bizagi
Time to Digital

BPMN Guide Quick Start

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Scope

This document gives you practical examples about how to use BPMN 2.0 notation to model business processes. Elements of each diagram will not be explained in detail but they will give you a general idea of how they can be used in real business processes.

BPMN 2.0 – Business Process Modeling Notation

Business Process Modeling Notation (BPMN) is a graphical notation that describes the logic of steps in a business process. This notation has been especially designed to coordinate the sequence of processes and messages that flow between participants in different activities.

Why Is It Important To Model With BPMN?

- BPMN is an internationally accepted process modeling standard.
- BPMN is independent of any process modeling methodology.
- BPMN creates a standardized bridge which reduces the gap between business processes and their implementation.
- BPMN enables you to model processes in a unified and standardized way so that everyone in an organization can understand each other.

Introduction to BPMN

The Business Process Modeling Notation - BPMN – provides a common language which allows all the parties involved to communicate processes clearly, completely and efficiently. In this way, BPMN defines the notation and semantics of a Business Process Diagram (BPD).

BPD is a diagram based on the 'Flowchart' technique, designed to present a graphical sequence of all the activities that take place during a process. It also includes all relative information for making an analysis.

BPD is a diagram designed for the use of process analysts who design, control and manage processes. In a BPD diagram there are a series of graphical elements that are grouped into categories.

Core Concepts

This section introduces the basic concepts for modeling a process using BPMN. It endeavours to show how it is possible to model many business situations using BPMN. The diagrams will not be built step by step, but they should be references to understand the use of the BPMN elements within a real business process context.

Loan Request Process

The Loan Request Process handles the necessary activities to receive, analyze and approve loan applications submitted by customers of a financial entity.

A simplified version of this process consists of a couple of activities. First, a customer submits a loan request together with the required documents, then, the information submitted is verified and the application is studied. Finally, the amount of the loan is disbursed, if approved.

The Loan Request Process BPMN diagram is as follows:

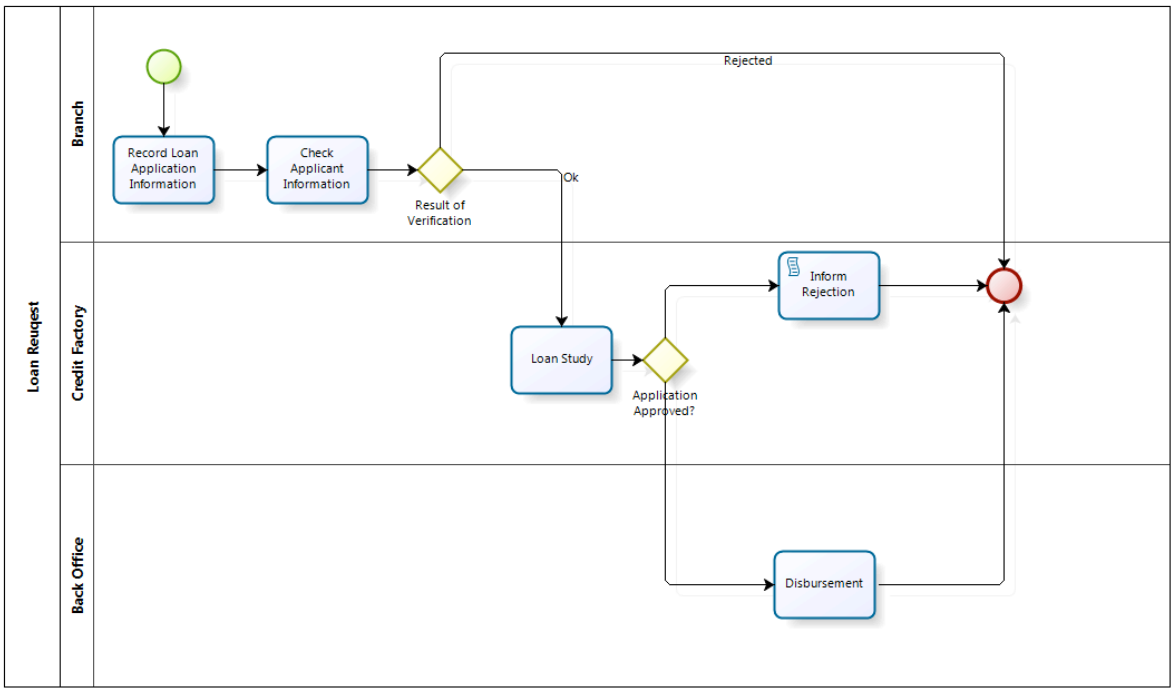


Diagram 1. Loan Request Process

As you can see, within a business process diagram, there is a set of graphical elements that allow us to model it.

The business process diagrams are contained in objects known as *pools* that allow us to represent the responsibilities in a process or simply identify the process. BPMN also allows depicting the process performers through separators known as *Lanes*. For this case the *pool* is called *Loan Request* and the lanes represent the *Branch*, the *credit factory* and the *back office* as can be seen in the diagram.

We can identify 3 types of elements that describe the process behavior: *Tasks*  represents the work that is performed; events  that, for this case, are used only to identify the start and end of the process; decision elements, known in BPMN as *gateways,* that are represented by diamonds  and indicate a branching point in the flow. Such elements are connected by sequence lines to represent how the process flows.

Let´s analyze in detail the function of each element within the process.

At the beginning we find a *start event*  that indicates the process start. Processes can be started in many ways so BPMN provides a set of *start events* (simple, message, signal, among others) to model those behaviors. We will see some of those events in detail later.

Then there are two *tasks*  . The first represents the record of the loan request information and the second, the verification of the applicant information. When the information is verified, a branching point must evaluate if it was successfully verified or if the applicant is rejected. This evaluation is made through an *exclusive gateway*  that choses one of the possible paths based on process data. If the applicant's information is correct, the loan request will be studied, if not the process will be finished.

A similar situation occurs when the loan study is done: the *Loan Approved? Exclusive gateway* evaluates the result of the study and according to this, notifies the rejection of the loan or disburses the funds.

Finally, we find a *Terminate End Event*  , that indicates the process finishes when the applicant was rejected, the loan was not approved or the amount of the loan was disbursed.

Travel Plan Quote Process

This process handles request for quotes of travel plans made by customers of a travel agency.

When a customer requests a quote, a travel agent must verify the availability and calculate the costs of each of the services the customer included in the request (Flight, hotel, car rental). When completed, a travel plan is built and the quote is sent. If the customer is interested in the plan, a *travel plan delivery* process starts, if not the process finishes.

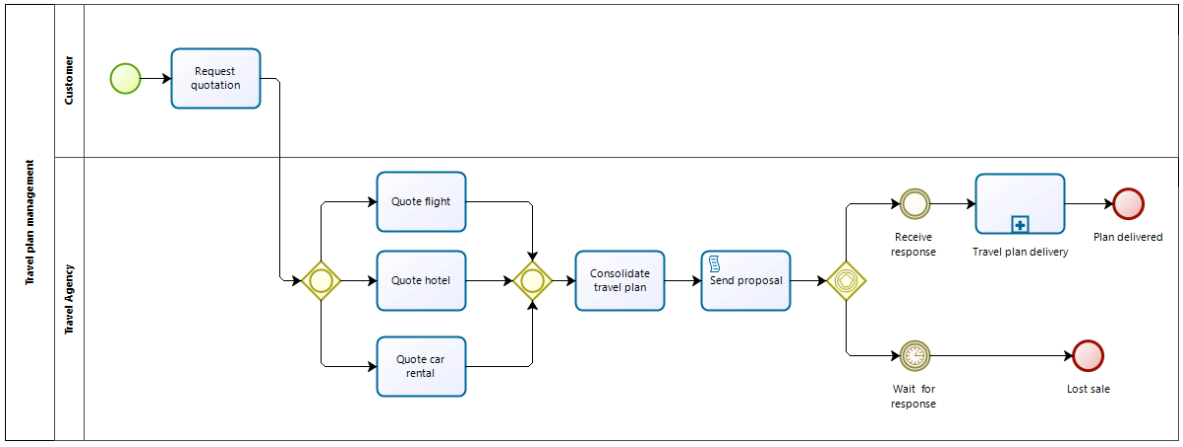


Diagram 2. Travel Plan Quote Process

The process starts with the *Request Quote task* where the customer submits their requirements for travel. The customer can request plans that include auto rental, hotel and airplane tickets. According to the selected services, a travel agent must perform the necessary activities to verify availability and calculate the cost of each one.

The *Inclusive Gateway*  allows enabling only the activities related to the services the customer wants, it means the paths are not exclusive and one or more of the three available can be chosen.

In order to ensure the process continues only when the necessary activities have been accomplished, another *Inclusive gateway* is used as convergence or

synchronization, so the flow is allowed to continue when all the active paths are joined.

Once the requested services have been managed, the travel agent consolidates the travel plan based on their availability and costs, and then the proposal is sent to the customer via email. The email sending is modeled using *script tasks*  . This kind of task allows the execution of scripts that the modeler defines.

The next shape we find in the flow is an *Event-Based Gateway*  . This gateway represents a decision point in the process where the selection of a path depends on events rather than process data.

In this case two events can occur: the *Receive Response None Intermediate event*  ,that is manually executed by the travel agent when he/she has received a positive response from the customer, or the *Wait Response Timer event*  , that waits a specific time for the customer response. The event that is activated first enables its related path and the other will be no longer valid. This means that if the customer does not give a response to the quote after a specific time, the process finishes when reaching the *End Event*  .

In case the customer gives a positive response to the quotation, a travel plan delivery process must start. This is depicted in the diagram by a *sub-process*  which is a set of activities with a logical sequence (a process) thus this can be broken down into more levels of detail. This *sub-process* represents the activities that the administrative department must perform in order to delivery and invoice the services to the customer.

Finally the process finishes when it reaches the E*nd Event*  .

Purchase Order Generation Process

The goal of this process is to automatically generate purchase orders according to the raw materials inventory levels and to manage their approval, record them in the company accounting system and deliver them to suppliers.

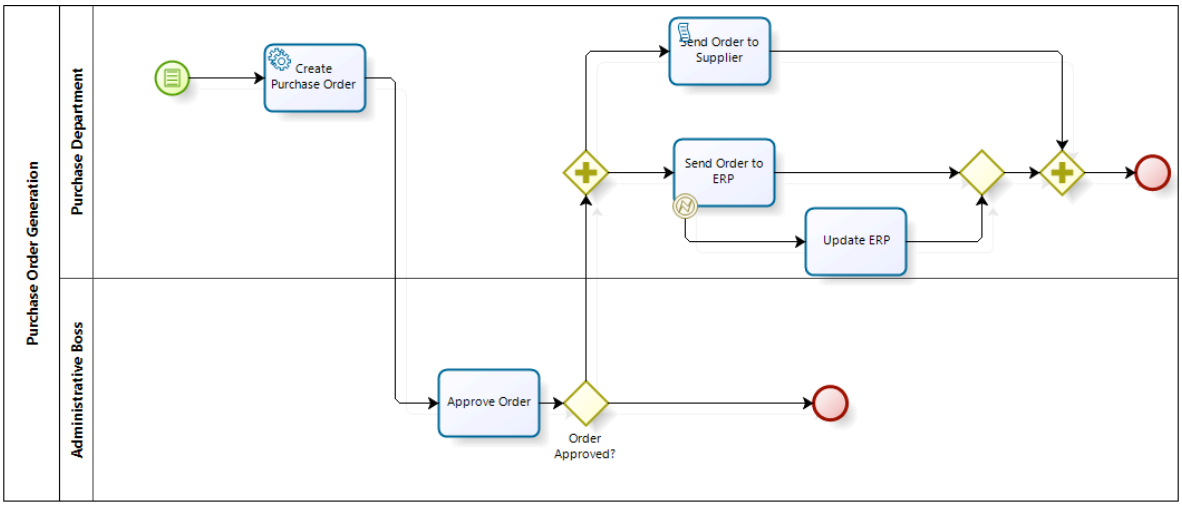


Diagram 3. Purchase Order Generation Process

Suppose you have a system that allows you to measure the inventory levels in real time. Once the inventory level reaches the re-order point, a purchase order is generated.

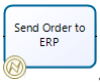
The *Conditional Start Event* allows modeling this situation. It is activated when a business condition is fulfilled to start the process.

A *Service Task* is used to automatically generate the Purchase Order PDF. This task depicts an activity that is executed without human intervention through an automatic application or web service.

Purchase orders must be approved by the Administrative Boss so he/she must review the Purchase Order PDF and decides whether to approve it or not.

The *Order Approved? Exclusive Gateway* is used to choose the flow the process will follow according to the decision of the Administrative Boss. If the Order was rejected, the process will be finished, but if the order was approved, two tasks will be enabled to be executed simultaneously by using a Parallel Gateway; The first task sends the Purchase Order to the supplier via email, the second one records the Purchase Order in the company's ERP.

In the first parallel flow we find a *script task*. to send the purchase order to the supplier via email.

In the second one, we find a Service Task with an attached event 

. Such event is a *Catch Error Event*  . The service task allows recording the Purchase Order into the company's ERP through an interface, however, if during the execution of this task an error arises (network connection error, etc.) the *error event* is triggered and the next task is enabled. In this case the *Update ERP task* is enabled in order to manually record the Purchase Order in the company's ERP.

In order to synchronize the active flows we find two gateways. The *exclusive gateway*  synchronizes the flows related to the activities *Send Order to the ERP* and *Update ERP.* In the same way, the *parallel gateway*  merges the parallel paths previously enabled. Once both paths reach this gateway, the process finishes due to the *End Event*  .

Incident Management Process

The goal of the incident management process is handling and solving failures and disruptions in the technological infrastructure to avoid affecting the normal performance of business activities within an organization.

The process starts when a user reports an incident. This incident is handled by technicians that find a solution, communicate it to the user and record the procedure followed to solve the incident in a knowledge base. Finally the case is closed.

The following diagram shows a more complex situation of this process. This include activities that must be carried out, in an exceptional way, when the incident is too serious or it is not possible to solve it in a specific period of time.

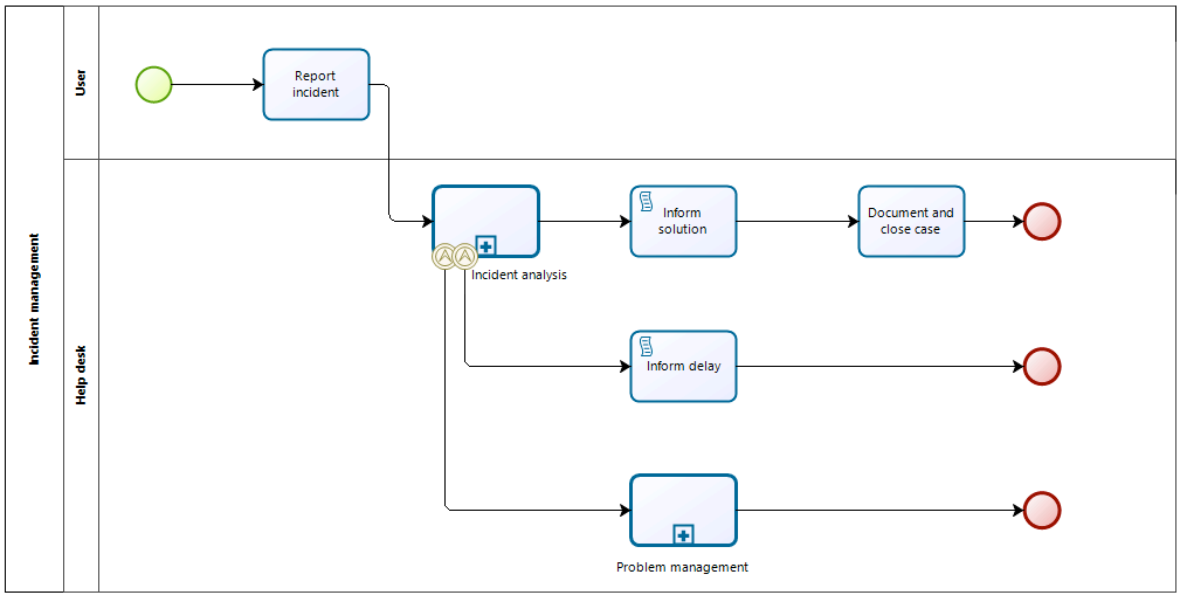


Diagram 4. Incident Management Process

The user reports the incident in the first process activity. Then, the necessary activities to ensure the incident is timely resolved are performed in the *Incident analysis sub-process.* .

Note this sub-process has two events attached to its boundaries; the first is an interrupting escalation event , and the second is a non-interrupting escalation event . These escalation events represent the activation of exception flows when an escalation event is caught from the sub-process flow.

The first escalation event interrupts the execution of the sub-process; any pending flow into the sub-process will be cancelled and the exception flow related in the main process will be activated.

The second one activates the exception flow in the main process, but the pending flows into the sub-process will remain active.

For a better understanding of the utility of each event attached, let´s see the sub-process flow.

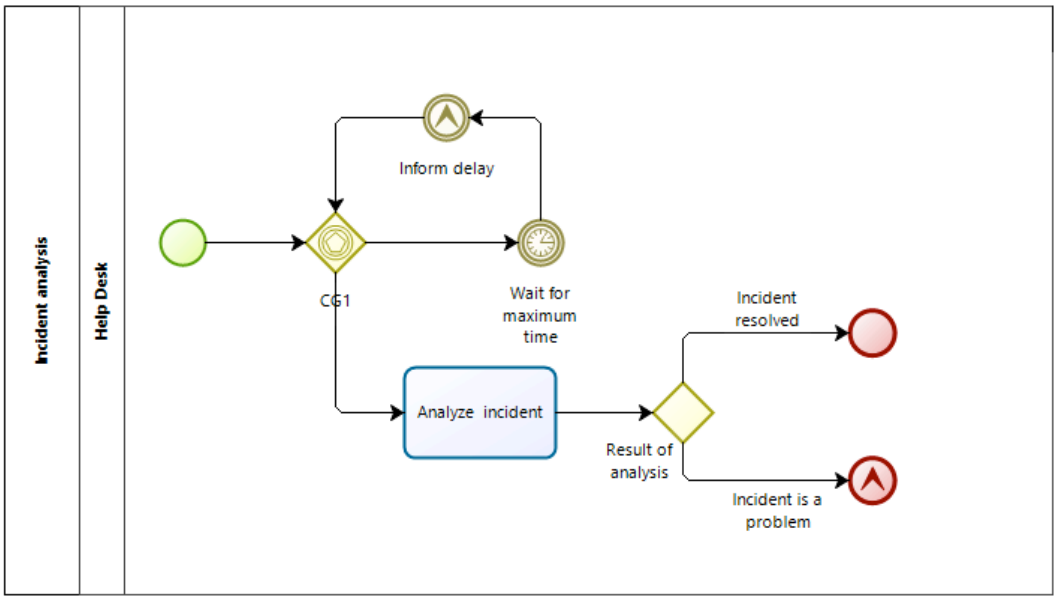


Diagram 5. Incident analysis Sub-process

The sub-process has one activity, the other elements are used to control conditions related to the incident solution.

We find an *Event-Based Gateway* . Remember that this Gateway enables one of the possible flows based on events; the event that is activated first enables its related path and the other will be no longer valid. In this case, if the person working on the incident does not find a solution within an established time, the upper flow is enabled and an escalation event is triggered. This event is related to the *non-interrupting escalation event* attached to the sub-process shape in the main process and it will activate an exception flow that notifies the user about the solution delay.

Additionally, the person working on the incident can find a solution or identify that the incident is a problem that has arisen repeatedly and additional management is required. Those conditions are evaluated by the *Activity Result exclusive gateway* that will enable the proper flow according to the business conditions.

If the incident was solved, the first path is enabled, the sub-process finishes and the main process will continue its normal flow. If a problem was identified, and *escalation end event* is triggered. This will activate the *interrupting escalation event* attached to the sub-process shape in the main process and will enable an exceptional flow that starts the *Problem Management sub-process.*

Travel Request Process: Using The Transactional Sub-Process

Transactional processes are used to coordinate multiple activities that have to be successfully completed. We will use the Travel Request process to show you how this kind of process is used.

A Travel Request process includes the necessary activities to receive and handle travel requests made by the employees of a company. This is a very simple process if we do not take into account the unexpected situations that can arise.

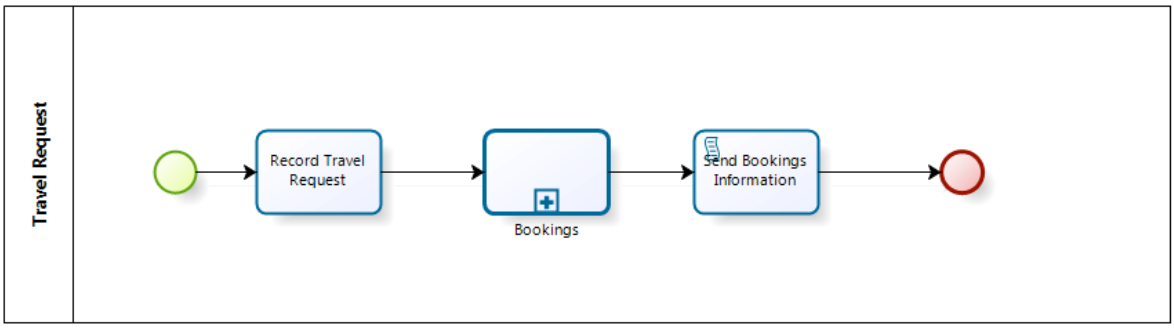


Diagram 7. Simple Travel Request Process

The process has 3 activities. First, the requester enters the information related to the travel, then the Administrative Department has to manage the bookings the employee requested and send the information related to them once they have been confirmed. The activities related to the Booking sub-process are:

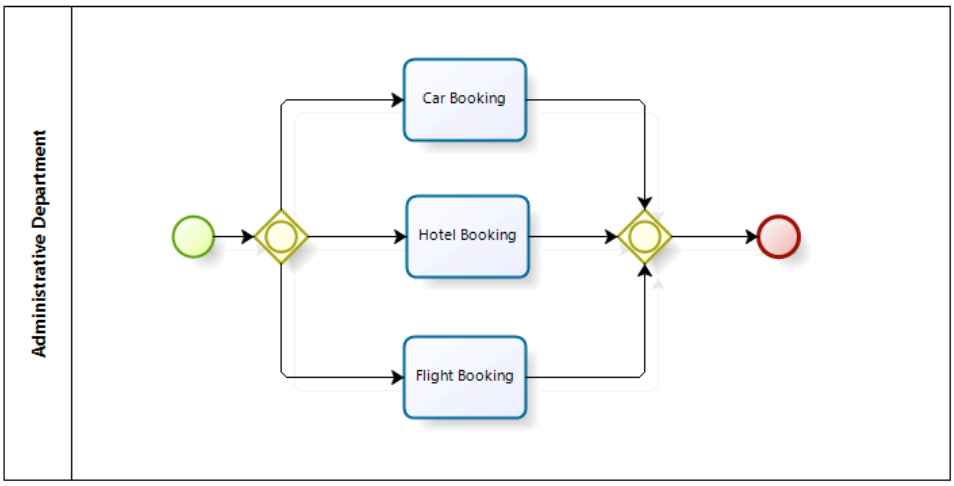


Diagram 8. Simple Bookings Sub-process

The Administrative Department can manage the car, hotel and flight bookings simultaneously as requested by the employee. When completed, the sub-process finishes. However, many situations can arise during the process development.

Suppose the Administrative Department has successfully confirmed the car and hotel booking. But when the flight is going to be booked, no airline has flight availability on the requested date. The car and hotel were already booked for that date so they have to be undone and the employee must be notified about this situation. This can be modeled as follow:

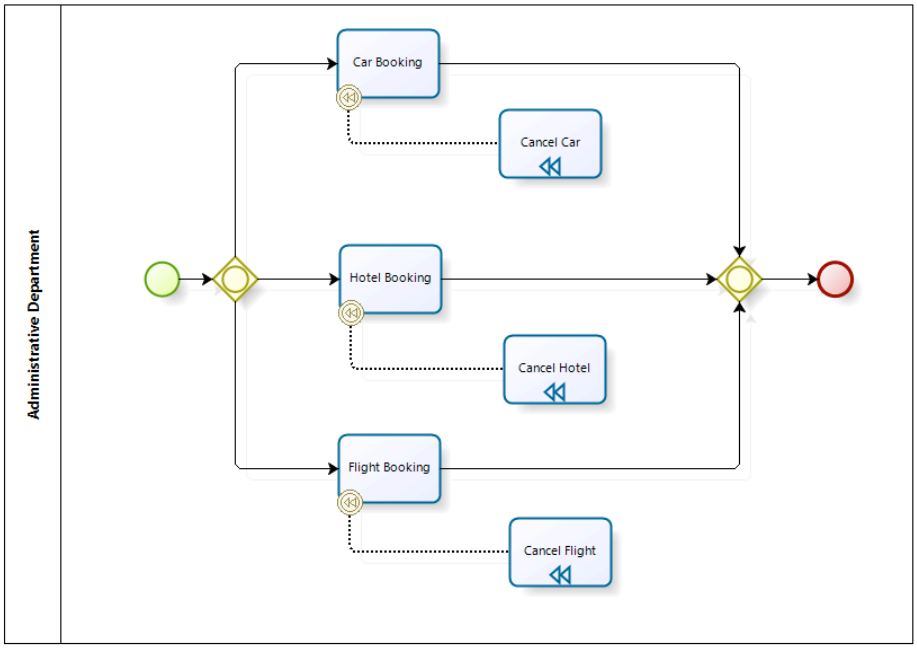


Diagram 9. Bookings Sub-process with compensation activities

We find a new event type attached to the boundaries of the activities related to the bookings, that is the C*ompensation event*  . This event is used to activate an exception flow once it is triggered. In this case, the exception flow represents activities that must be manually executed in order to face unexpected situations.

For example, if the flight booking could not be made, but the car and hotel booking were already confirmed, the compensation event will be activated and *the Cancel Car and Cancel Hotel compensation activities*  will be enabled so the Administrative Department can undo them.

We can sense that if the activities are compensated, the main process will not follow its normal flow. The employee will not be notified about the successful bookings because they were cancelled. Taking this into account, some things must be modified in our original main process:

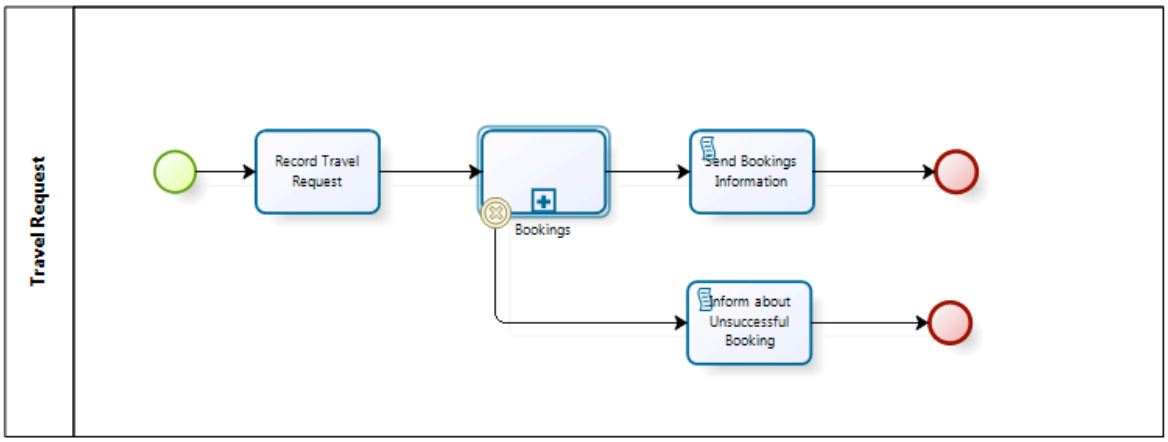


Diagram 10. Travel Request process with cancelation event

A new element appears: the transactional sub-process 

. This kind of sub-process enables the execution of a transaction protocol, it means, the three possible results of a transaction can be executed: Cancellation, compensation and error.

We have already modeled the compensation of the sub-process activities, now it is necessary to enable their cancellation. In order to do this, the *cancellation event*  is attached to the sub-process shape. This event is triggered when all the compensation activities are finished and enables an exception flow for the main process. In this case, the exception flow will send a notification to the employee in order to inform him/her that the booking could not be made, through a *script task*  .

Finally we will show the last result of a transaction: the Error. This occurs when something unexpected arises and there is no defined procedure to cover it. Suppose that flight bookings are made through a *service task*  . The sub-process diagram will be:

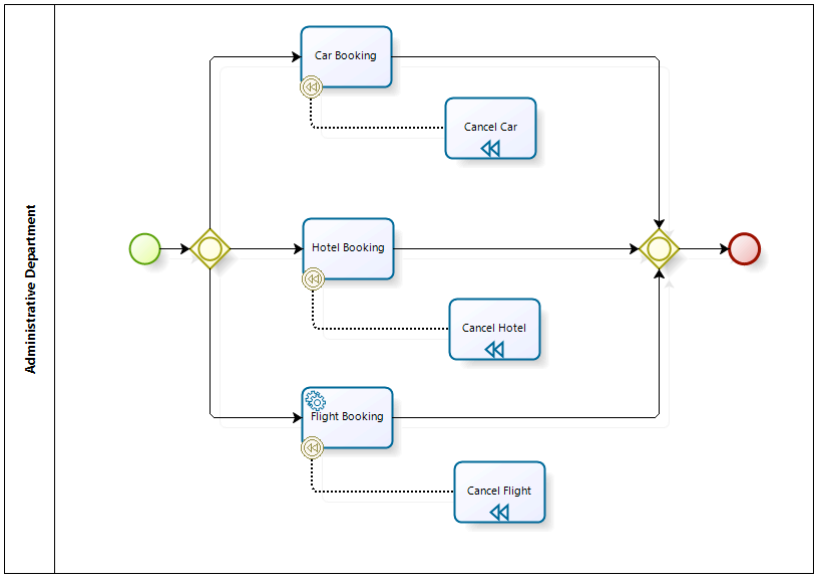


Diagram 11. Bookings sub-process with automatic activity

If during the execution of the automatic task an error arises (connection error, etc.) the sub-process will have to be finished and an exception flow has to be enabled for the main process. In order to catch the error, an *error event* must be attached to the boundaries of the sub-process shape:

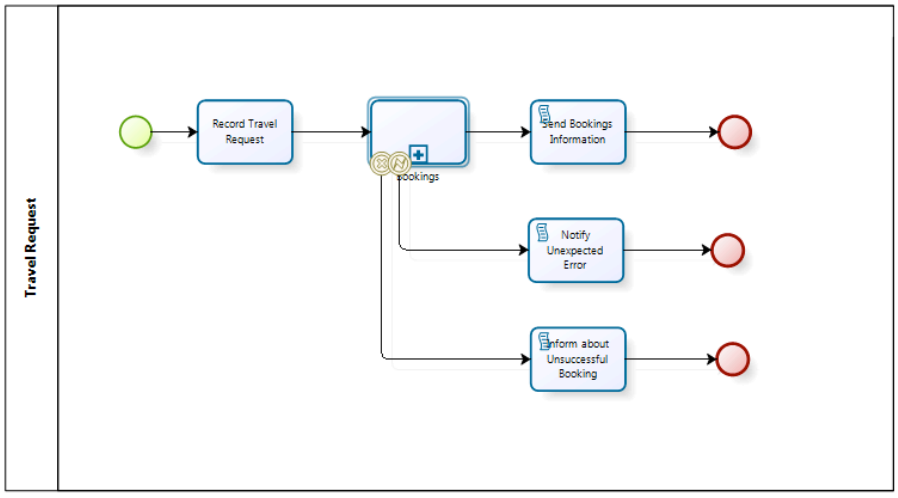


Diagram 12. Travel Request Process with cancellation and error events

Note that when the *error event* is triggered, an exception flow will notify the proper person about the error so he/she takes the necessary actions to cover it.

Collaboration diagrams

Collaboration diagrams depict the interaction between two or more processes. Usually they contain two or more pools to represent the collaboration performers.

Let´s take the parallel processes performed by a company and its suppliers when a purchase is managed. Each performer carries out independent processes, however, those processes constantly interact by changing information (calls, emails, faxes, etc.) and no one will finish without the information given by the other. The next diagram shows this situation:

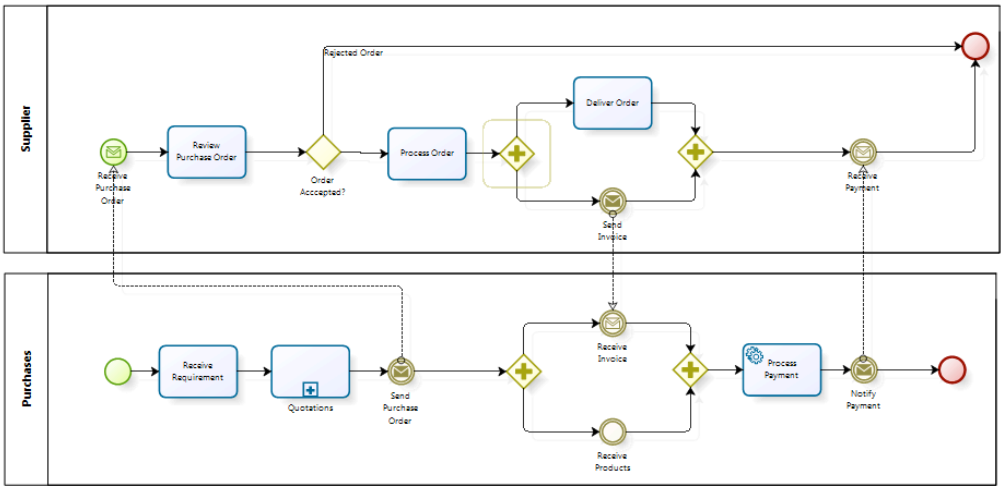


Diagram 13. Collaborative Purchase Process

As we can see, there are two performers involved: The company and the supplier. They are represented by the pools.

The process is started by the company which receives a purchase request from a department. When accepted, the request starts the *Quotations sub-process*  . This sub-process manages the necessary activities to receive and evaluate quotations of the requested products in order to select a supplier.

Once the supplier has been selected, a purchase order is sent, this is depicted through a *Message Event*  . In Collaborative diagrams, *the information flow between processes is represented through message flows*. The *message event* activates the message and the outgoing dotted line that you see in the diagram is a *flow line.* This line connects two message events to relate them to each other.

Note that in the diagram the *Send Purchase Order Message Event* is related to the *Receive Purchase Order Start Message Event*  . The last one will start a process instance for the supplier process once the purchase order is received.

The supplier starts a flow to process the company order and sends the products of the order and their invoice. This is depicted through the *Send Invoice Message Event*  . In parallel, the company waits for the invoice and the products. The *Receive Invoice Message Event*  waits for the invoice while *the Receive Products none intermediate event*  is enabled so that it can be manually executed once the order is received. Such events are enabled in parallel thanks to the *parallel gateway*  .

In order to ensure the company process does not continue until the invoice and the products of the order are received, a parallel gateway  is used to merge active flows. Finally, a service task processes the supplier payment and sends a payment confirmation, again, using message events and flows. Once the confirmation is received by the supplier both processes finish.

Sub-processes and call activities

As we have seen, activities can be composed or not. In BPMN, composed activities are known as sub-processes and atomic activities as tasks.

Task: A task is used when the work in progress is not broken down into more detail. It is performed by a person and/or application.

Sub-process: A sub-process is a composed activity that is included within a process. It is composed because this shape includes a set of activities and a logic sequence (process) that indicates such activity can be expanded.

A *Call Activity* is a reference to a process or task, defined in a global way, that is reused in the current process. Sub-processes can be defined through *Call Activities* when the activity or diagram involved is used in one or more processes (Reusable sub-processes).

Expanded Sub-Processes

Sub-processes can be represented in an expanded or collapsed way. In this example, the Travel Request process is depicted with an expanded *Booking sub-process*. The activities within the sub-process are part of the main process. This is a single process represented in a single diagram.

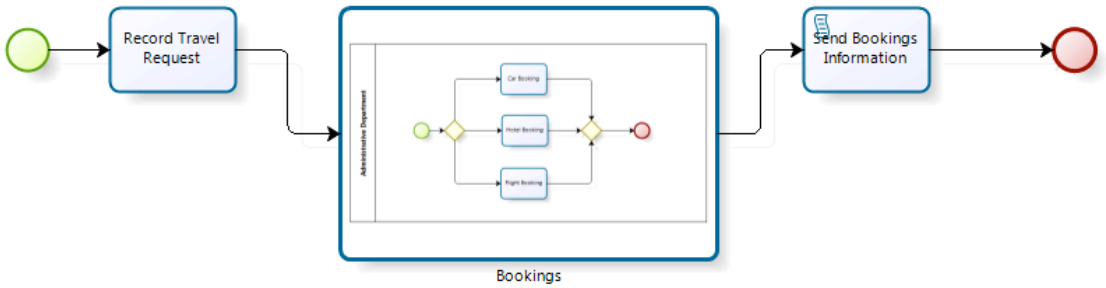


Diagram 14. Expanded Sub-process Example

Collapsed Sub-Processes

In this example, unlike the previous one, the Travel Request process is depicted with a collapsed *Bookings sub-process*.

Diagram 15. Collapsed Sub-process Example

The details of the *Bookings* Sub-process are depicted in a separate diagram.

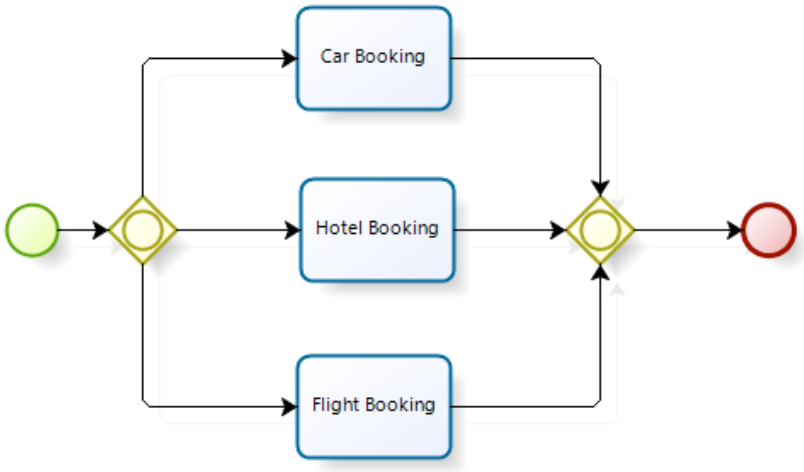


Diagram 16. Bookings sub-process diagram

This is a single process depicted in two diagrams: one diagram for the parent process and one diagram for the sub-process.

Note that both expanded and collapsed depictions are visual variations of the same single Travel Request process.

Using Call Activities

In this example, the Travel Request process is depicted with a collapsed Call Activity (Reusable sub-process) "Bookings". This diagram introduces the concept of Reusable processes. In this case, the Bookings are not a sub-process of Travel Request but separate independent process that is called (re-used) within the Travel Request process.

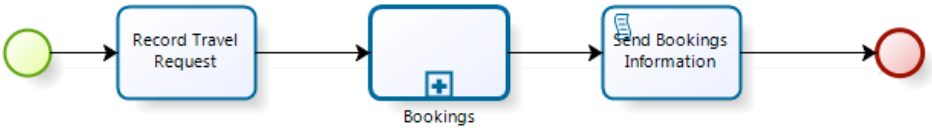


Diagram 17. Call Activity Example

The diagram associated with the invoked process is:

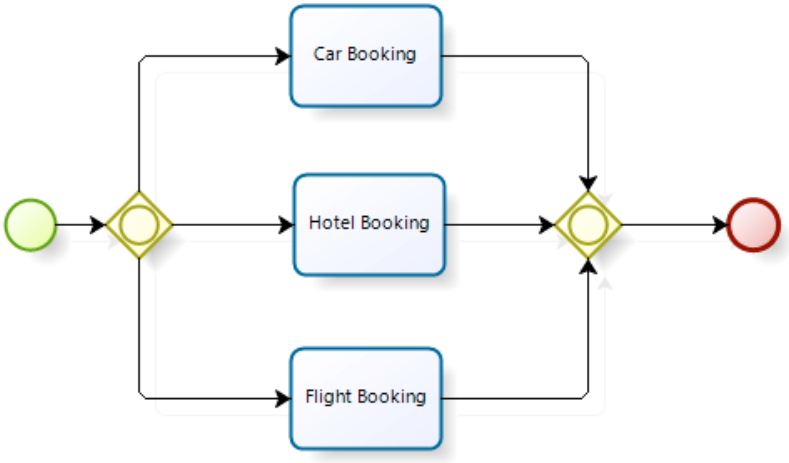


Diagram 18. Bookings sub-process diagram

We thus have two processes each in their own diagrams (2 processes, 2 diagrams). Note the *Call Activities* are represented with highlighted edges 

BPMN elements summary

We have seen in the previous examples how some BPMN graphical elements have been used. These BPMN elements are classified into four categories:

Flow Objects:

These are the chief graphical elements that define the behavior of the processes. Among the Flow Objects, we find:

- Events: They consist of something that happens in the course of a business process; they affect the flow of the process and usually have a cause and a result.

  In the above examples we use start, end and timer; these elements are events and are classified in 3 types.

   Start Events

   Intermediate Events

   End Events

  BPMN includes many ways of starting or ending a process, and there are also many things that can happen in the course of the process, for this reason there are different types of starting events, end events and intermediate events.

- Activities: These represent the work that is carried out as part of a business process. The activities may be compound or not, which is why we use examples of two existing types of activity:

   Task  Sub-processes

As we saw in the previous examples, there are different kinds of tasks: Simple, automatic, manual, user, and others- There are also different kinds of sub-processes: embedded, reusable, etc.

Having these different kinds of elements available allow us to diagram the processes in greater depth, thereby providing more information and clarity to the user.

- Gateways: These are modeling elements used to control the divergence and convergence of the flow.

There are 5 types of gateways:

  - Exclusive Gateway
  - Gateway Based on events
  - Parallel Gateway
  - Inclusive Gateway
  - Complex Gateway

In the examples given in this document we were able to see the use of the exclusive, based on events, parallel and inclusive gateways.

Connection Objects:

These are the elements used to connect two objects in the process flow.

Among the examples used were the Sequence Lines, which connect flow objects and Associations, which are the dotted lines to help us associate notations in some flows.

There are 3 types of connection objects:

- Sequence Lines
- Associations

- Message Lines

Swim Lanes:

These are elements used to organize flow activities in different visual categories which represent functional areas, roles or responsibilities.

- Pools
- Lanes

Artifacts:

Artifacts are used to provide additional information about the process.

In the examples some notations were used in the flow.

There are three types:

- Data Objects
- Groups
- Annotations

If you wish to practice what you have learned, download Bizagi's Free Process Modeler at:

http://www.bizagi.com/en/bpm-suite/products/modeler

For more information please refer to:

Mr White Introductory BPMN Document

http://www.omg.org/bpmn/Documents/Introduction_to_BPMN.pdf

BPMN Specifications at:

http://www.omg.org/bpmn/Documents/BPMN_1-1_Specification.pdf