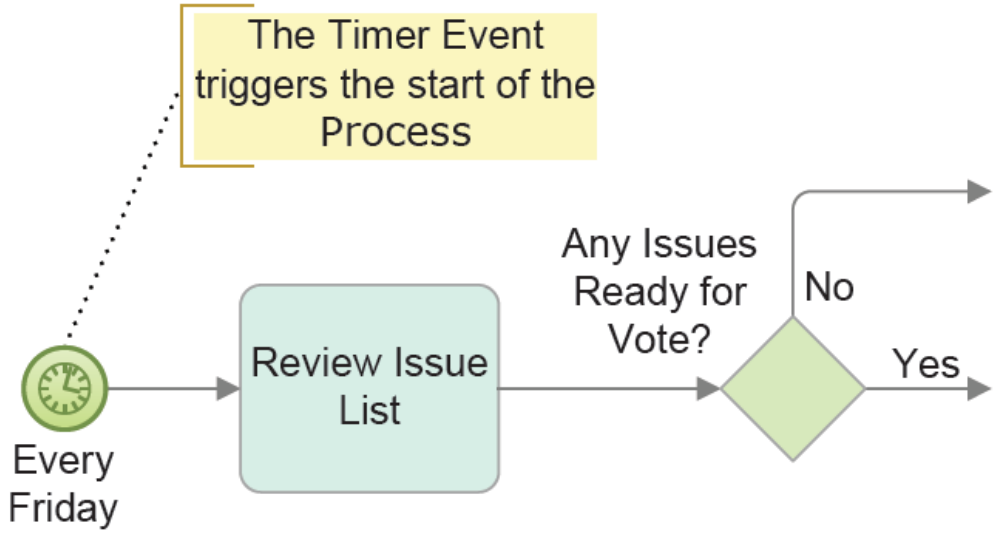


When a token arrives at an end event, **the result of the event**, if any, **occurs** and the ***token is consumed***.



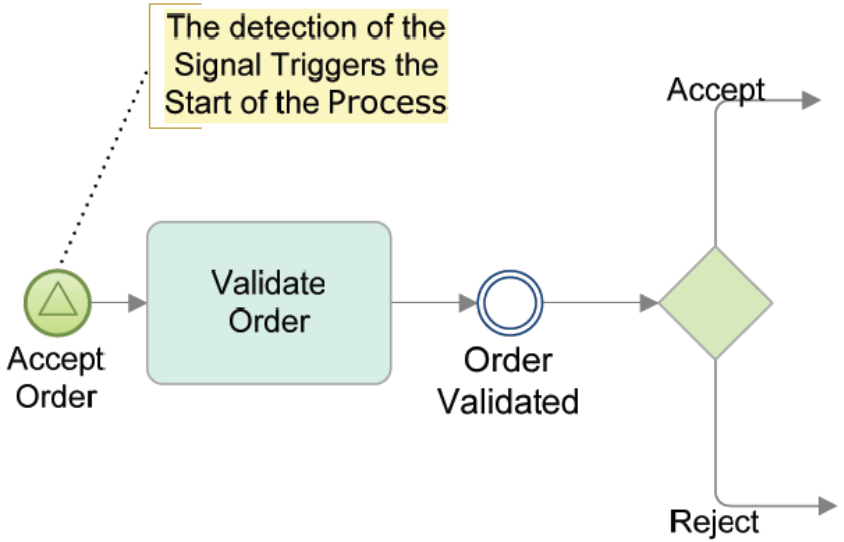
Example: Timer Start Event

- The **Timer Start Event** indicates that the process is started (i.e., triggered) when a **specific time condition** has occurred.
  - This could be a specific date and time (e.g., January 1, 2009 at 8am) or a recurring time (e.g., every Monday at 8am).

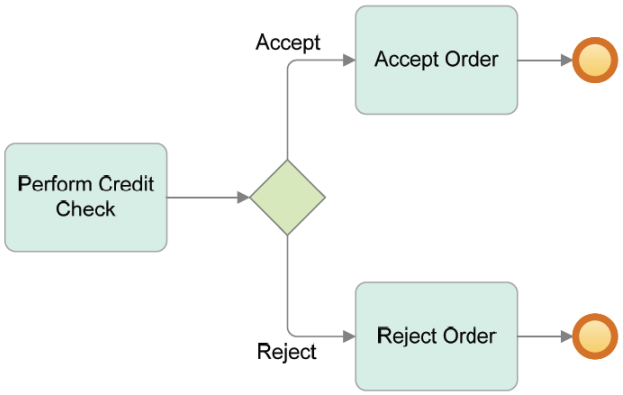


Example: Signal Start Event

- The **Signal Start event** indicates that the process is started (i.e. triggered) when a **signal** is detected.
  - The signal is a broadcast communication from a business participant or another process.
  - Signals have no specific target or recipient - i.e., all processes and participants can see the signal and it is up to each of them to decide whether or not to react.
  - Unlike messages, signals can operate **only within a process**.

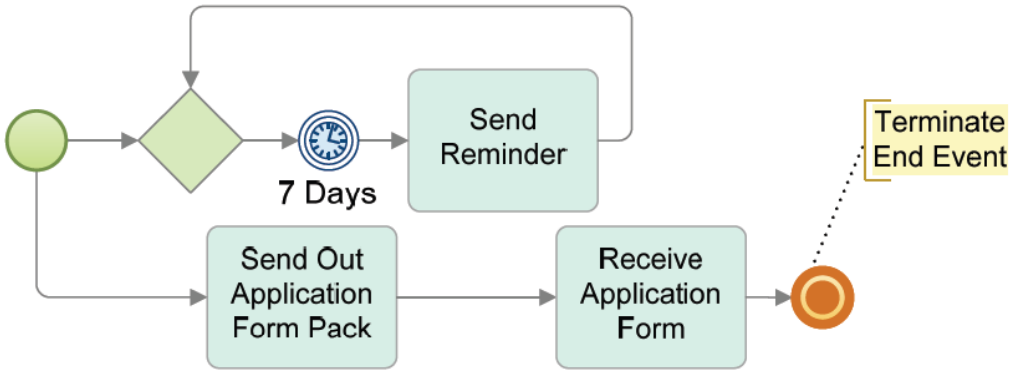


Example: None and Terminate End Event

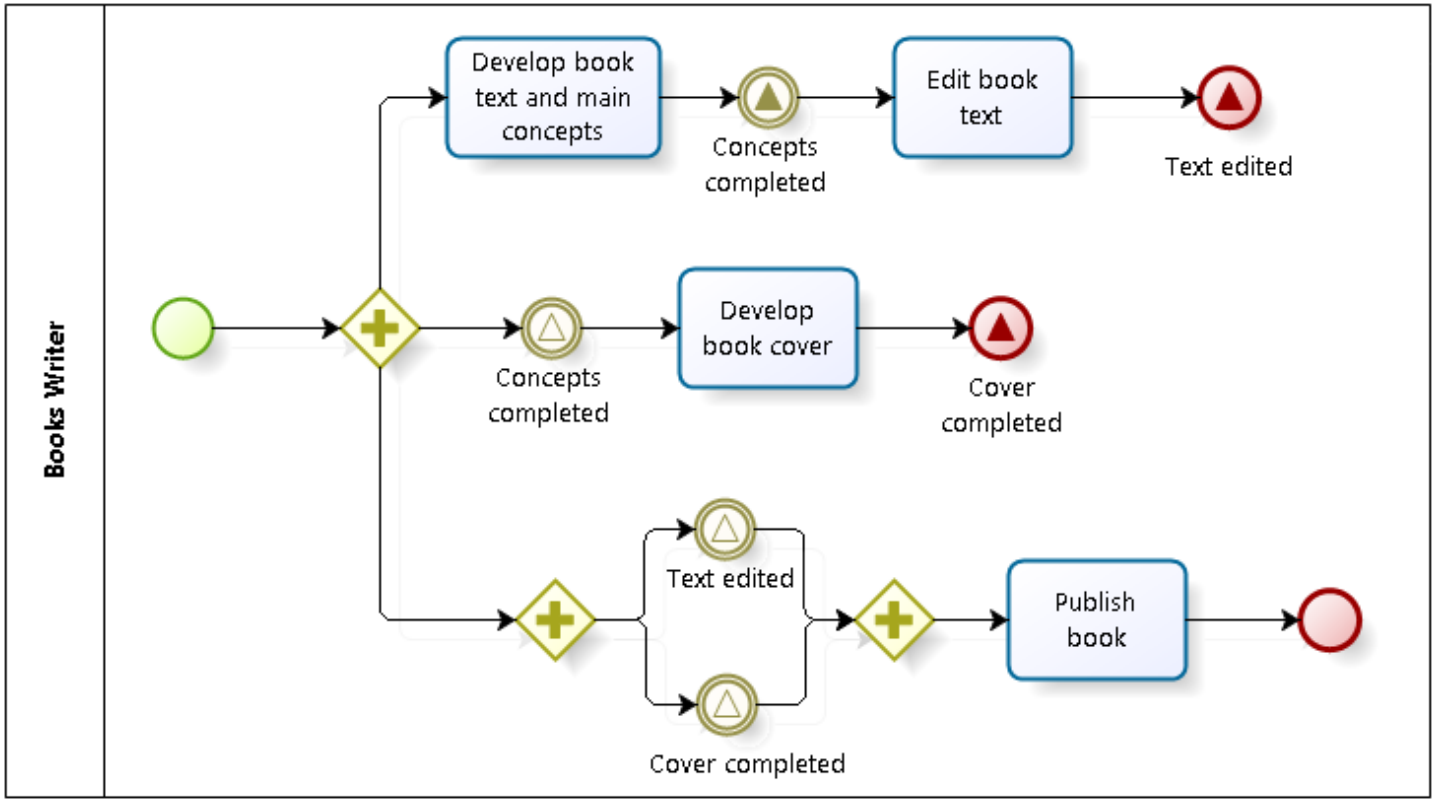


- The None End Event consumes a token but **not necessarily causes the completion of the process instance**.
- It is possible to have **one or more paths** (threads) that continue even after the token in one path has reached an End Event and has been consumed.

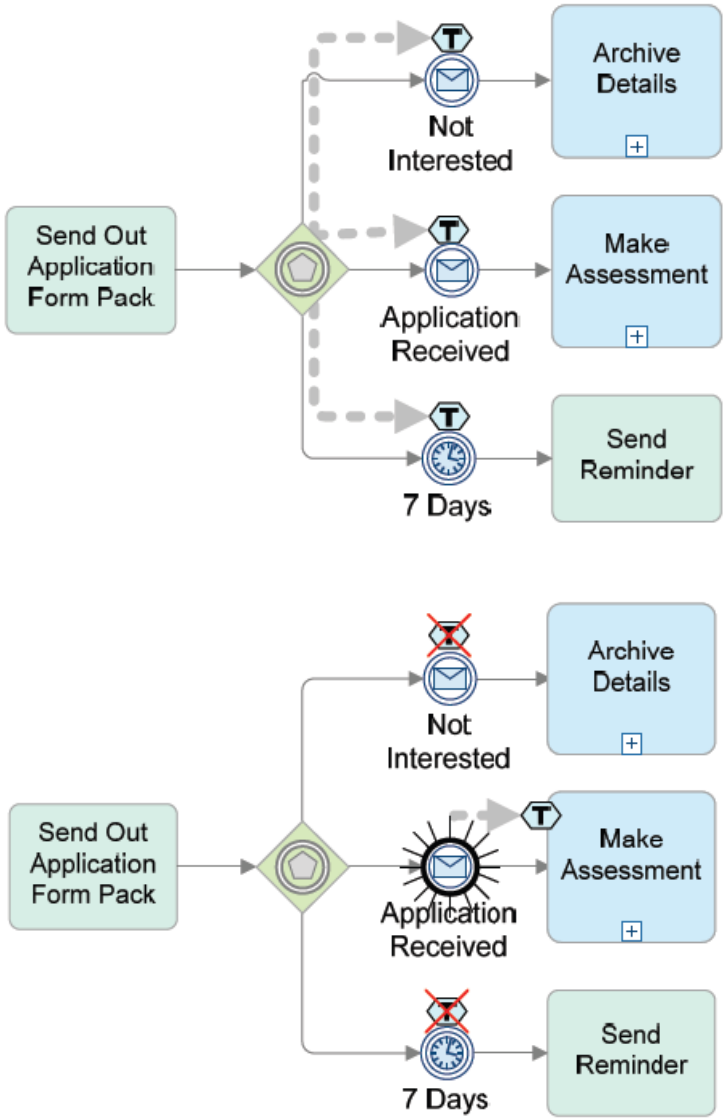
- The Terminate End Event causes the **immediate cessation of the process instance at its current level and for any sub-processes** (even if there is still ongoing activity).



Example: Publishing a Book



Recap: Event-Based Exclusive Gateways

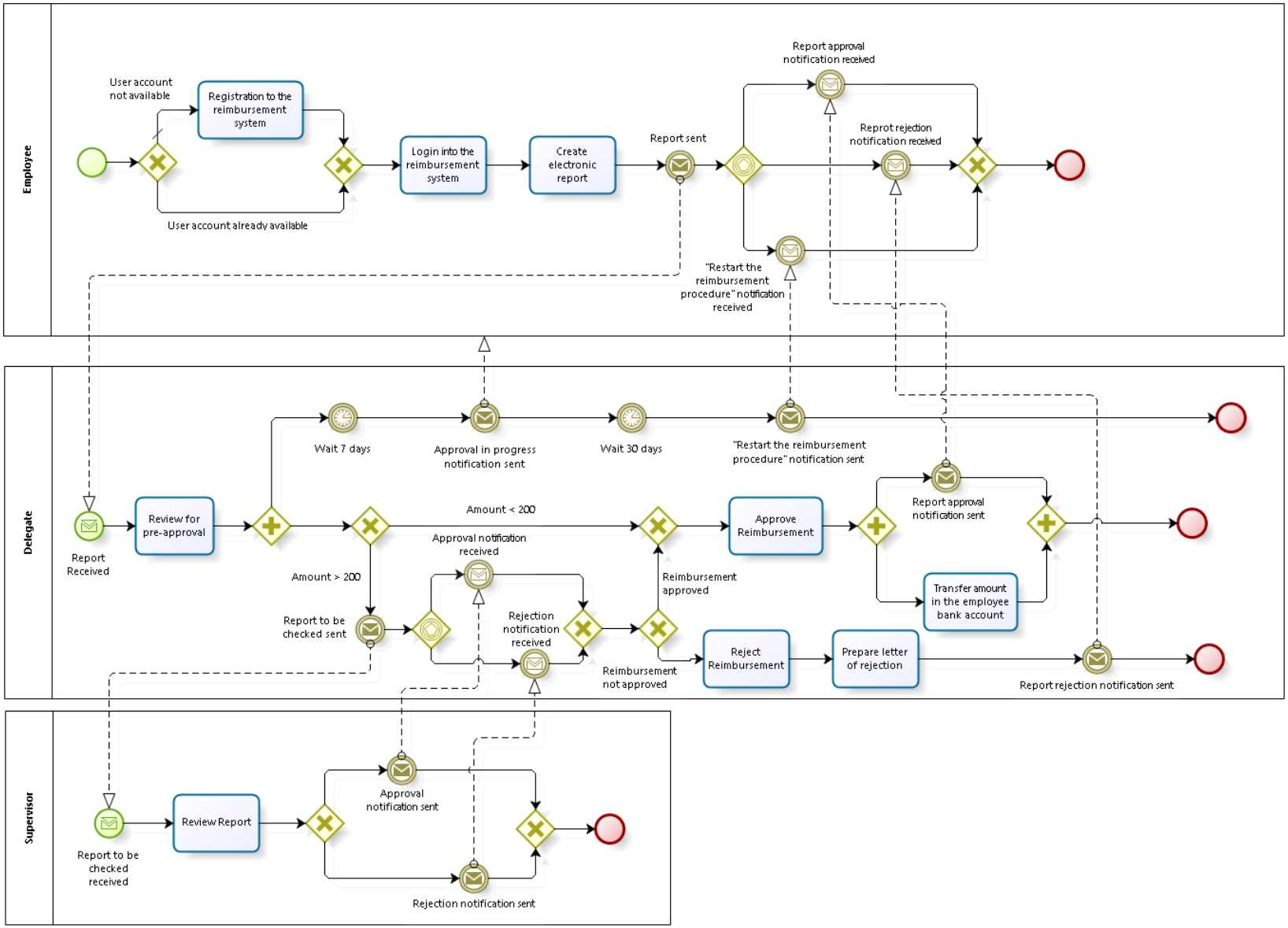


- ***Event-Based Exclusive Gateways*** represent an alternative branching point where the decision is based on two or more events that might occur, rather than data-oriented conditions (as in an Exclusive Gateway).
  - These Events, which must be of the ***catch variety***, are the first objects connected by the Gateway's outgoing Sequence Flow. The tokens will wait there until one of the Events is triggered.
  - The Intermediate Events that are part of the Gateway configuration become involved in a *race condition*. Whichever one finishes first (fires) will win the race and take control of the process with its token.
- Then the token will immediately continue down its outgoing Sequence Flow, by disabling the other paths.

Exercise

- Design a sample ***expense reimbursement process*** for the reimbursement of expenses incurred by employees of a company. For example buying a technical book, office supplies or software.
- To ask for a reimbursement, an employee must first create an account on the reimbursement system (if s/he does not have one) and then perform the login procedure.
- Once logged in, the employee must create an electronic report indicating the amount of expenses to be reimbursed. When ready, the report is submitted into the system for being approved/rejected by a delegate of the administration.
- When the delegate receives a new report, s/he checks it for pre-reviewing it. Amounts under $200 are automatically approved, whereas amounts equal to or over $200 require a further review performed by a national supervisor, which must decide for the approval or rejection of the reimbursement. Such a decision is not notified directly to the employee, but is communicated to the delegate.
- In case of rejection, the delegate must reject the reimbursement request through the system and the employee must receive a rejection notice (together with a motivation for the rejection) by email.
- In case of approval, the reimbursement is formally accepted through the system, and the delegate notifies the employee. The reimbursement will go to the employee's direct deposit bank account.
- If the reimbursement is not completed in 7 days, then the employee must receive an "approval in progress" email. If the request is not finished within 30 days, then the process is stopped and the employee is required to submit a new reimbursement request.

Solution


Employee
User account not available
Registration to the reimbursement system
User account already available
Login into the reimbursement system
Create electronic report
Report sent
Report approval notification received
Reprot rejection notification received
"Restart the reimbursement procedure" notification received
Delegate
Report Received
Review for pre-approval
Wait 7 days
Approval in progress notification sent
Wait 30 days
"Restart the reimbursement procedure" notification sent
Amount < 200
Approval notification received
Amount > 200
Report to be checked sent
Rejection notification received
Reimbursement approved
Reimbursement not approved
Approve Reimbursement
Report approval notification sent
Transfer amount in the employee bank account
Reject Reimbursement
Prepare letter of rejection
Report rejection notification sent
Supervisor
Report to be checked received
Review Report
Approval notification sent
Rejection notification sent