Introduction to Process view of the organization

The Organization

- **Functional Units**
- **Business Processes**

Business Process

- **Business Process**: A collection of inter-related events, activities, and decision points that involve several actors and objects, which collectively lead to an outcome that is of value to a customer.

Business Process

- **Event**: Events correspond to things that happen atomically, which means that they have no duration.

- **Activities**: Both fine-grained or coarse-grained units of work.
  - **Tasks**: refers to a fine-grained unit of work performed by a single process.

- **Decision points**: points in time when a decision is made that affects the way the process is executed.

- **Actors**: Human actors, organizations, or software systems acting on behalf of human actors or organizations.
  - Internal - process participants.
  - External

Business Process

- **Physical objects: E**quipment, materials, products, paper documents.
- **Informational objects:** Electronic documents and electronic records.
- **Outcomes**: an outcome should deliver value to the actors involved in the process.
  - Negative outcome
  - Positive outcome
- **Customer:** The one who consumes the output.

Processes and Outcomes

- Every Process leads to one or more outcomes – Positive or Negative
  - Positive outcomes add value
  - Negative outcome reduce value

- Outcomes:
  - Items received as requested
  - Items received but different from requested
  - Items requested rejected by supervisor
  - Items not available
  - Items received as per changed request from supervisor

Business Process

- **Business Process**: A collection of inter-related events, activities, and decision points that involve several actors and objects, which collectively lead to an outcome that is of value to at least one customer.

- **Business Process Management:** A body of methods, techniques, and tools to identify, discover, analyze, redesign, execute, and monitor business processes in order to optimize their performance.

Business Process Management (BPM)

- Art and science of overseeing how work is performed in an organization to ensure consistent outcomes and to take advantage of **improvement** opportunities.

- Improvement:
  - Reducing costs
  - Reducing execution times
  - Reducing error rates
  - Gaining competitive advantage through innovation.

- Improvement initiatives may be one-off or of a continuous nature; they may be incremental or radical.

Examples of Business Processes

- ***Order-to-cash***
- ***Quote-to-order***
- ***Procure-to-pay***
- ***Issue-to-resolution***
- ***Application-to-approval***
- ***Claim-to-Settlement***

Business Process Management

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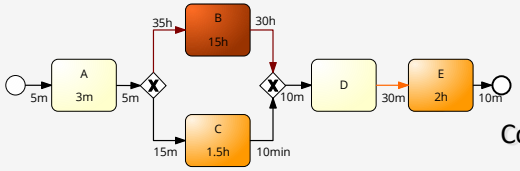
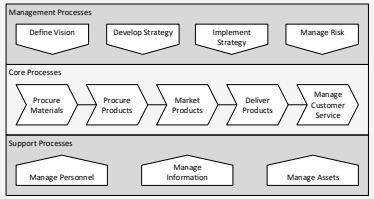
- **Business Process Management**: A body of methods, techniques, and tools to identify, discover, analyze, redesign, execute, and monitor business processes in order to optimize their performance.

Process Analysis in the BPM Lifecycle

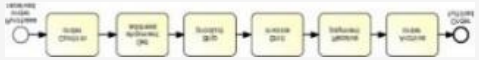


Process identification



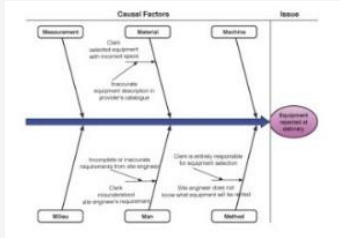
Process architecture

Process discovery



As-is process model

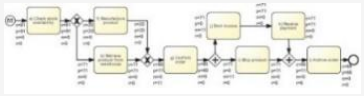
Process analysis



Insights on weaknesses and their impact

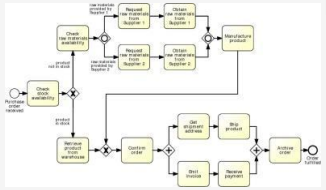
Process redesign

To-be process model



Process implementation

Executable process model



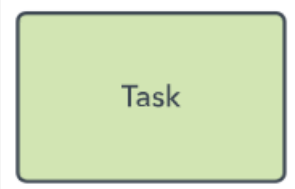
Process monitoring

Conformance and performance insights

Rules

- Events are represented by circles

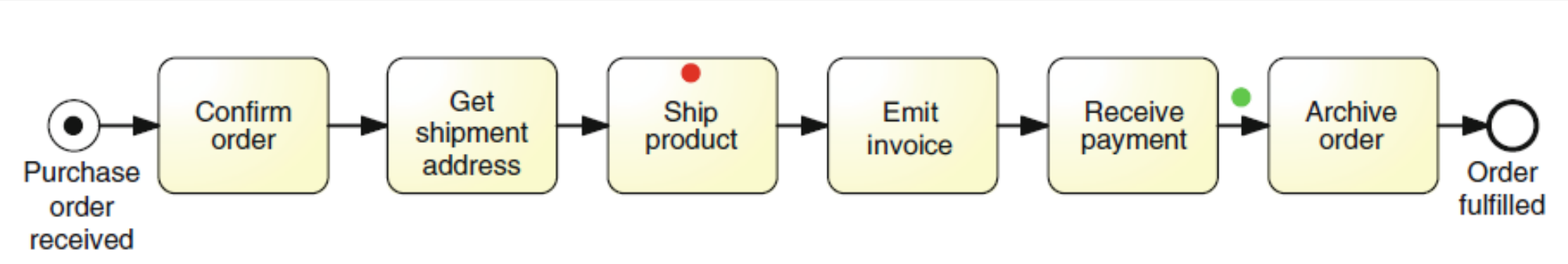
- Task or Activities by rounded rectangles



- Sequence flows (also called arcs) are represented by arrows with a full arrow-head

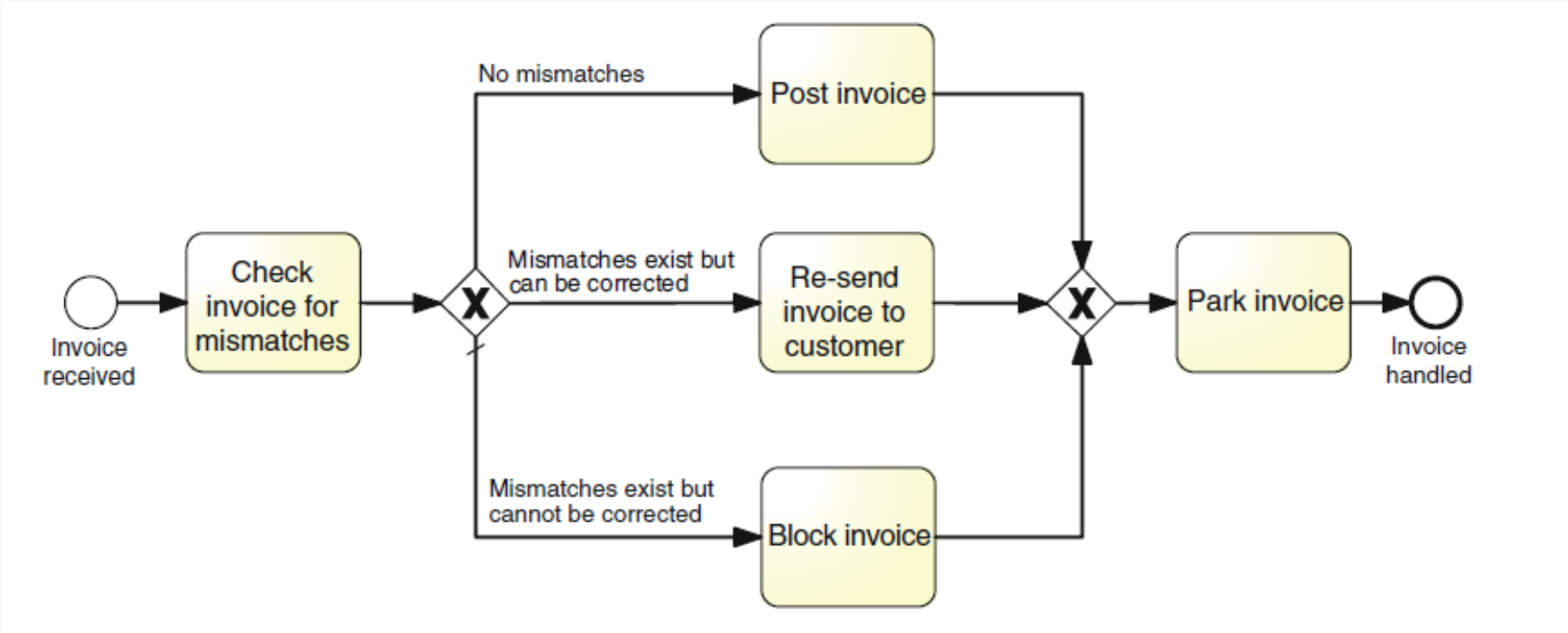
Token

- Represents state of an Instances of a process



Branching and Merging - Mutually exclusive paths

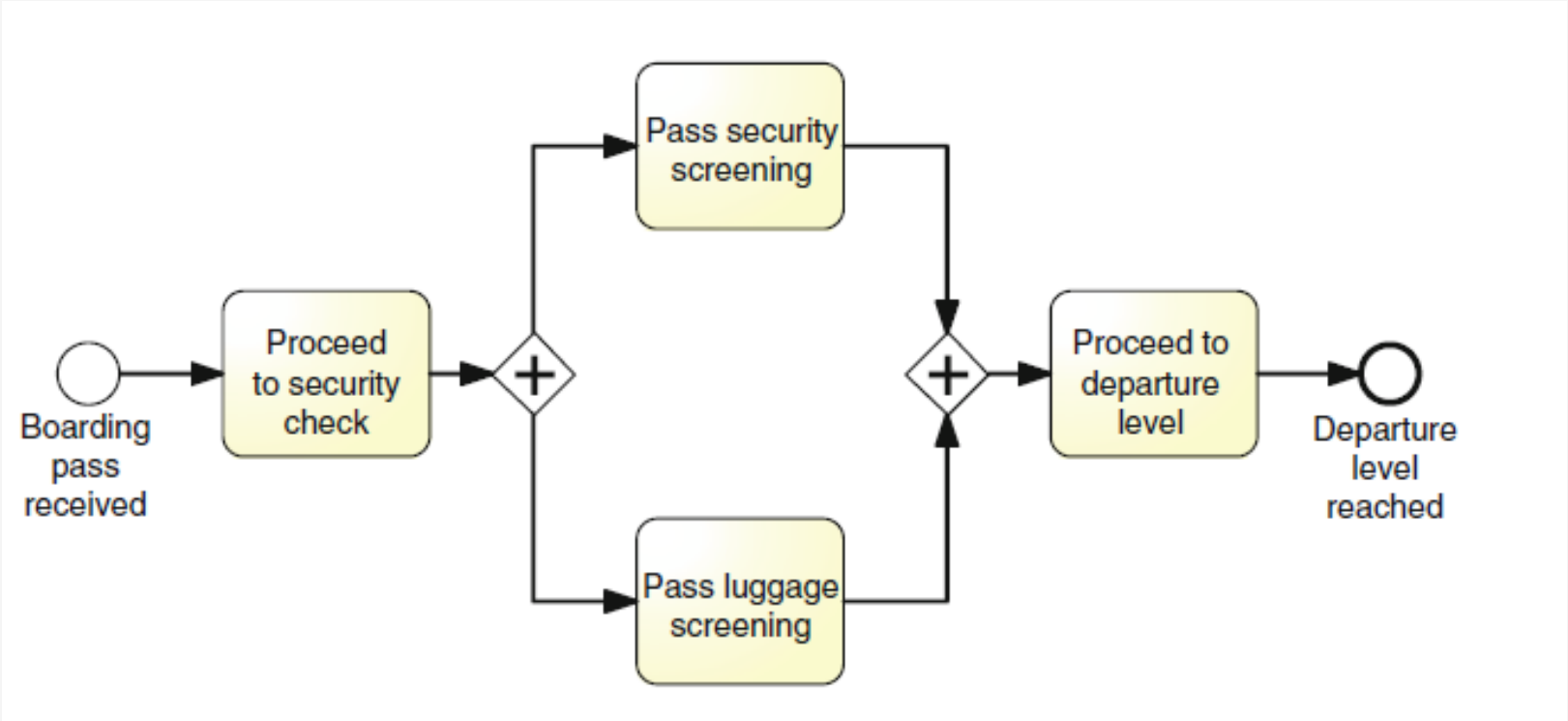
- Gateways – XOR gateway
  - XOR split
  - XOR join



- Default flow

Branching and Merging – Parallel paths

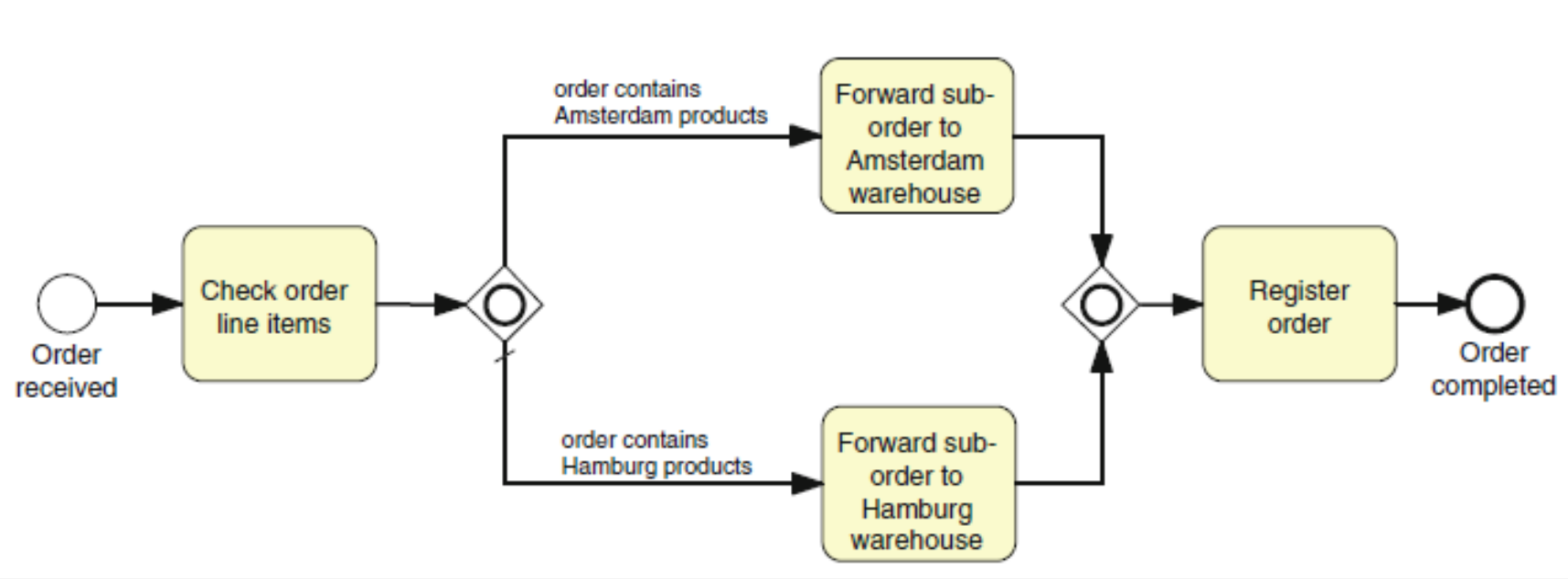
- Gateways – AND gateway
  - AND split
  - AND join



- Synchronization

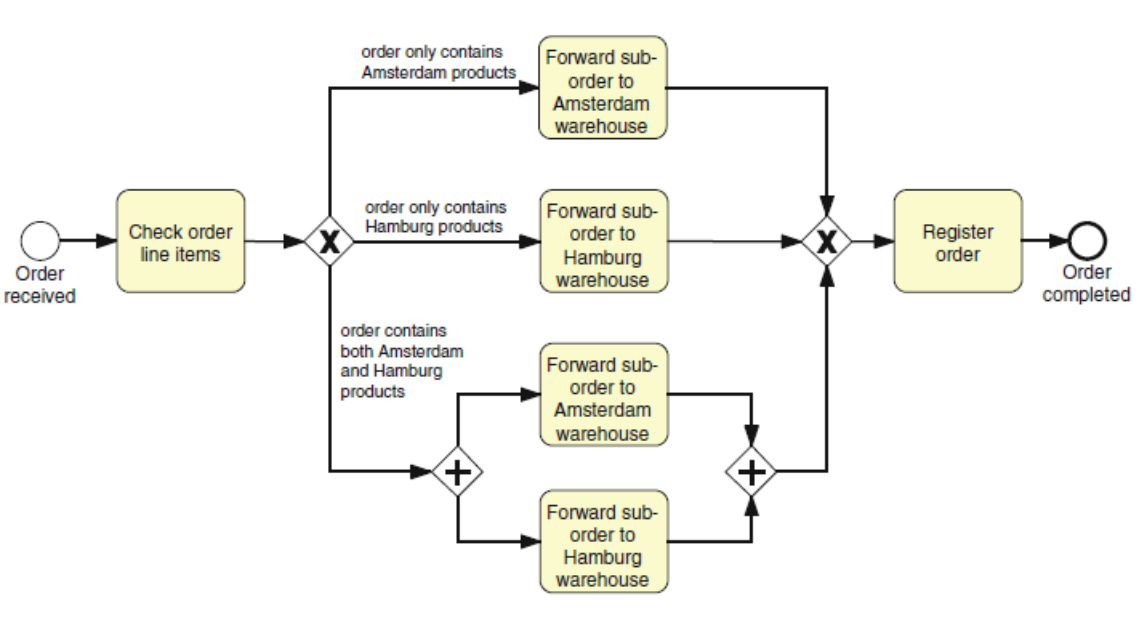
Branching and Merging – Multiple paths

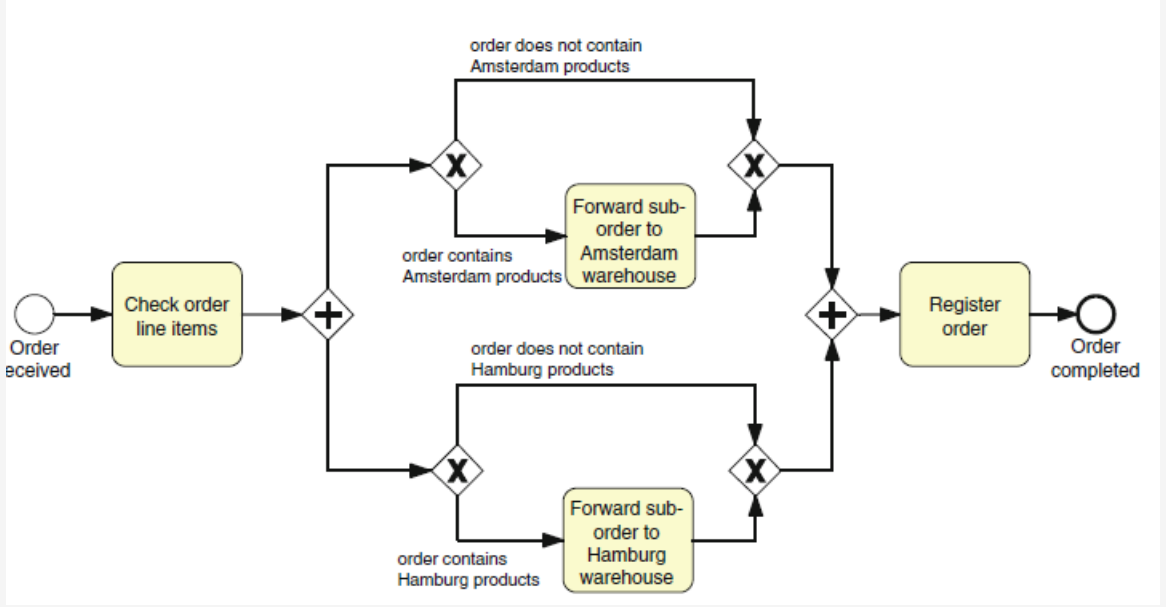
- Gateways – OR gateway
  - OR split
  - OR join



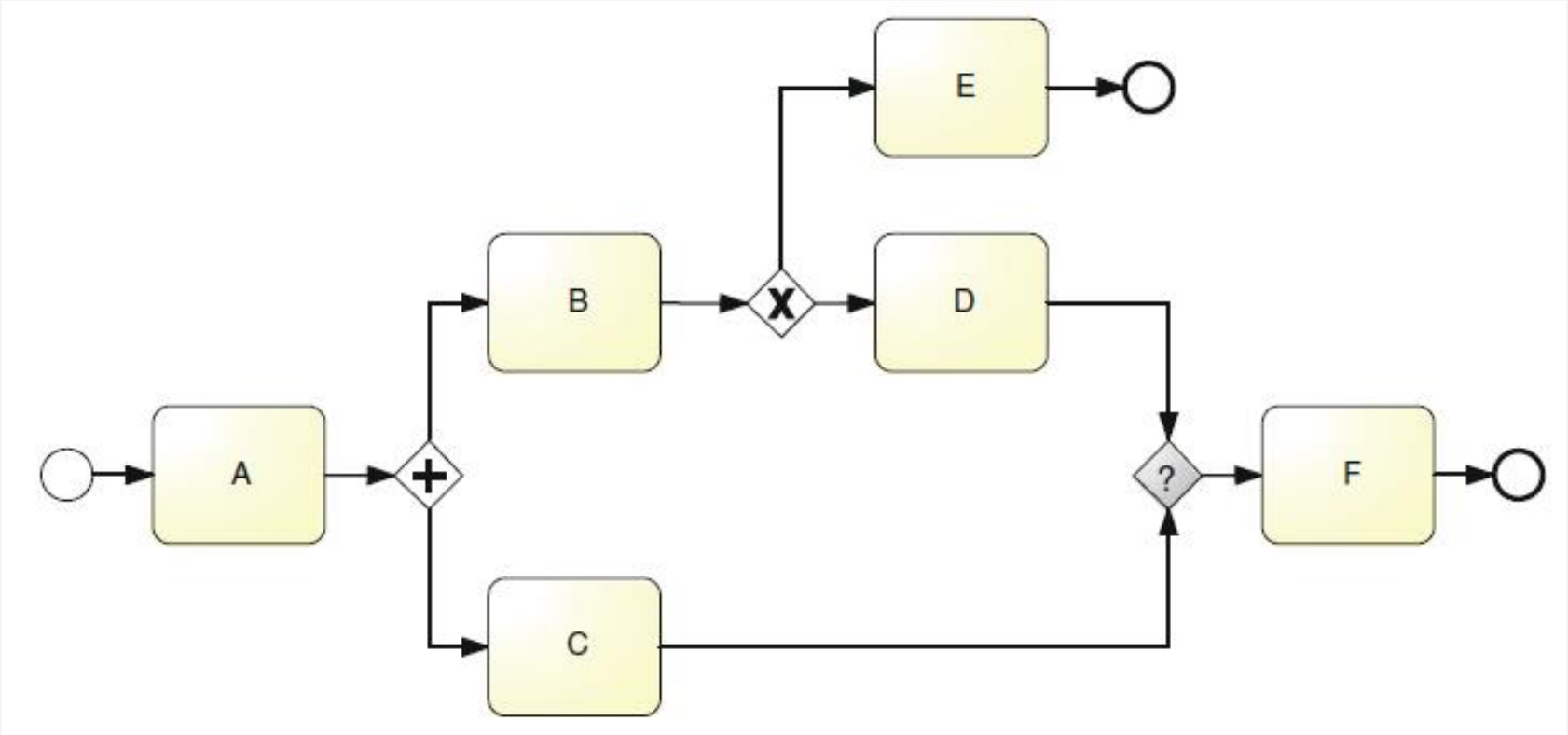
- Synchronization

Branching and Merging – Interpret the models

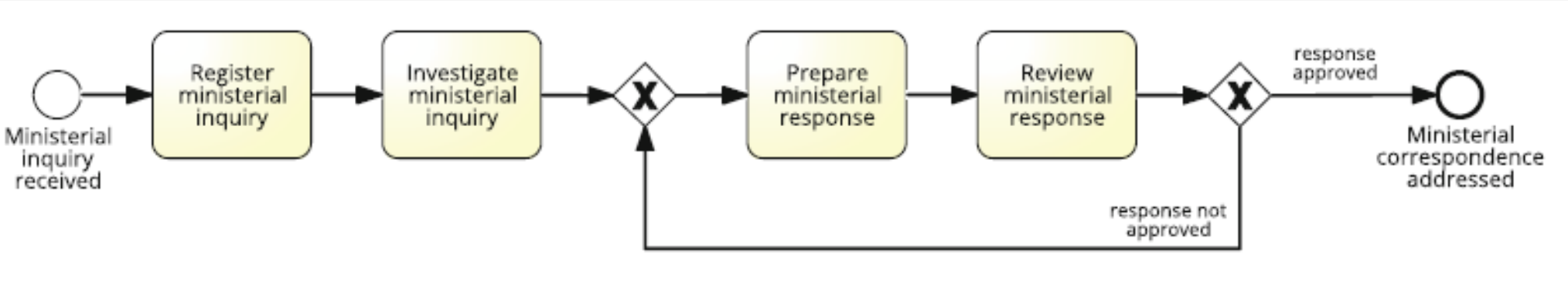




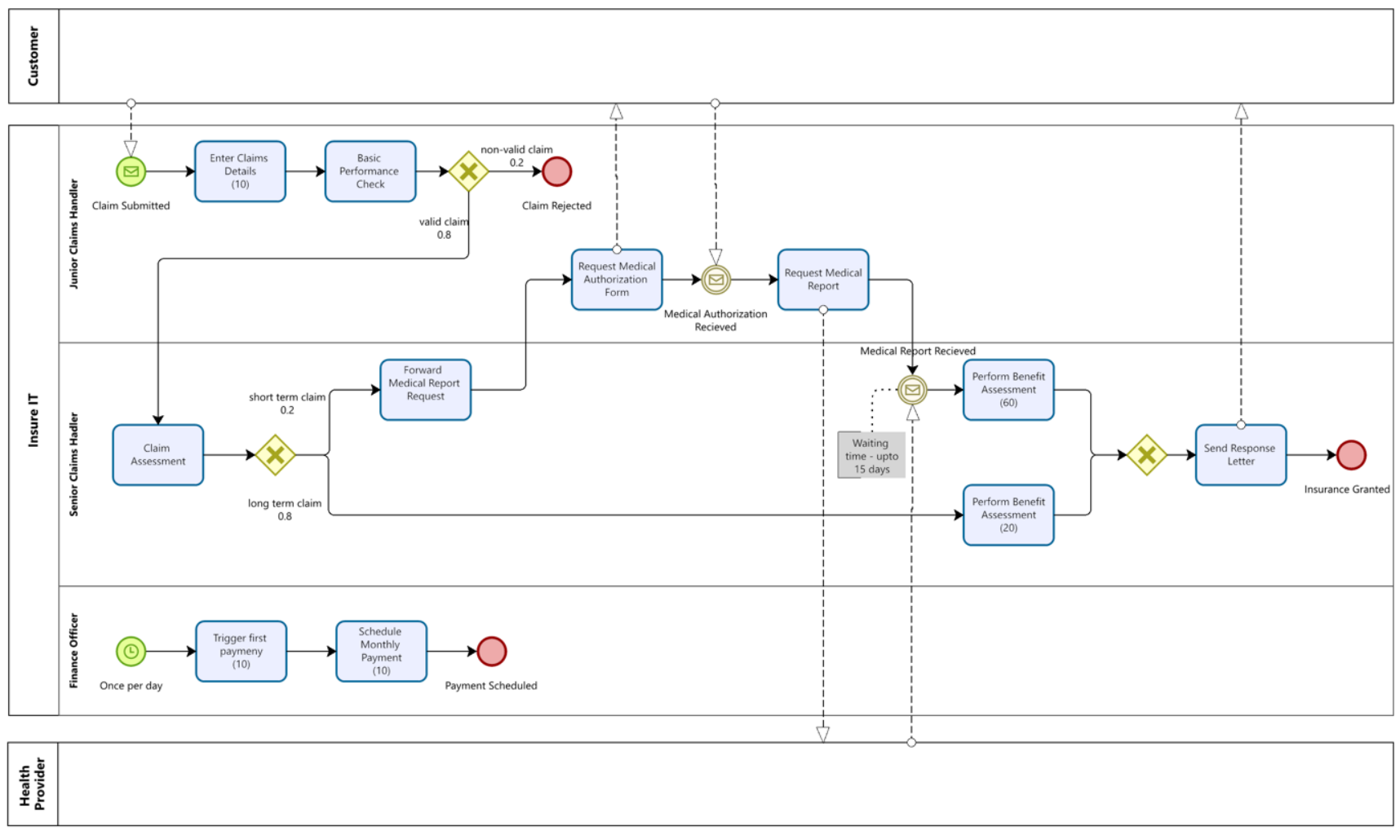
Branching and Merging – Deadlock, Lack of synchronization



Branching and Merging – Repetition block



Disability Insurance Claims Handling at InsureIT



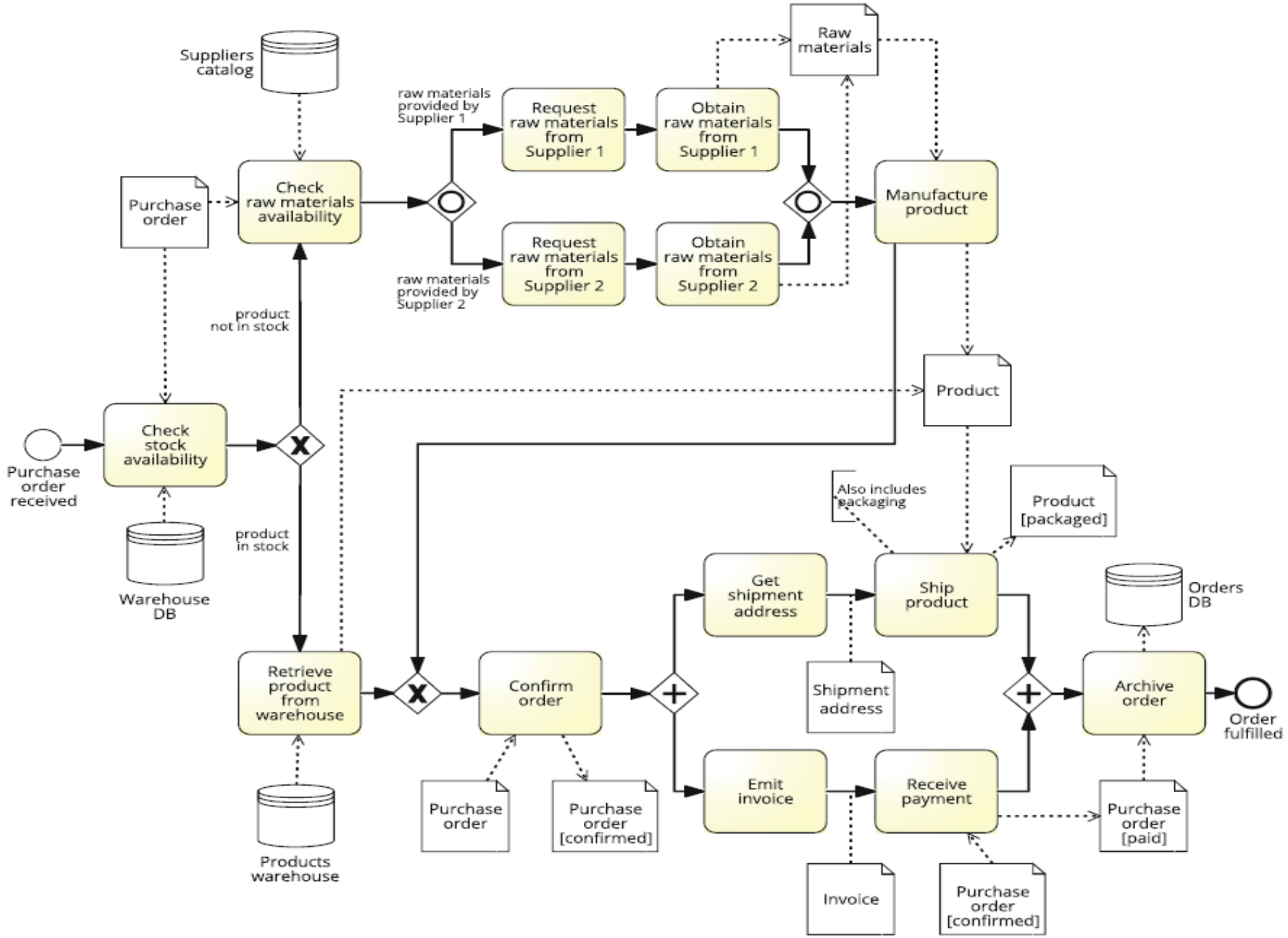
Business Objects

- Data objects – Artefacts
  - As a document with the upper-right corner folded over

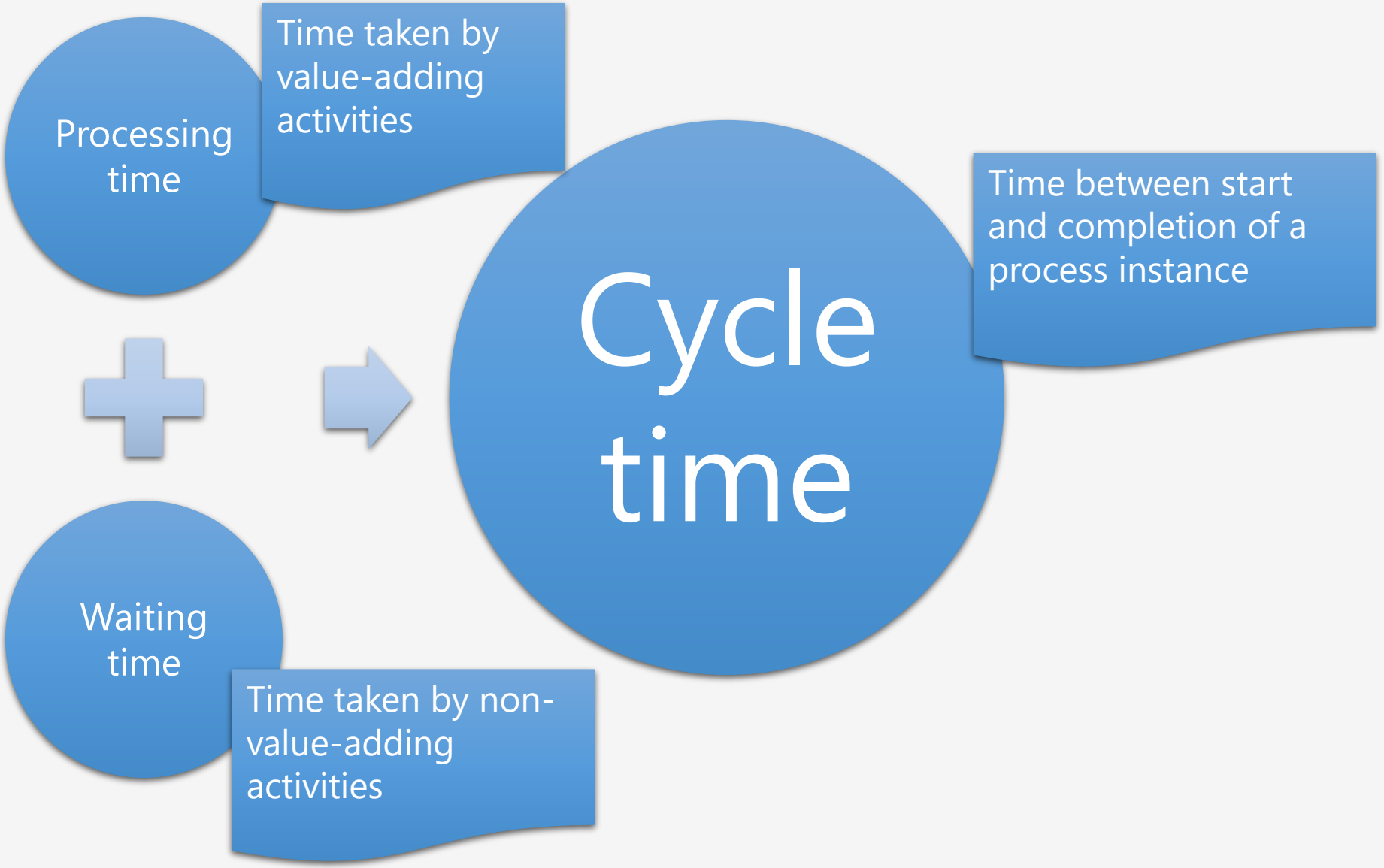
- Link them to activities with a dotted arrow with an open arrowhead
  - Data Association

- State

- Data store – A place containing data objects that need to be persisted beyond the duration of a process instance

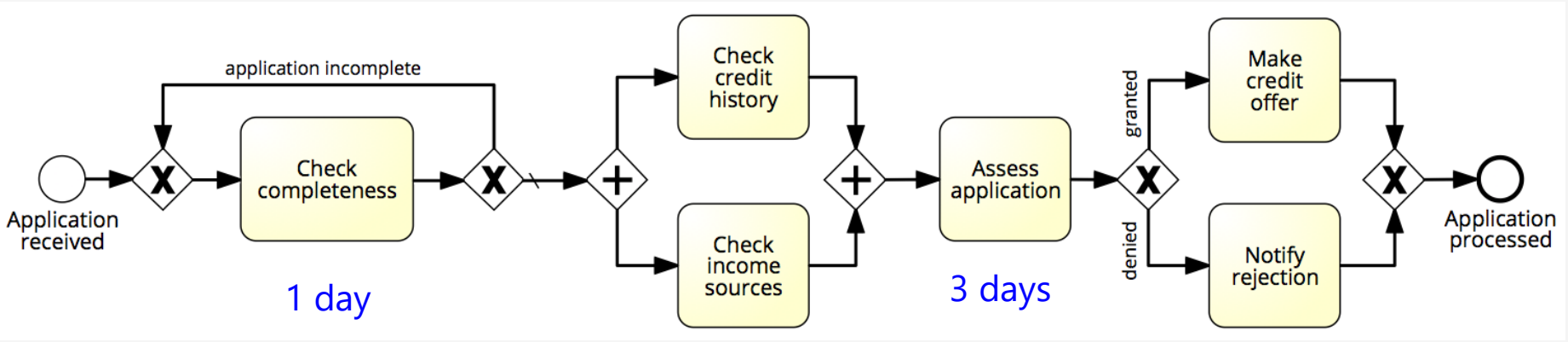

Suppliers catalog
Raw materials
raw materials provided by Supplier 1
Request raw materials from Supplier 1
Obtain raw materials from Supplier 1
Purchase order
Check raw materials availability
Manufacture product
raw materials provided by Supplier 2
Request raw materials from Supplier 2
Obtain raw materials from Supplier 2
product not in stock
Product
Purchase order received
Check stock availability
Also includes packaging
Product [packaged]
product in stock
Warehouse DB
Get shipment address
Ship product
Orders DB
Retrieve product from warehouse
Confirm order
Shipment address
Archive order
Order fulfilled
Purchase order
Purchase order [confirmed]
Emit invoice
Receive payment
Purchase order [paid]
Products warehouse
Invoice
Purchase order [confirmed]

Common time-related measures



Cycle time efficiency

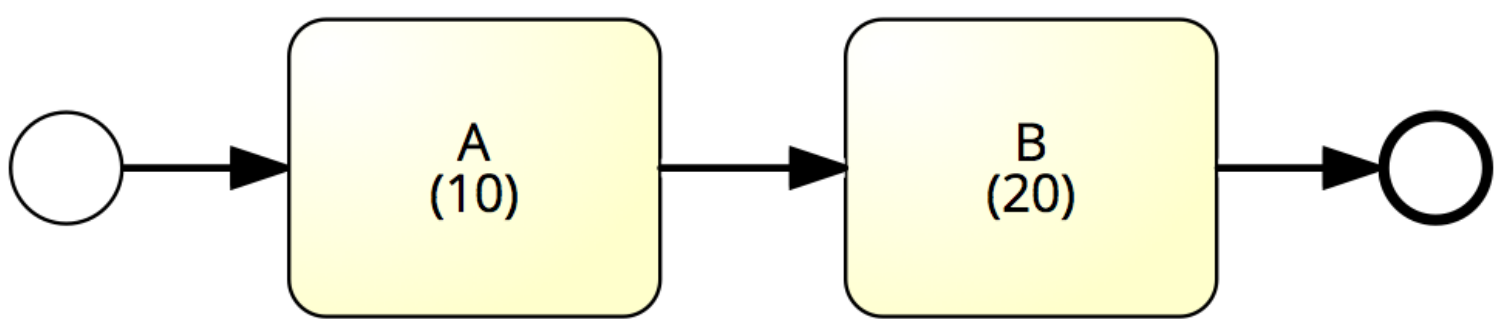
Flow analysis of cycle time



Cycle time = X days

Sequence – Example

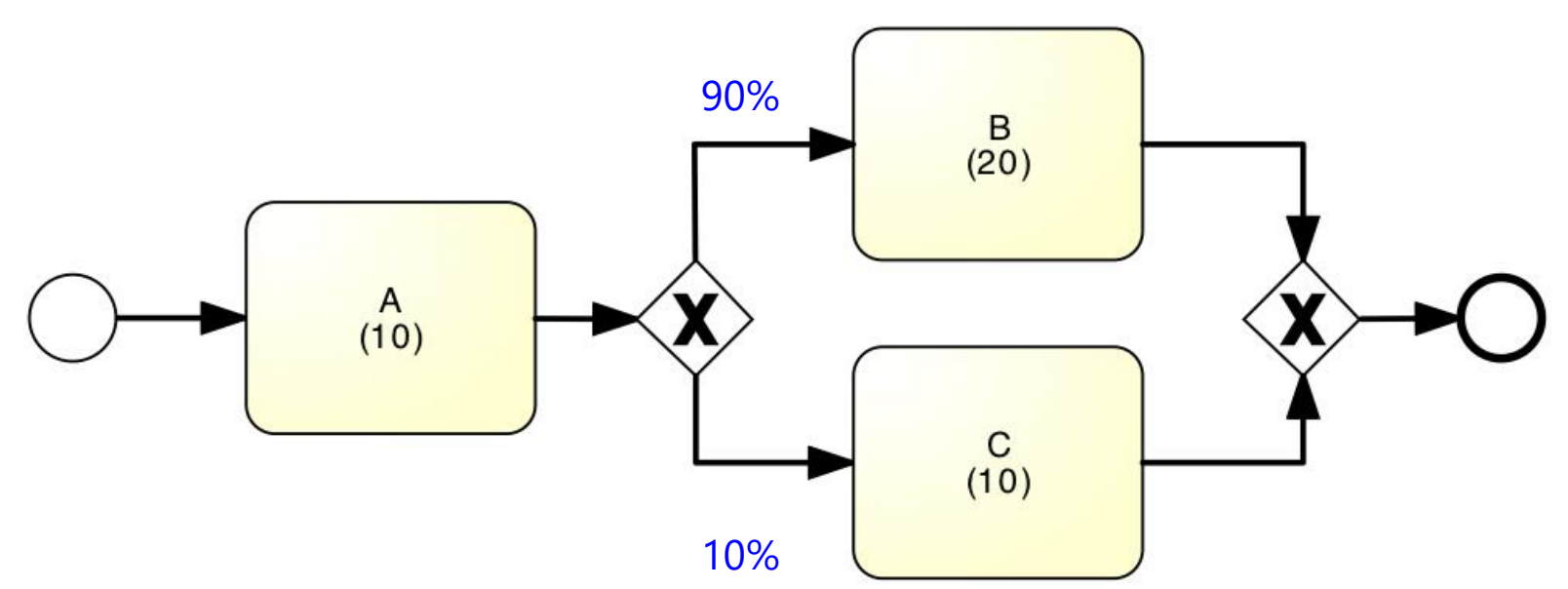
- What is the average cycle time?



Cycle time = 10 + 20 = 30

Example: Alternative Paths

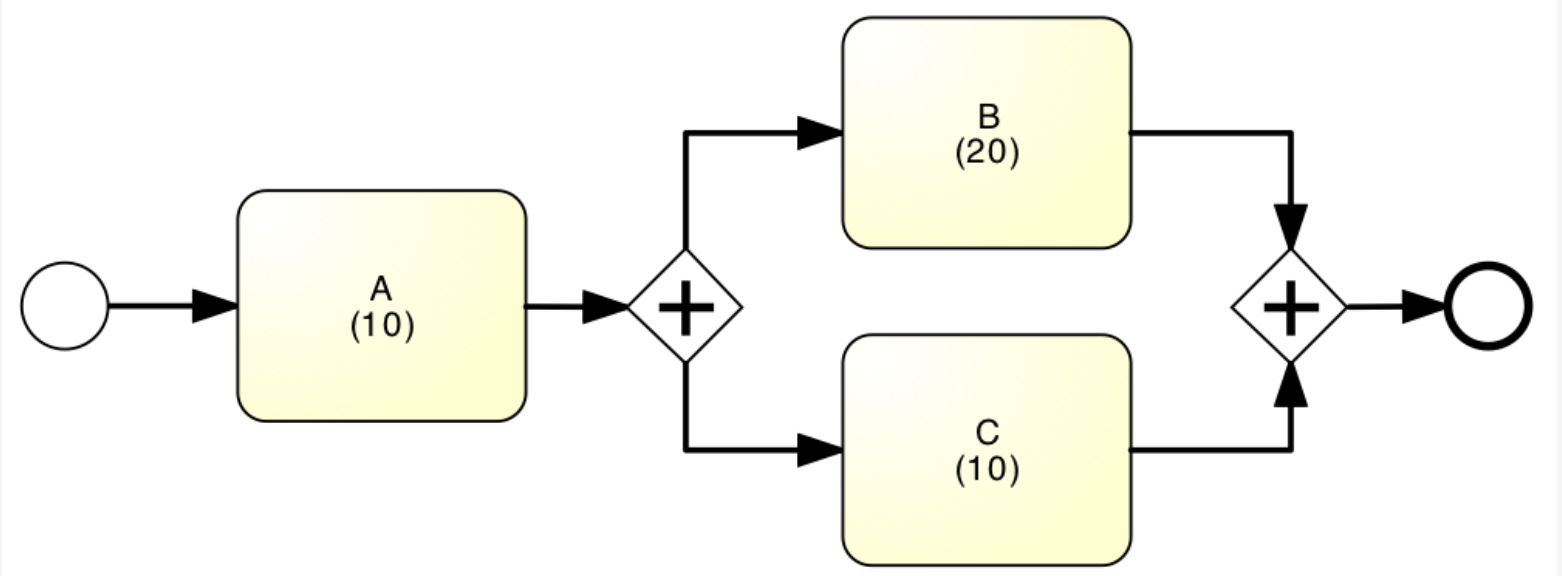
- What is the average cycle time?



Cycle time = 10 + 0.9*20+0.1*10 = 29

Example: Parallel paths

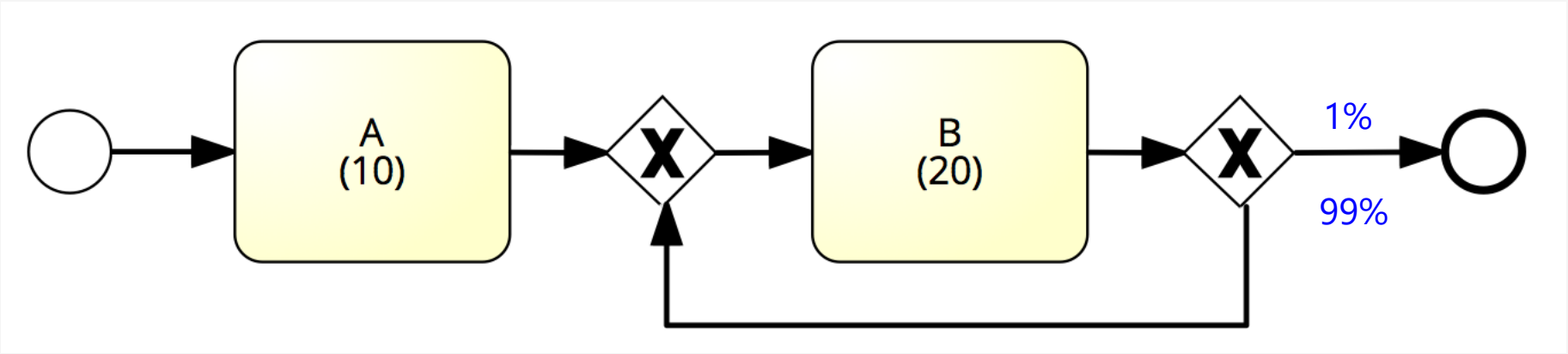
- What is the average cycle time?



Cycle time = 10 + 20 = 30

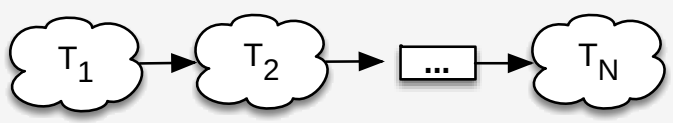
Example: Rework loop

- What is the average cycle time?

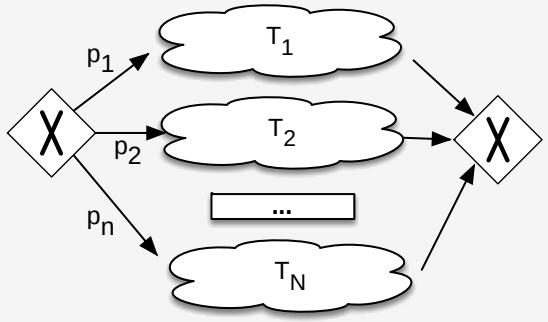


Cycle time = 10 + 20/0.01 = 2010

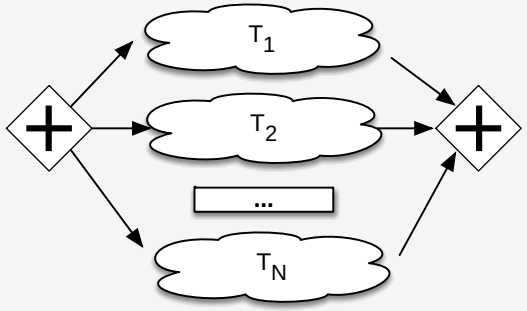
Flow analysis equations for cycle time



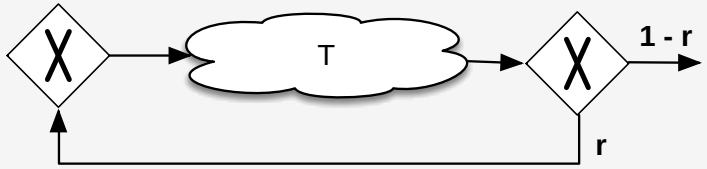
$$CT = T_1 + T_2 + \ldots + T_N$$



$$CT = p_1 * T_1 + p_2 * T_2 + \ldots + p_n * T_N$$

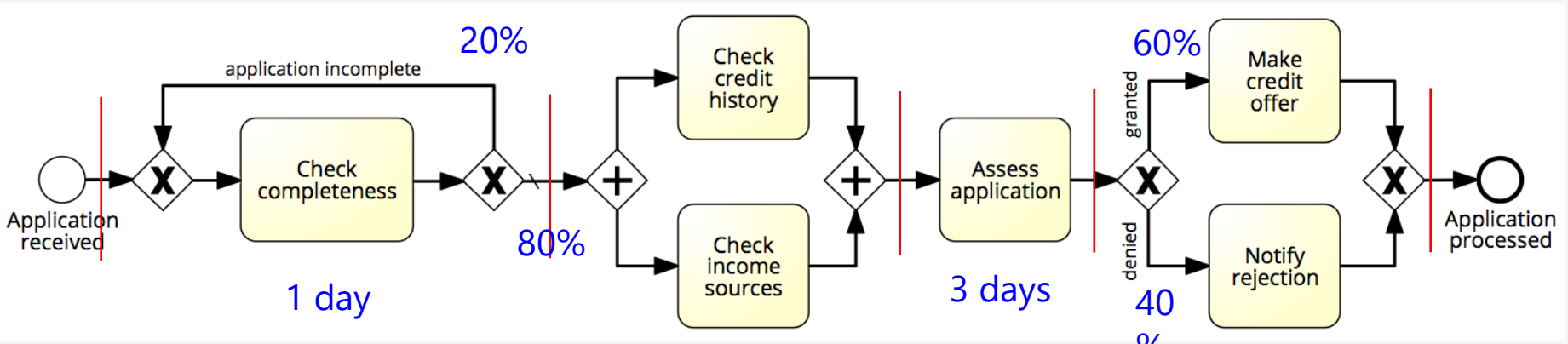


$$CT = \max(T_1, T_2, \ldots, T_N)$$



$$CT = T / (1-r)$$

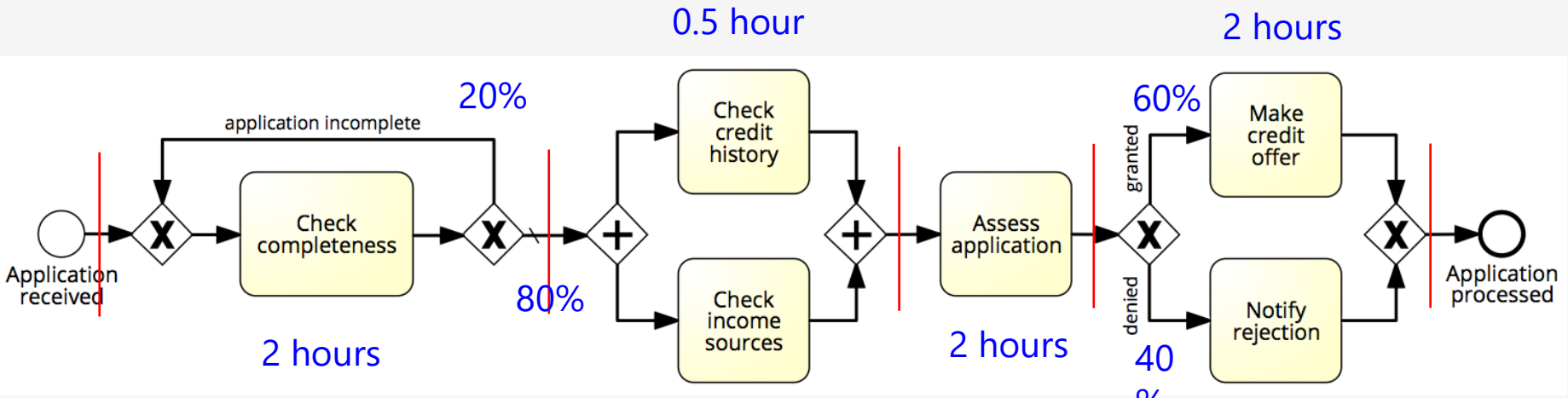
Flow analysis of cycle time



1/0.8 max(1,3) 3 0.6*1+0.4*2

Cycle time = 1.25 + 3 + 3 + 1.4 = 8.65 days

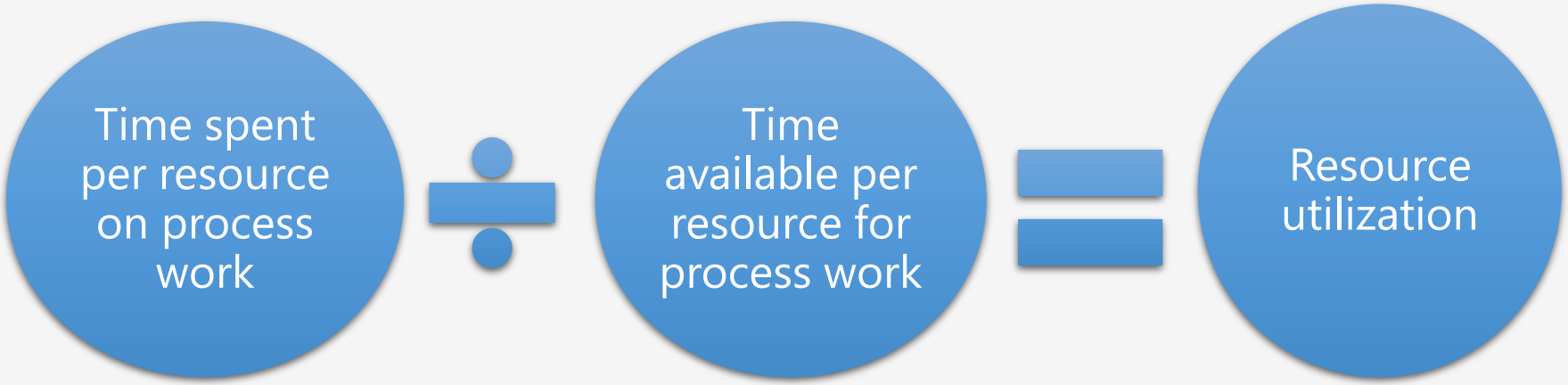
Flow analysis of processing time



Processing time = 2.5 + 3 + 2 + 1.4 = 8.9 hours

Cycle time efficiency = 8.9 hours / 8.65 days = 12.9%

Resource utilization



Resource utilization = 60%
➔ on average resources are idle 40% of their allocated time

Resource utilization vs. waiting time

Typically, when resource utilization > 90%
➔ Waiting time increases steeply

Cycle Time & Work-In-Progress

- WIP = (average) Work-In-Process
  - Number of cases that are running (started but not yet completed)
  - E.g. # of active and unfilled orders in an order-to-cash process
- Little's Formula: WIP = $\lambda \cdot CT$
  - λ = arrival rate (number of new cases per time unit)
  - CT = cycle time

Exercise

A fast-food restaurant receives on average 1200 customers per day (between 10:00 and 22:00). During peak times (12:00-15:00 and 18:00-21:00), the restaurant receives around 900 customers in total, and 90 customers can be found in the restaurant (on average) at a given point in time. At non-peak times, the restaurant receives 300 customers in total, and 30 customers can be found in the restaurant (on average) at a given point in time.

1. What is the average time that a customer spends in the restaurant during peak times?
2. What is the average time that a customer spends in the restaurant during non-peak times?

Issue register

- Purpose: to maintain, organize and prioritize perceived weaknesses of the process (issues)
- Sources of issues:
  - Input to a process modelling project
  - Collected as part of ongoing process improvement actions
  - Collected during process discovery (modelling)
  - Value-added/waste analysis

Issue register structure

- Can take the form of a table with:
  - Issue identifier
  - Short name
  - Description
  - Assumptions
  - Impact: Qualitative and Quantitative
  - Possible improvement actions
- Larger process improvement projects may require issue trackers

Example of an issue documentation

Issue name

- Equipment kept longer than needed

Description

- Site engineers keep rented equipment longer than needed by asking for deadline extensions

Assumptions

- 3000 pieces of equipment rented p.a.
- In 10% of cases, equipment is kept two days more than needed
- Average rental cost is 100 per day

Quantitative impact

- 0.1 × 3000 × 2 × 100 = 60,000 p.a

Issue Register Example

Name	Explanation	Assumptions	Qualitative Impact	Quantitative Impact
Equipment kept longer than needed	Site engineers keep equipment longer than needed via deadline extensions	3000 pieces of equipment rented p.a. In 10% of cases, equipment kept two days longer than needed. Rental cost is 100 per day		0.1 × 3000 × 2 × 100 = 60,000 p.a.
Rejected equipment	Site engineers reject delivered equipment due to non-conformance to their specifications	3000 pieces of equipment rented p.a. 5% of them are rejected due to an internal mistake For each equipment rejected due to an internal mistake, BuildIT is billed 100.	Disrupted schedules. Employee stress and frustration	3000 × 0.05 × 100 = 15,000 p.a.
Late payment fees	Late payment fees incurred because invoices are not paid by their due date	3000 pieces of equipment rented p.a. Average rental time is 4 days Rental cost is 100 per day. Each rental leads to one invoice. About 10% of invoices are paid late. Penalty for late payment is 2%.	Poor reputation with suppliers	0.1 × 3000 × 4 × 100 × 0.02 = 2400 p.a.

Issue Register Example

Issue Name:	Customer make enquiry about insurance claim status
Priority:	2
Description:	Customer often call or email to check the insurance claim status
Assumptions:	Each customer make enquiry twice. There is 2000 claims per year. Each enquiry takes 10 minutes of juniour claims handler to process. In each third time juniour claims handler has to spend additionally 10 minutes to contact health provider. Juniour claims handler salary is 20 eur per hour
Qualitative impact:	Customers are dissatisfied and waste time of claims handlers.
Quantitative impact:	2000 * 2 = 4000 enquires per year 4000 * 10 + (4000 /3) * 10 = 53333.33 minute per year spend from juniour claims handler 53333.33 / 60 * 20 = **17777 eur per year** is spent on handling enquires

Issue Name:	Benefit renewals require new medical report and tend delays
Priority:	1
Description:	Some renewals require new medical report, which means additional delays and dissatisfied customer, who will call twice to find out the claim status.
Assumptions:	There is 2000 claims per year. 80% of these claims are long-term claims renewal is required each 3 month, meaning that each claims has to be renewed 4 time per year. 50 % of those claims require renewal of the health report, which additionally takes 60 minutes of the benefit assessment. 50 % of those claims require simple renewal, which takes 30 minutes. During the renewal of the health report, which is time-consuming, customer makes 2 enquires about the claim status. Each enquiry takes 10 minutes of juniour claims handler to process. In each third time juniour claims handler has to spend additionally 10 minutes to contact health provider.
Qualitative impact:	Customers are dissatisfied and waste time of claims handlers.
Quantitative impact:	2000 * 0.8 = 1600 long-term claims 1600 * 4 = 6400 total number of renewals 6400 * 0.5 = 3200 claims require simple renewal 3200 * 30 = 96000 minutes spent on simple renewal per year 6400 * 0.5 = 3200 claims require complex renewal 3200 * 60 = 192000 minutes spend on complex claims assessment per year 3200 * 2 = enquires per year 3200 * 10 + (3200 /3) * 10 = 42666.66 minute per year spend from juniour claims handler (42666.66 + 96000 + 192000) / 60 * 20 = **110222 eur per year** is spent on renewals and handling additional custom enquires

Reference

- *Book:*
  - *Fundamentals of business process management*
  - Dumas, M., La Rosa, M., Mendling, J., & A Reijers, H. (2013). . Springer.

- *Software Used:*
  - *Bizagi: **https://www.bizagi.com/en***
- ***Alternative:***
  - ***Microsoft Visio:***
    - ***https://www.microsoft.com/en-in/microsoft-365/visio/flowchart-software***