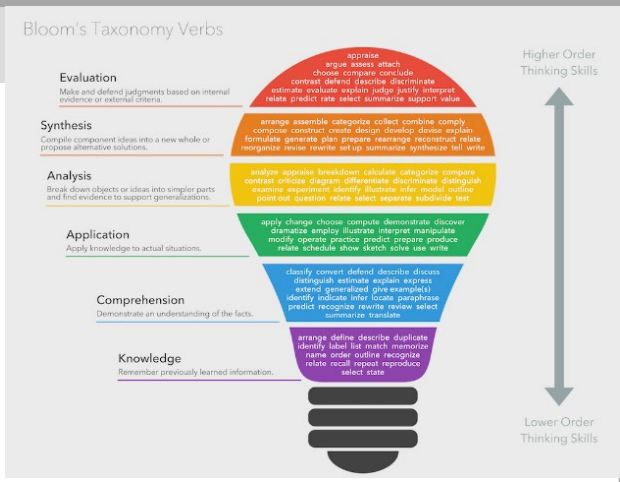
„Business Process Technologies“ [2] Modeling and BPMN



Bloom's Taxonomy Verbs by Fractus Learning, Lizenz: CC-BY-SA 4.0

Lerning Goals

- ✓ Understand the background of BPMN
- ✓ Decide on the appropriate BPMN model type for modeling
- ✓ Model example business processes with the given constructs
- ✓ Motivate and create company modeling conventions

Agenda

- Modeling
  - Rules
  - Process
- BPMN
  - Constructs
- Conventions

[02.1] Modeling – Rules: Naming

Modeling – Naming: Processes and Activities

- Form „<Verb> <Noun (Sg.)>“
  - Business entities as noun (bearer of information, work token, no artifact)
  - Active, strong verbs from the business problem domain
  - Consistency check: rephrase to result „<Noun (Sg.)> <Verb participle>“
    - Result should be identifiable and countable
- Examples
  - Create customer order → Customer order created
  - Check customer order → Create customer order ustomer order checked

Modeling – Naming (2): Events

- At the end of a process or activity, a state <Noun> <Verb participle> should be reached → event and result
- Name events strongly and individually by the result
- Examples
  - Trivial: Drink beverage → Beverage drunk
  - Better: Drink beverage → Thirst quenched

[02.2] Modeling: Steps

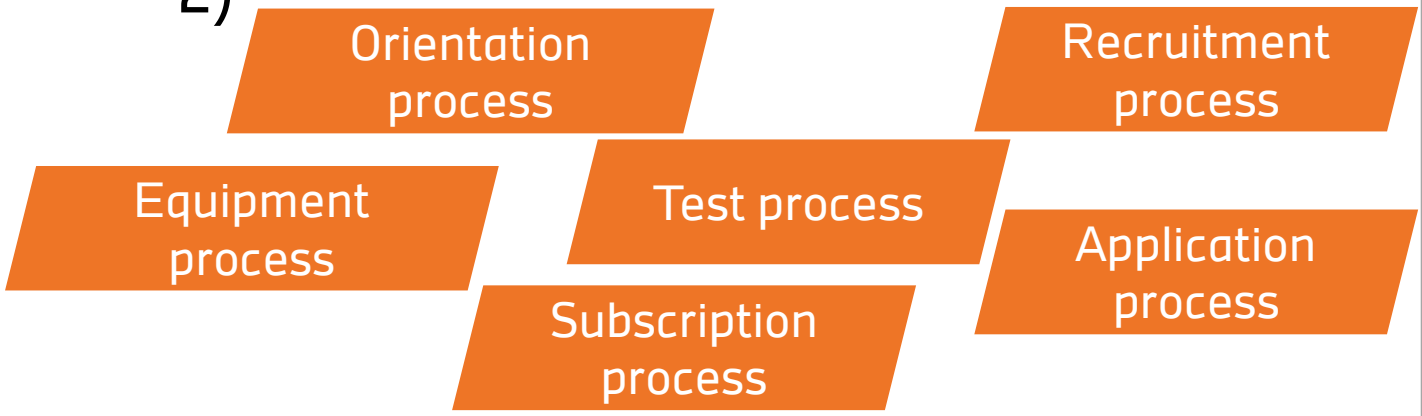
Modeling – Typical Steps

Input: Mission

1) Collect material
2) Clarify terminology
3) Set process boundaries
4) Create base flow
5) Trigger – Results – Activities – Cases (TRAC)
6) Iterative refinement towards mission

Mission: Enable people sustainably.

2)



3) 6 processes or 1?

→ 1, as Token=Student

4)

5)Trigger: Information requests, Events

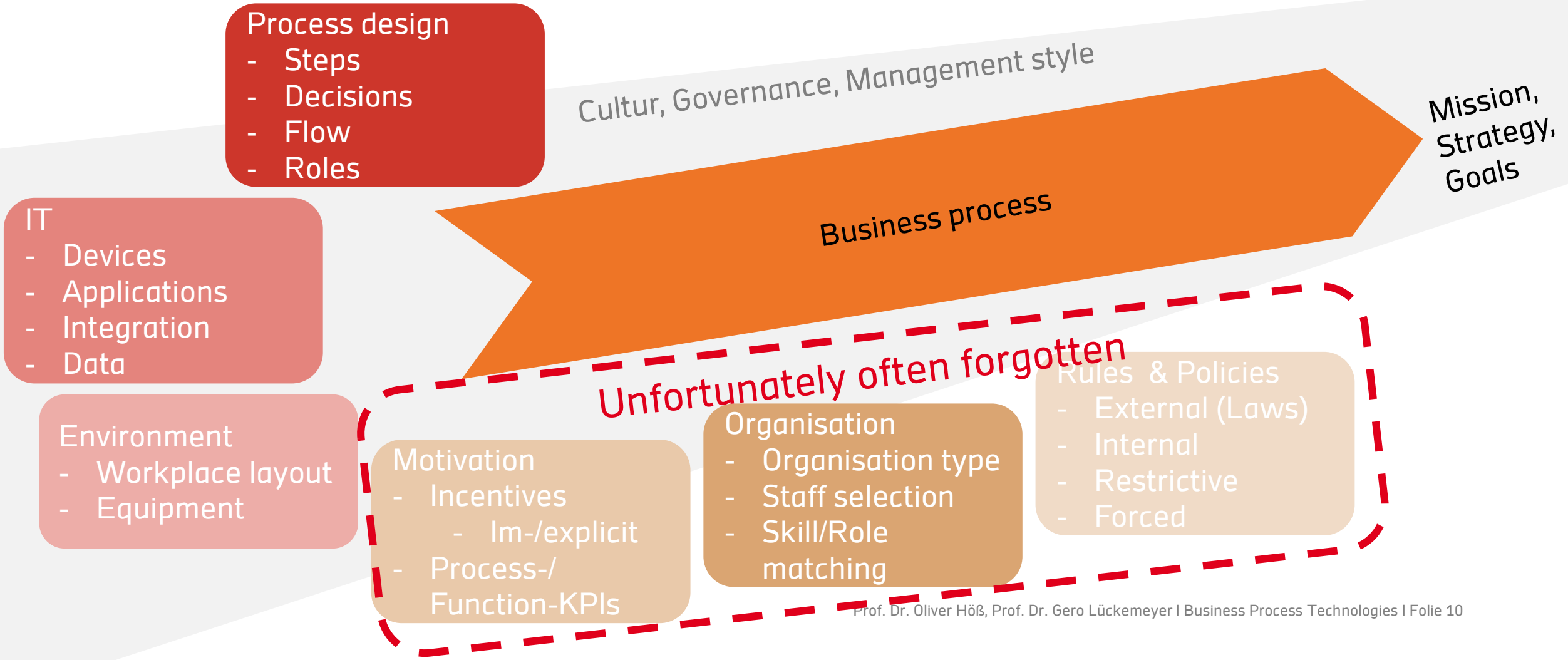
Cases: first time students, changers

Results: enrolled students

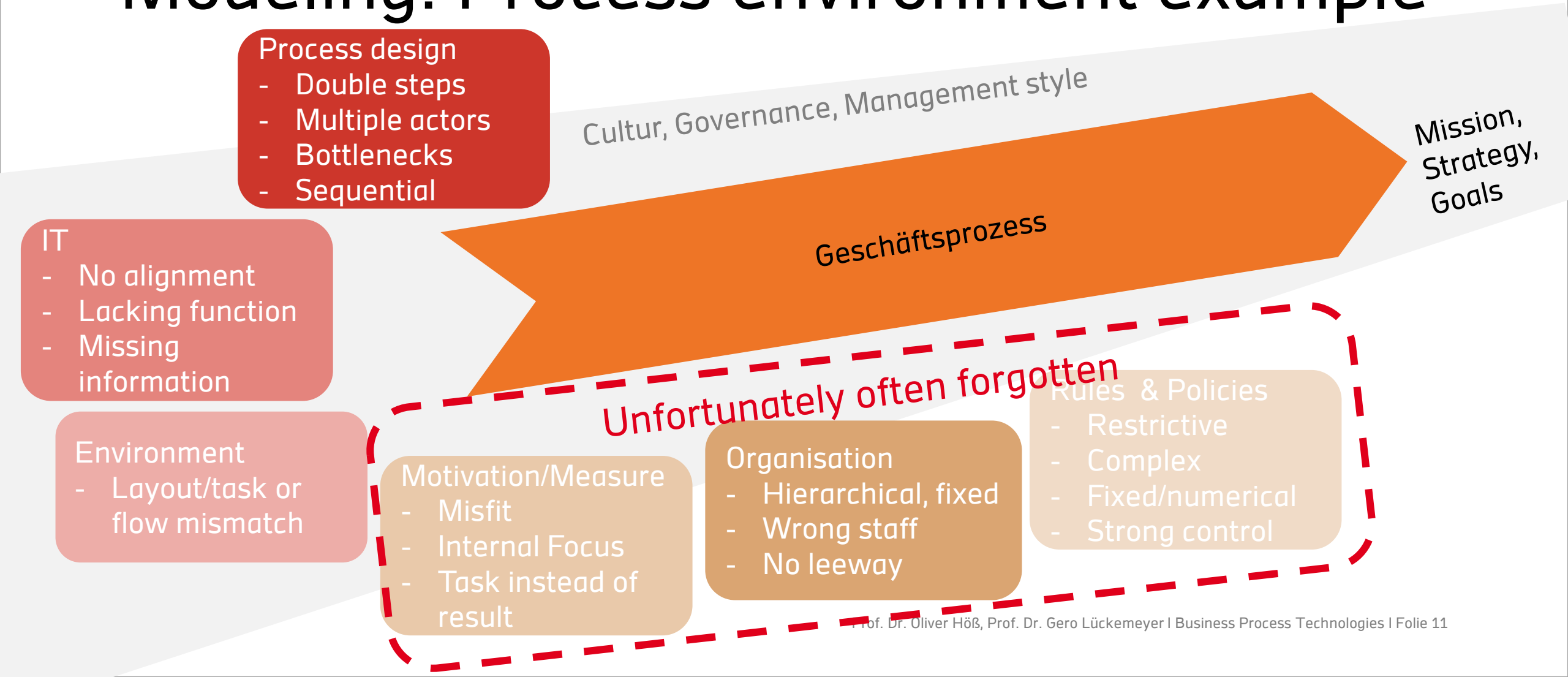
Modeling Step 1: Collect Material

- Sources
  - Documents
  - Interviews
  - Workshops
  - Observation
  - Benchmarking
- Types
  - Things — What?
  - Facts about things
  - Metrics
  - Roles — who?
  - Activities — how?
  - Processing methods — how?
  - Information methods
  - Other

Modellierung: Step 1 – Process environment



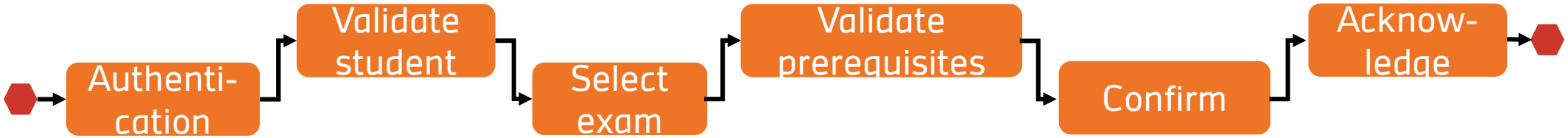
Modeling: Process environment example



Modeling Step 2: Importance of clarifying terminology

- Digital exam registration for flexible study

Goal	Business goal
Process	Business process
Application	User interface
	Business logic
Data	Database

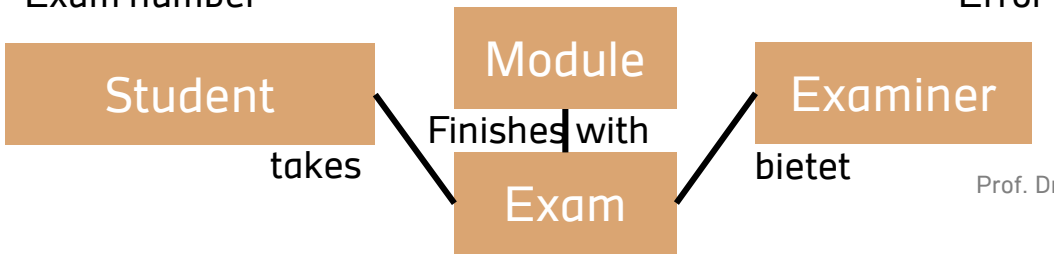


- Dialog „Login“
- Select menu item „Prüfungsverwaltung“
- Select module and type of exam
- Confirm

Input:
Mat number
Exam number

Register student for exam

Output:
Receipt |
Error



Use Case
Actor+Service+System

Service: Verb + Noun

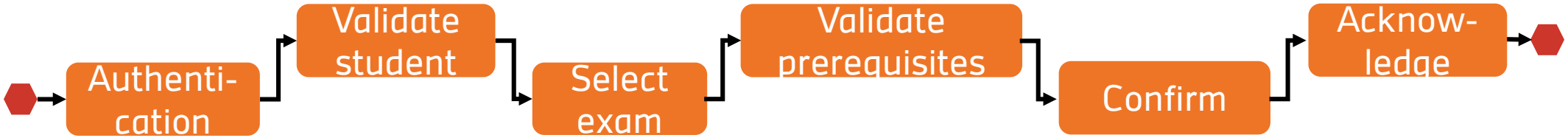
Entity („Thing“)
Noun

Modeling Step 2: Importance of clarifying terminology

Alle use the same term!

- Digital Exam registration for flexible study

Goal	Business goal
Process	Business process
Application	User interface
	Business logic
Data	Database



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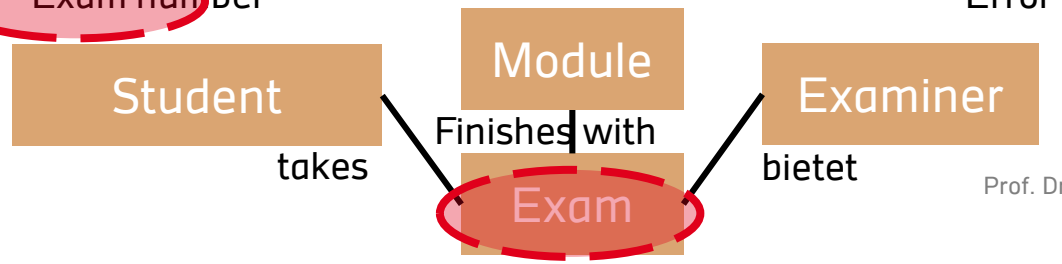


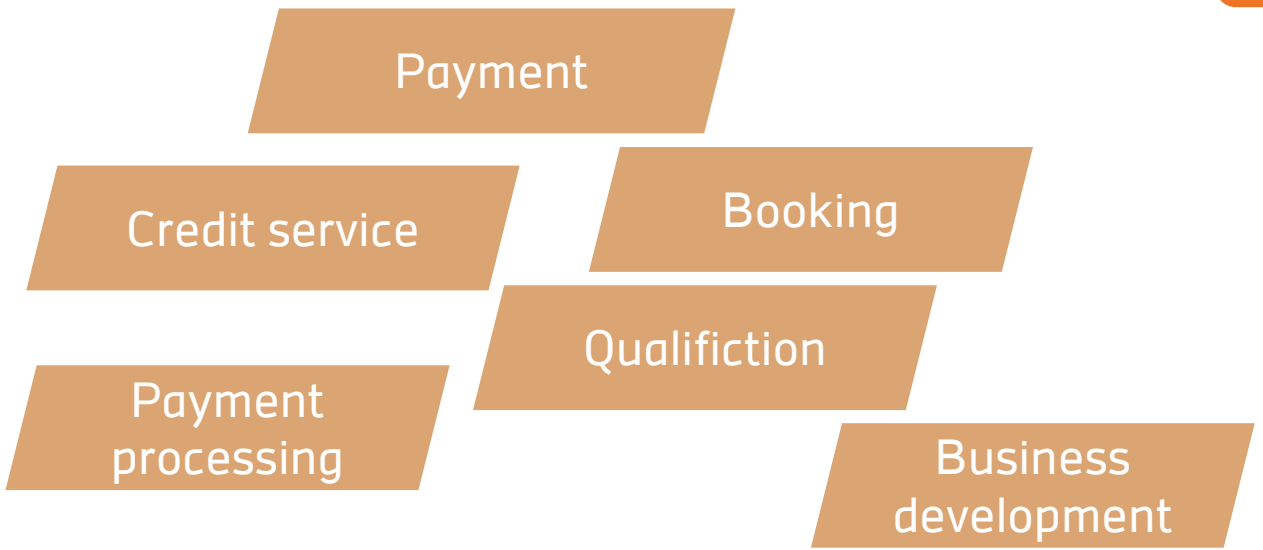
Use Case
Actor+Service+System

Service: Verb + Noun

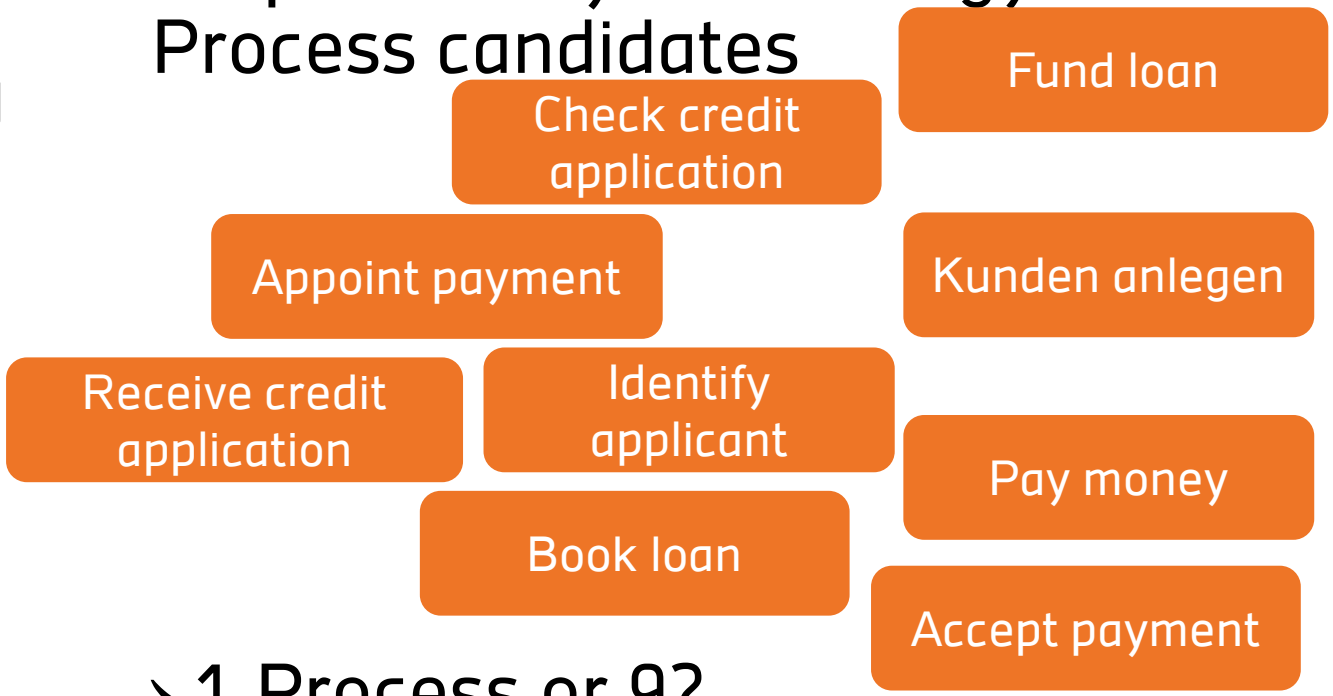
Entity („Thing“)
Noun

Modeling step 1/2 example: credit rating

- Mission: support credit rating process
- Step 1: Collect material: customer term collection



- Step 2: Clarify terminology → Process candidates



→ 1 Process or 9?

Modeling Step 3: Process boundaries

- All activities process 1 „Token“
- Trigger event beyond process control
- End event of the „Happy Path“ leaves >=1 stakeholder happy
- Process name: Noun + active verb derived from process result

Modeling example credit application Step 3

- Trigger
  Request

Token
Loan

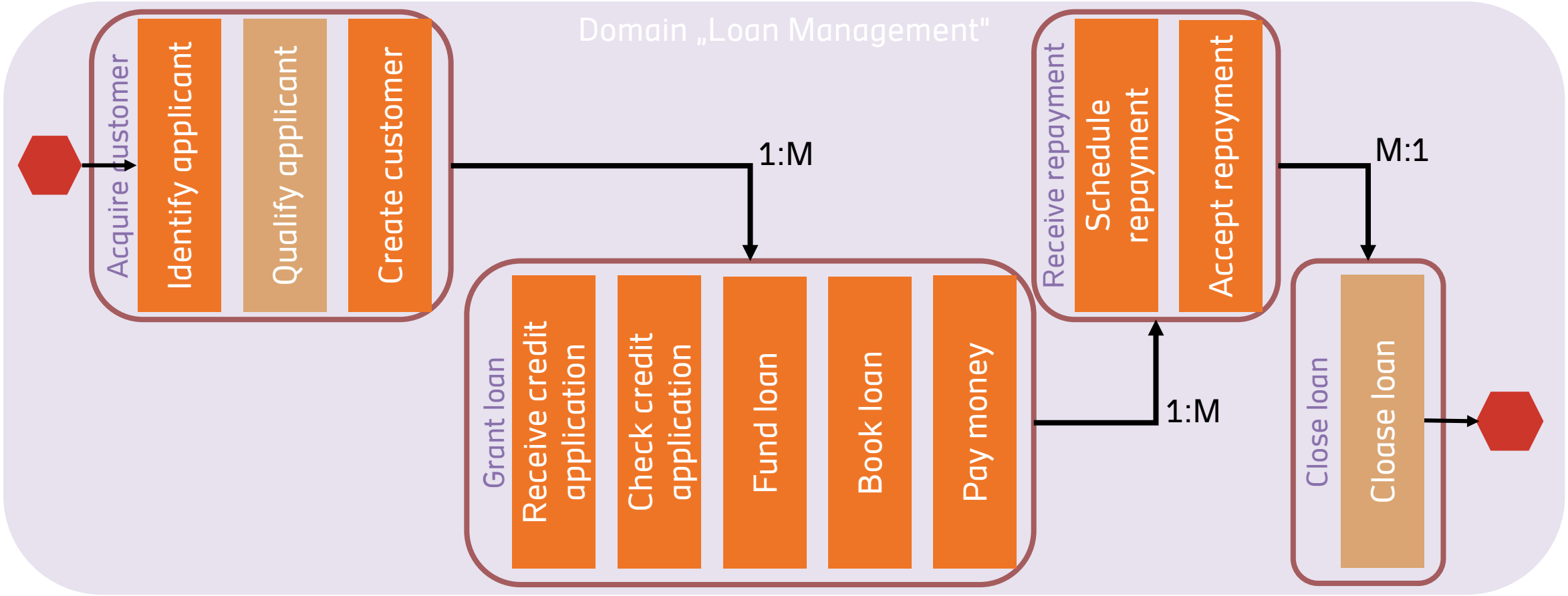
End
Customer: credit
Bank: money

Quelle: A. Sharp: The Process-Data Connection, BPMCE 2019, London.

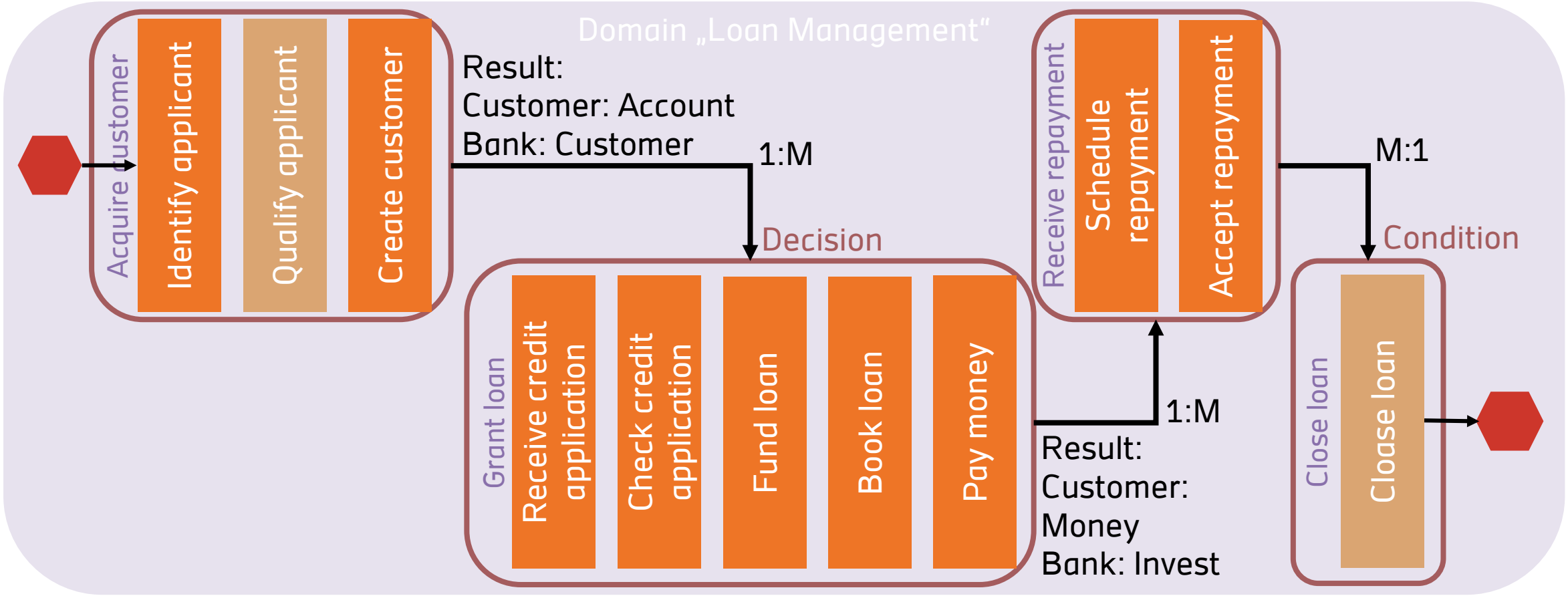
Modeling Step 4: Base activities

- 1:1 linked activities likely belong to the same process
- Neighboring processes of the same business domain possess different frequency and timing

Modeling example credit application: Step 4



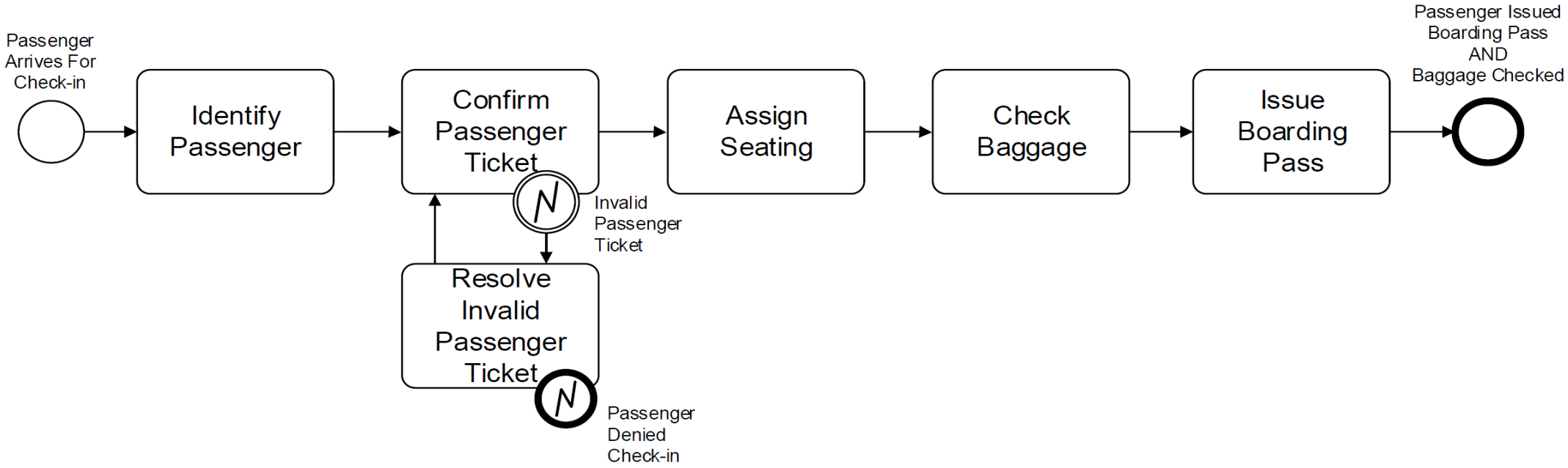
Modeling example credit application: Step 5



Modeling Step 6: common refinements

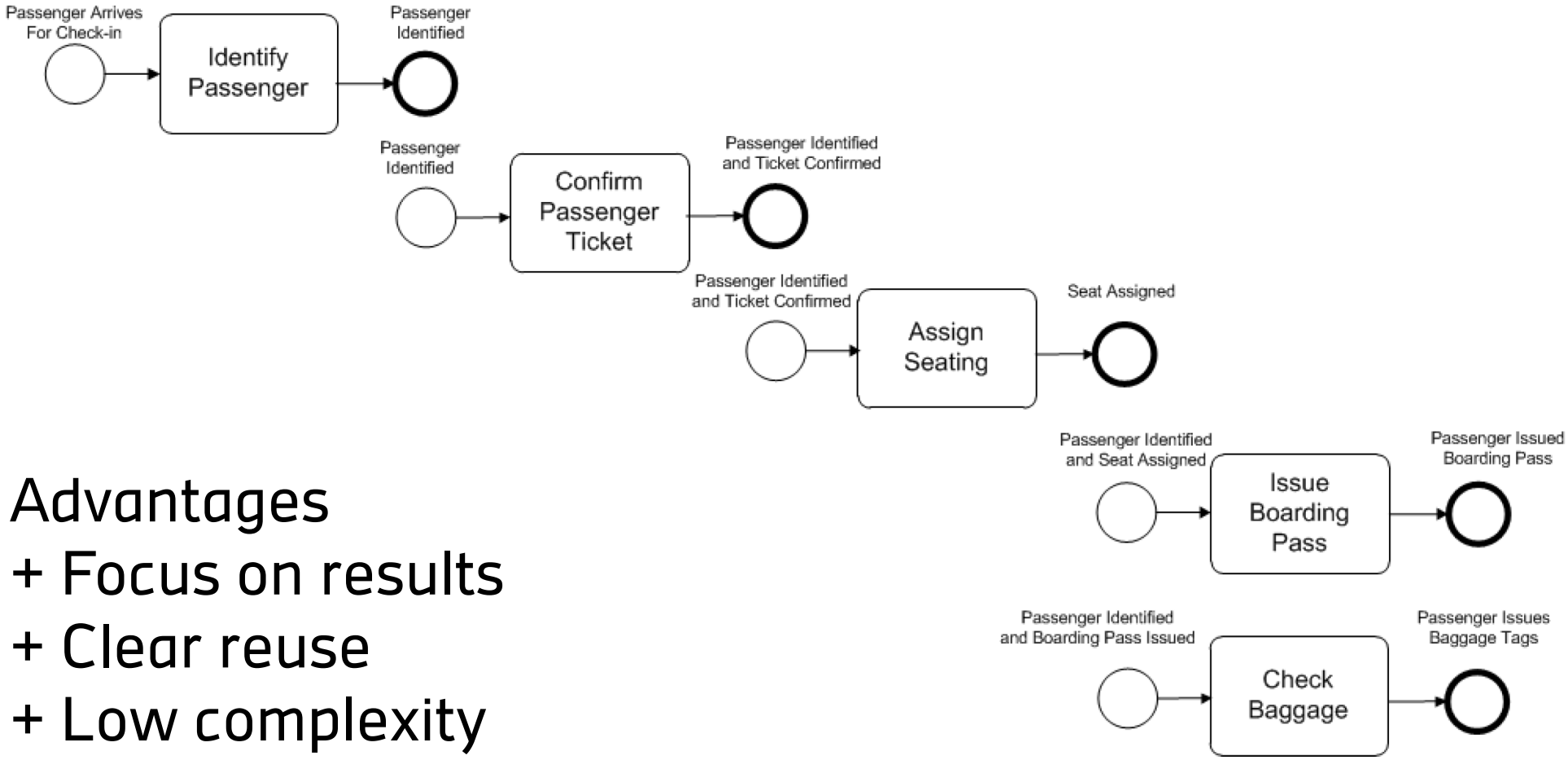
1. Split
2. Merge
3. Exception handling
4. Waiting time
5. Interrupt handling
6. Interaction with external stakeholders
7. Responsibilities
8. Data Input/Output
9. Related data records & documents
10. Outcome-orientierted process flow

Step 6: Example Exception Handling



Quelle: E. Metera: The Practical Guide to High Quality Business Process Models, BPMCE 2019, London.

Schritt 6: Example Outcome Orientation



Advantages
+ Focus on results
+ Clear reuse
+ Low complexity

Quelle: E. Metera: The Practical Guide to High Quality Business Process Models, BPMCE 2019, London.

[02.3] Business Process Model and Notation: Background

BPMN: Background

- Introduced 2001 as „Business Process Modeling Notation“
  - Maintained by Object Management Group (OMG)
  - Initially pure representation of processes
  - Stored in XML (XSD available)
  - Enhanced later to a model depictable by the notation
- Currently V2.0 (538 pages)
  - 5 model types with different elements

[02.3] BPMN: Model types

BPMN model types: Private Business Processes

Internal Processes (in a Pool/without Pools)

Private Non-executable (internal) Business Processes

- Factual modeling without executability goal

Private Executable (internal) Business Processes

- Contain all necessary information for execution (e.g. service calls)

Figure 7.1 - Example of a *private* Business Process

BPMN model types (2): Public Processes

- Represent the interactions between a private process and other processes or participants
- Only communicating activities considered
- External communication via messages

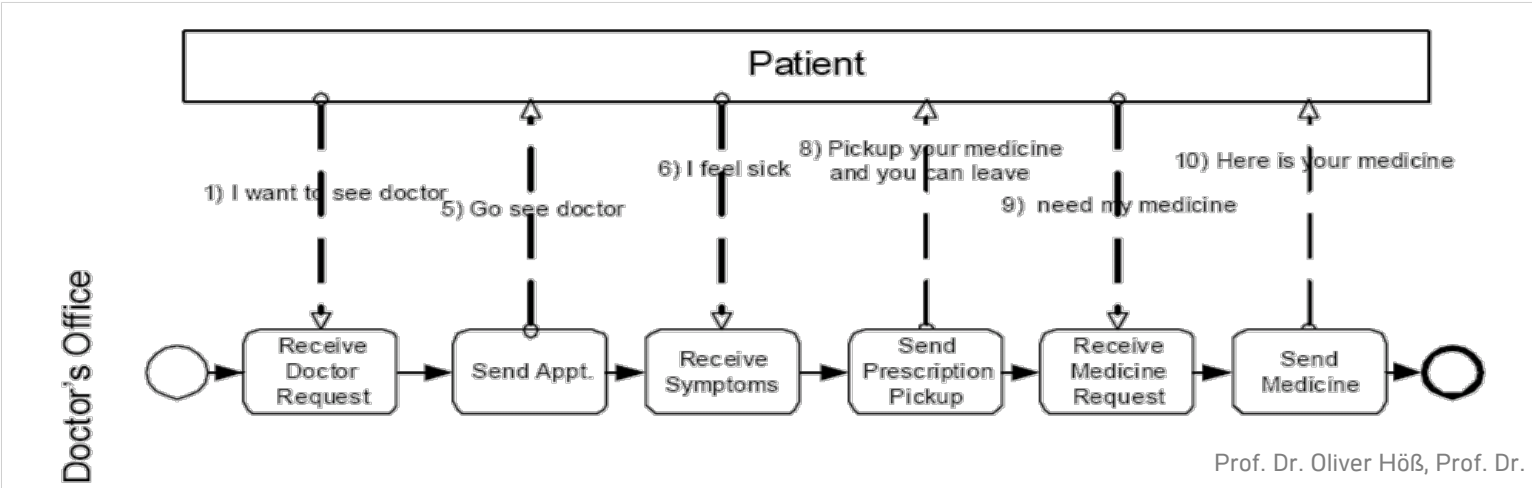


Figure 7.2 - Example of a *public* Process

BPMN model types (3): Collaborations

- Interactions between different organisations/participants in multiple pools
- Communication via messages

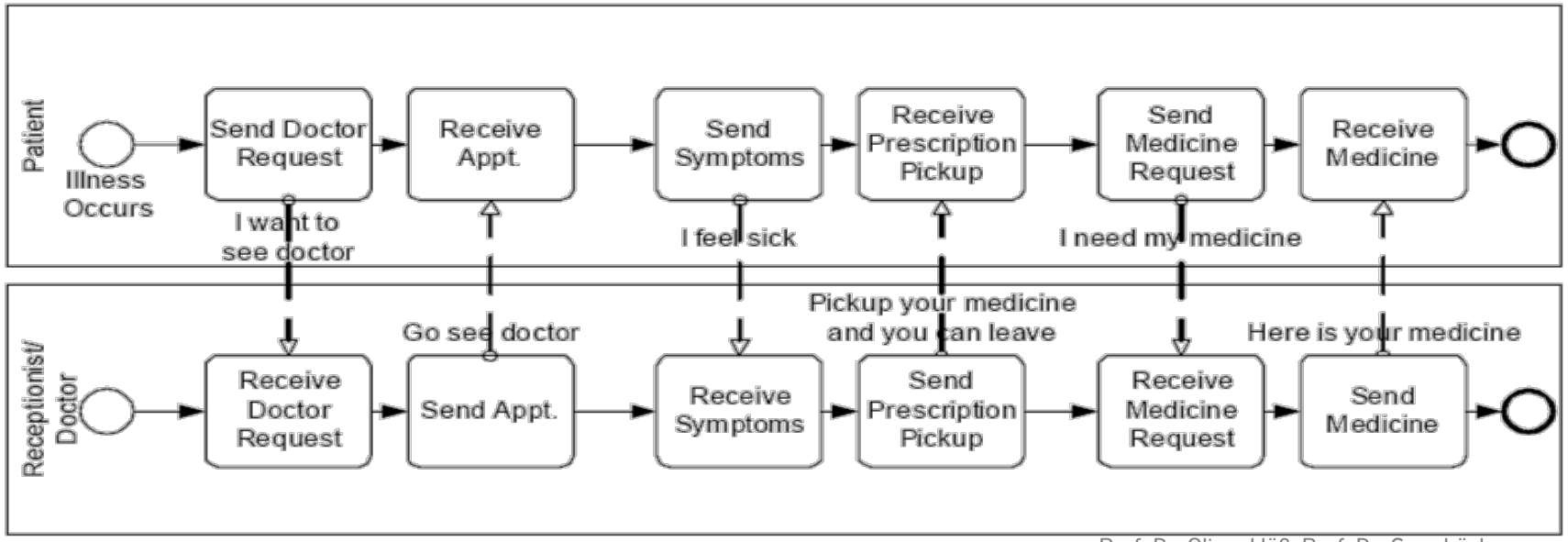


Figure 7.3 - An example of a Collaborative Process

BPMN model types (4): Conversations

- „Aggregated“ view on communication between entities
- No execution order

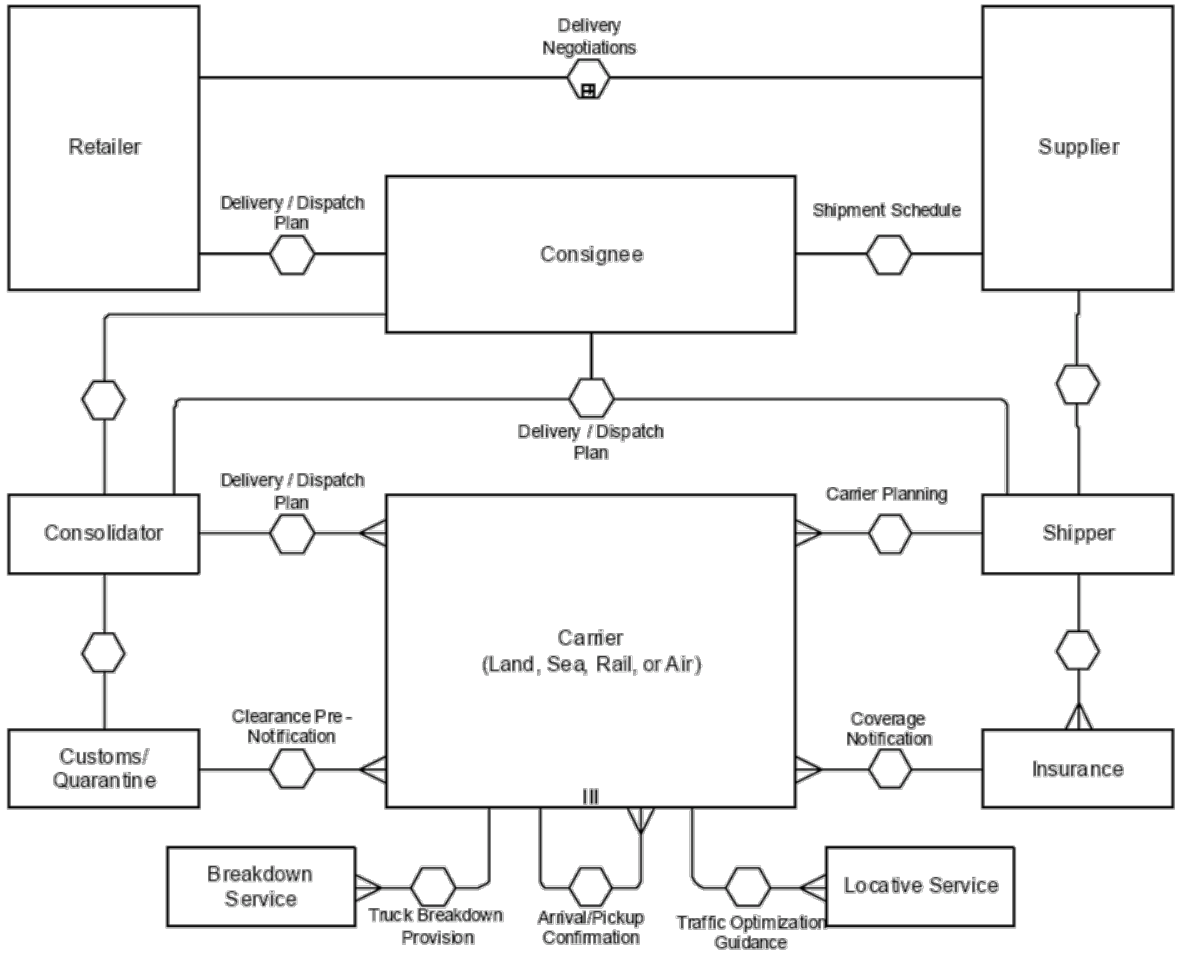


Figure 7.5 - An example of a Conversation diagram

BPMN model types (5): Choreographies

- Interaction-oriented representation between multiple entities
- Typically no pools

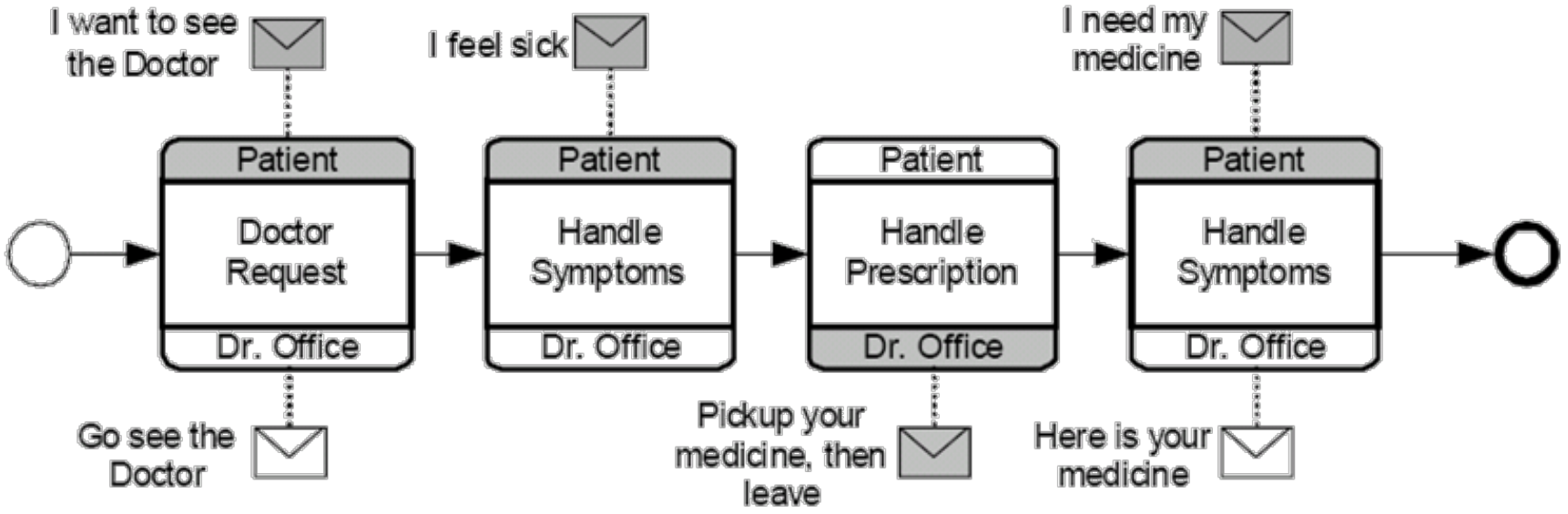
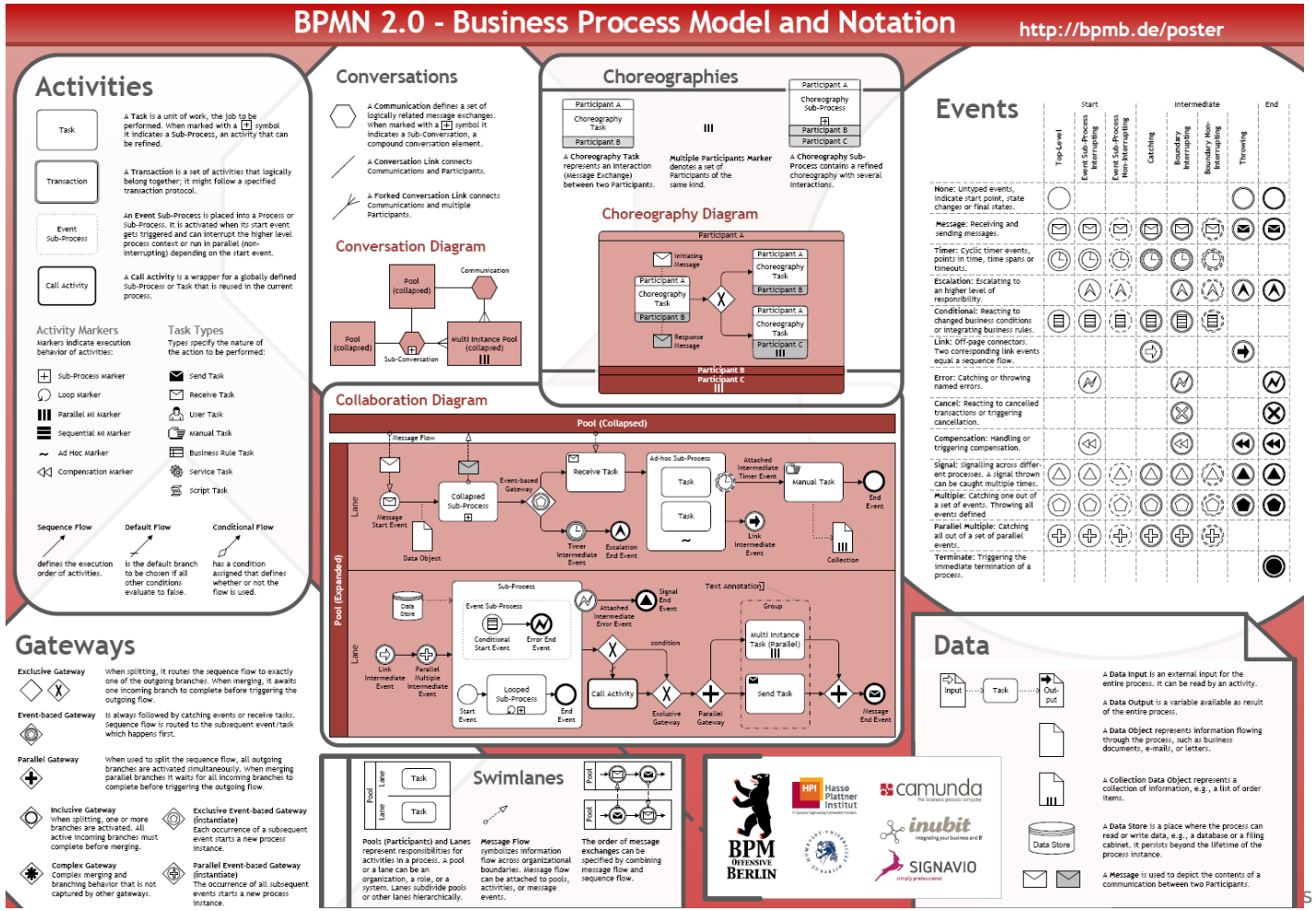


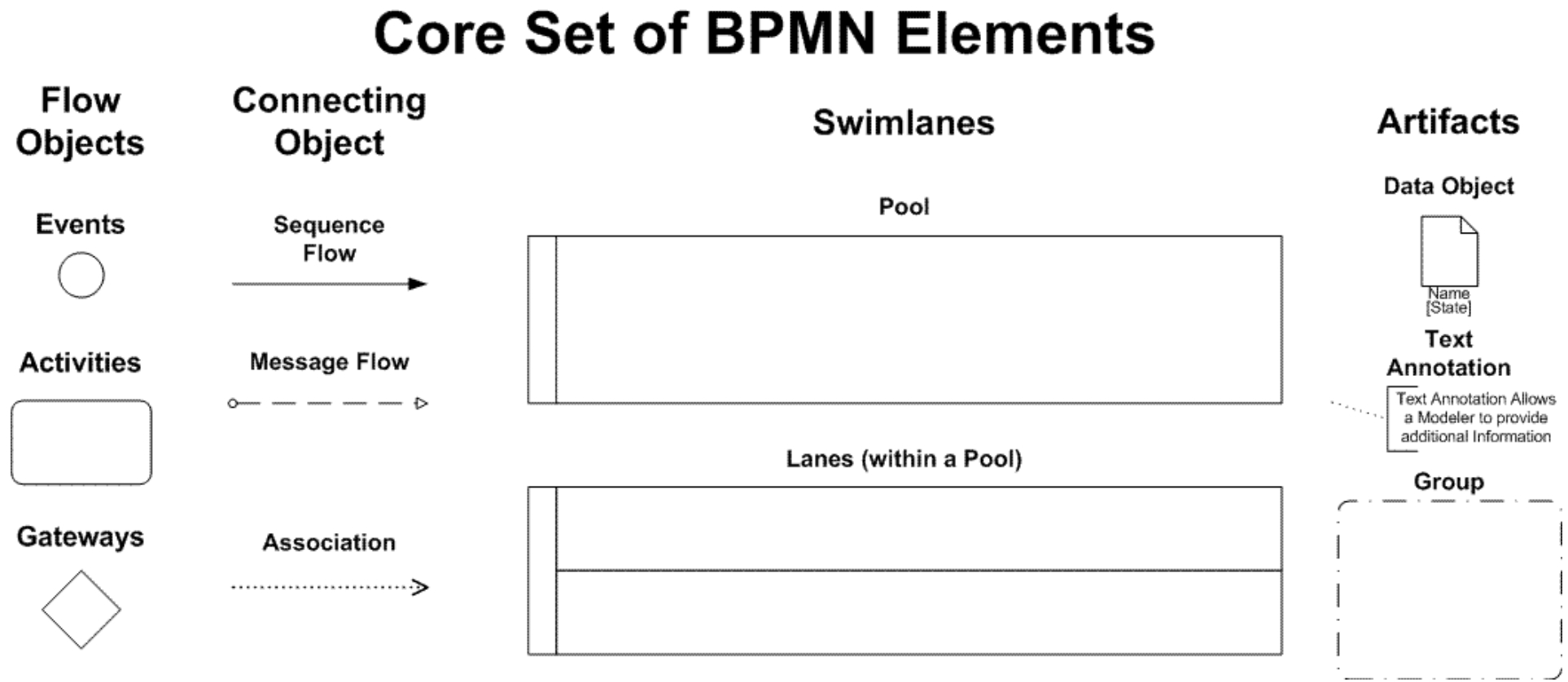
Figure 7.4 - An example of a Choreography

[02.4] BPMN: Model elements

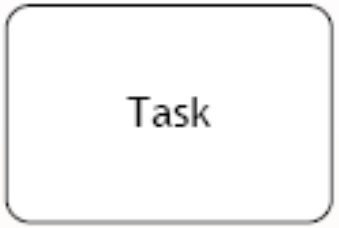
Basic BPMN elements: overview



BPMN: Element types

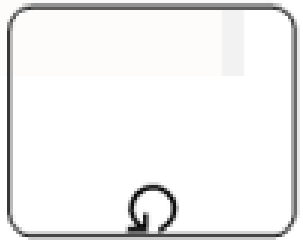


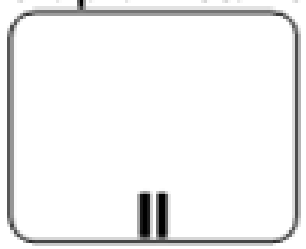
BPMN Elements: Activities

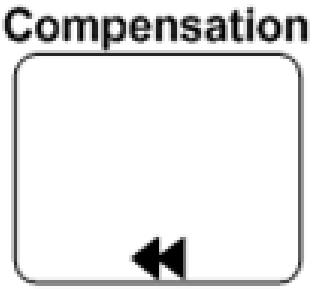


A **Task** is a unit of work, the job to be performed. When marked with a [+] symbol it indicates a **Sub-Process,** an activity that can be refined.

A **Transaction** is a set of activities that logically belong together; it might follow a specified transaction protocol.







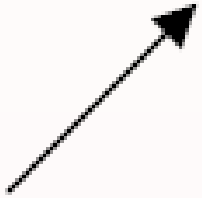
Activity Markers

Markers indicate execution behavior of activities:

- Sub-Process Marker
- Loop Marker
- Parallel MI Marker
- Sequential MI Marker
- Ad Hoc Marker
- Compensation Marker

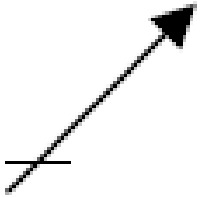
BPMN elements: Sequence Flows

Sequence Flow



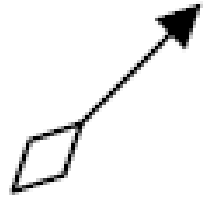
defines the execution order of activities.

Default Flow



is the default branch to be chosen if all other conditions evaluate to false.

Conditional Flow



has a condition assigned that defines whether or not the flow is used.

BPMN elements: Gateways

Exclusive Gateway

When splitting, it routes the sequence flow to exactly one of the outgoing branches. When merging, it awaits one incoming branch to complete before triggering the outgoing flow.

Event-based Gateway

Is always followed by catching events or receive tasks. Sequence flow is routed to the subsequent event/task which happens first.

Parallel Gateway

When used to split the sequence flow, all outgoing branches are activated simultaneously. When merging parallel branches it waits for all incoming branches to complete before triggering the outgoing flow.

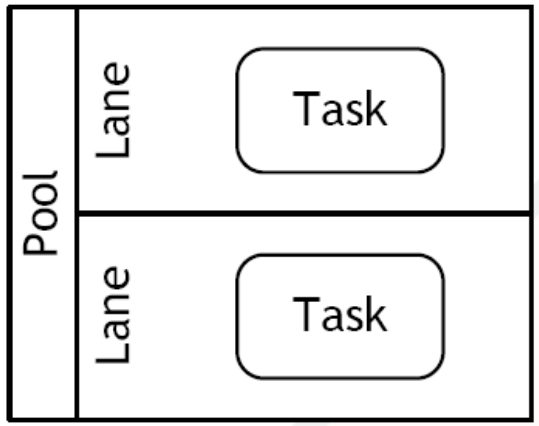
Inclusive Gateway
When splitting, one or more branches are activated. All active incoming branches must complete before merging.

Exclusive Event-based Gateway (instantiate)
Each occurrence of a subsequent event starts a new process instance.

Complex Gateway
Complex merging and branching behavior that is not captured by other gateways.

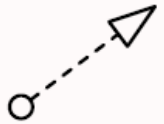
Parallel Event-based Gateway (instantiate)
The occurrence of all subsequent events starts a new process instance.

BPMN elements: Pools, Lanes and Messages

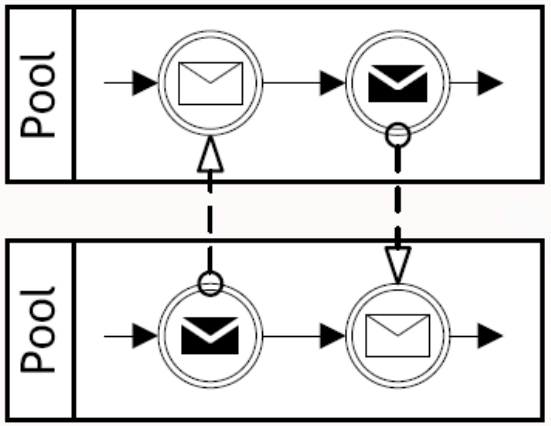


Pools (Participants) and **Lanes** represent responsibilities for activities in a process. A pool or a lane can be an organization, a role, or a system. Lanes subdivide pools or other lanes hierarchically.

Swimlanes

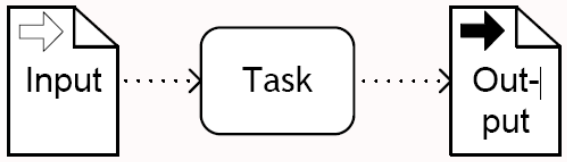


Message Flow symbolizes information flow across organizational boundaries. Message flow can be attached to pools, activities, or message events.



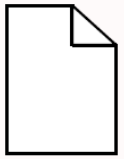
The order of **message exchanges** can be specified by combining message flow and sequence flow.

BPMN elements: Data Artifacts



A **Data Input** is an external input for the entire process. It can be read by an activity.

A **Data Output** is a variable available as result of the entire process.



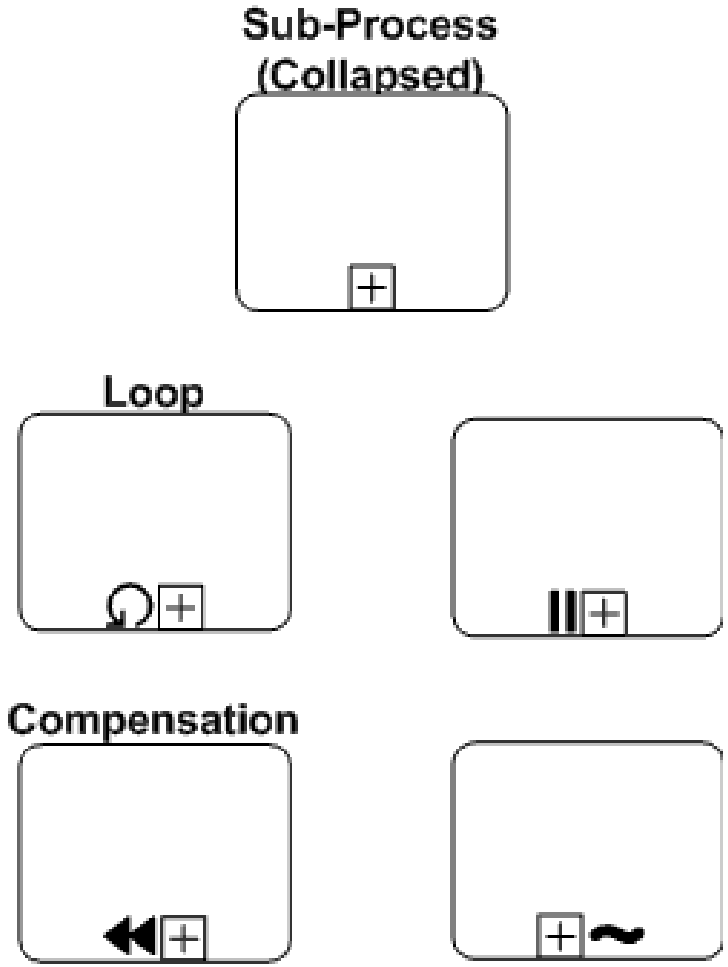
A **Data Object** represents information flowing through the process, such as business documents, e-mails, or letters.

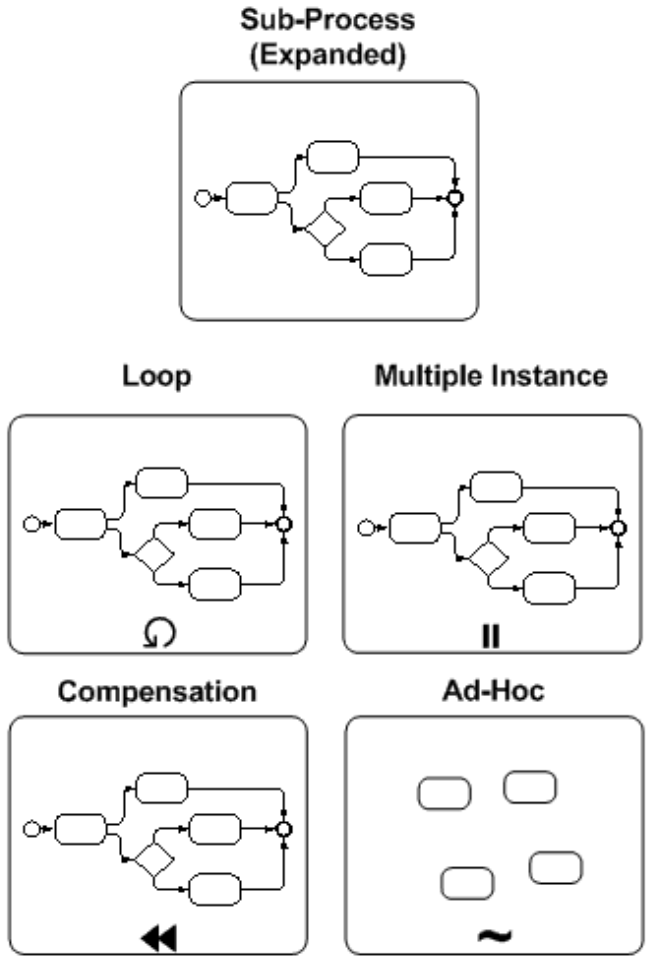
A **Collection Data Object** represents a collection of information, e.g., a list of order items.

A **Data Store** is a place where the process can read or write data, e.g., a database or a filing cabinet. It persists beyond the lifetime of the process instance.

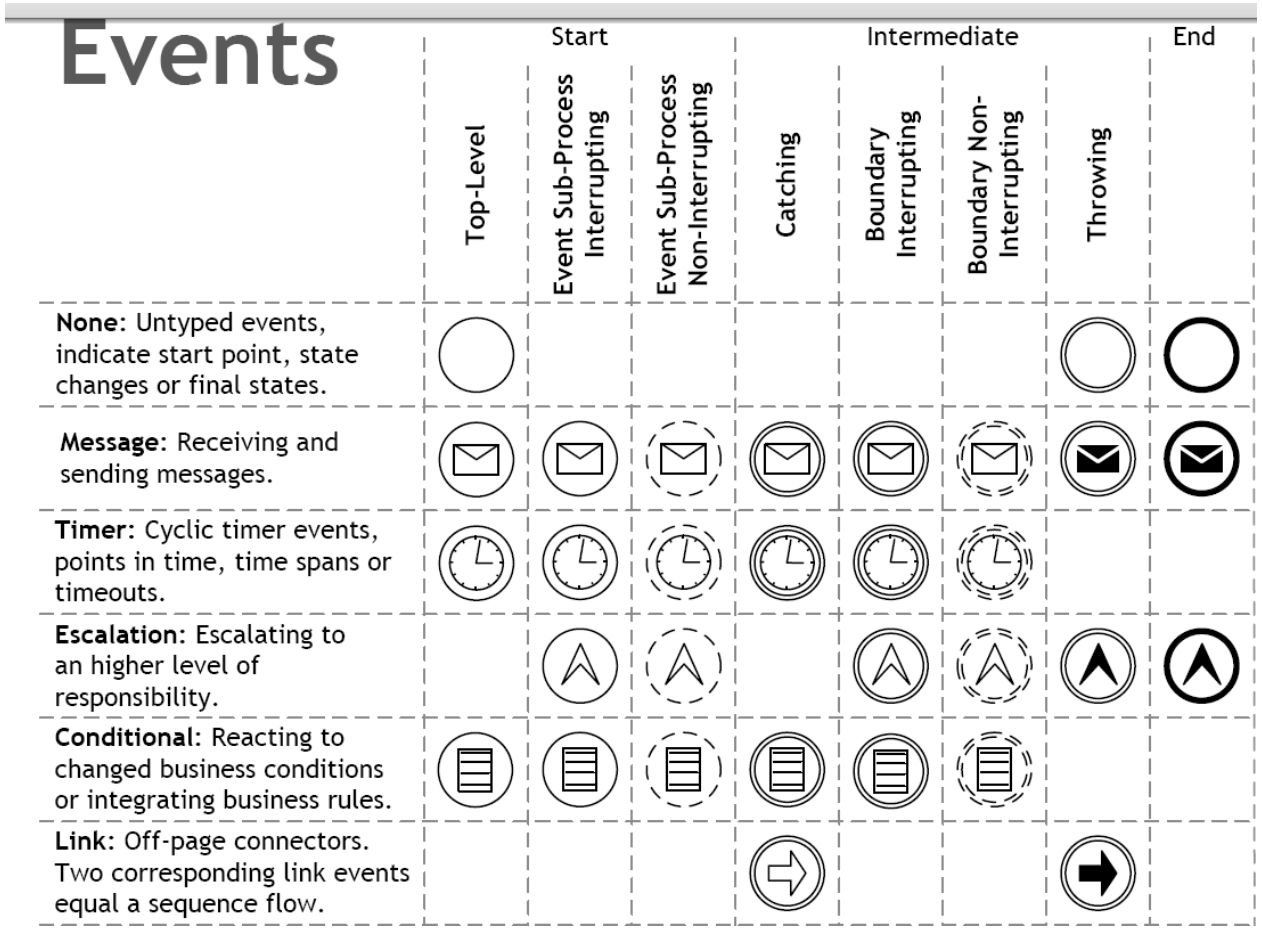
A **Message** is used to depict the contents of a communication between two Participants.

BPMN elements: Subprocesses

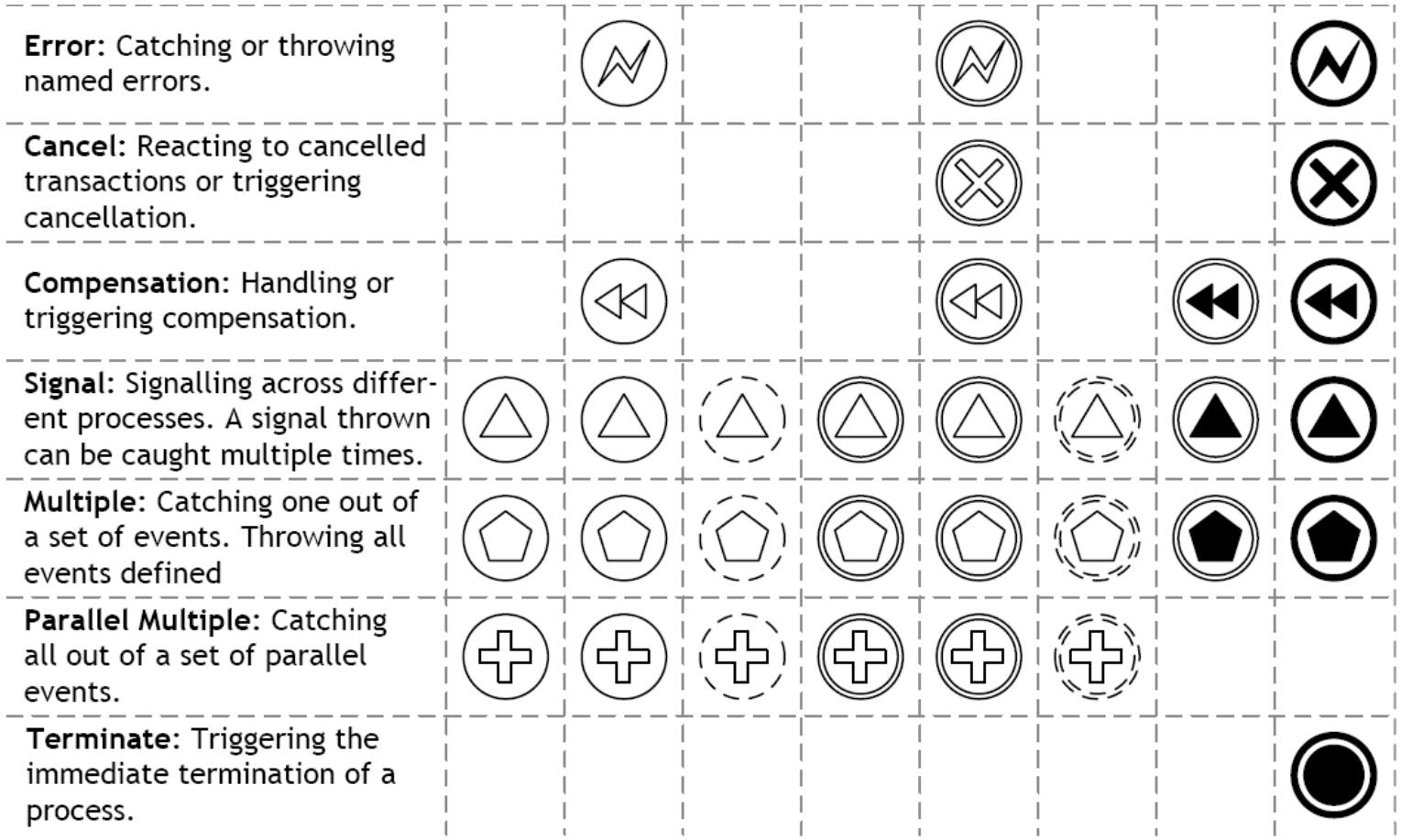




BPMN elements: Events



BPMN elements: Events (2)



Example: Pizza Service

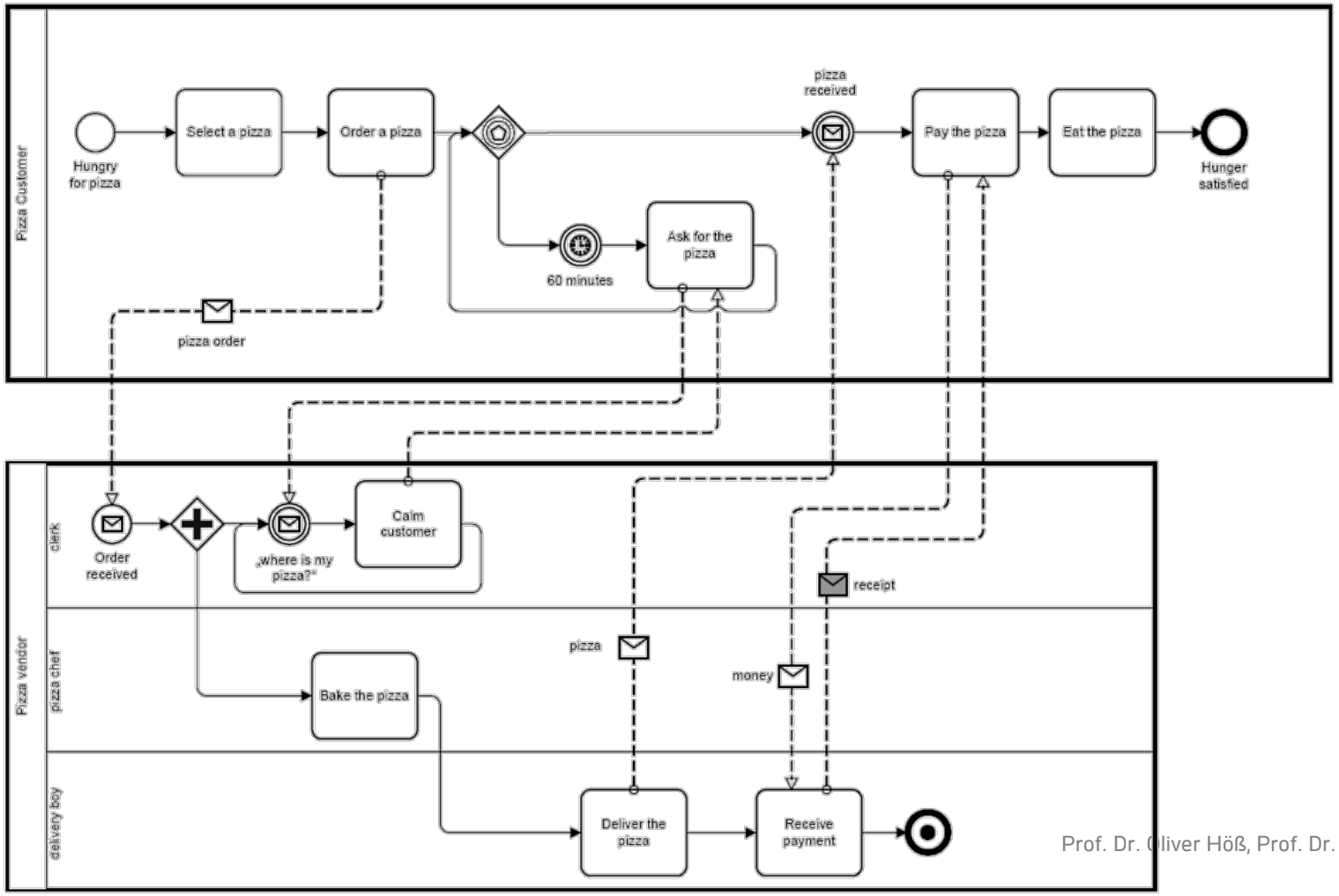


Figure 5.2: Ordering and delivering pizza

Example XML Representation

```
<?xml version="1.0" encoding="UTF-8"?><definitions xmlns="http://www.omg.org/spec/BPMN/201005
   <collaboration>
   <process id="sid-52B82E6B-D797-4AB9-8D35-A82EADB8A15C" isClosed="false" isExecutable="fals
      <laneSet id="sid-8d27ce8b-e523-498b-a778-2f29bdd1126b">
         <lane id="sid-BC9682B5-CA55-4F49-A336-79A88FEB0525">
            <extensionElements>
               <signavio:signavioMetaData metaKey="bgcolor" metaValue=""/>
            </extensionElements>
            <flowNodeRef>sid-912DABAE-91E9-4A48-BF3E-E47725B362ED</flowNodeRef>
            <flowNodeRef>sid-B6B76FC5-BD50-4305-9844-834288F8CFD0</flowNodeRef>
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            <flowNodeRef>sid-725B1F3B-7022-4782-9391-DF546D3925A0</flowNodeRef>
            <flowNodeRef>sid-99BD86A4-69E7-4DA4-AA48-7FDC2572055C</flowNodeRef>
         </lane>
      </laneSet>
      <task completionQuantity="1" id="sid-912DABAE-91E9-4A48-BF3E-E47725B362ED" isForCompens
         <extensionElements>
            <signavio:signavioMetaData metaKey="bgcolor" metaValue="#ffffcc"/>
         </extensionElements>
         <incoming>sid-07587246-EE81-44BA-B21C-1B3BB1414829</incoming>
         <outgoing>sid-777F62BD-C15C-4ED0-99CC-297F9CA1D671</outgoing>
      </task>
      <task>
      <startEvent id="sid-01EDC181-97CC-4F77-B724-AA5BD01368C6" isInterrupting="true" name="
         <extensionElements>
```

[02.5] BPMN: Modeling Rules

BPMN Modeling: Basic rules

- Pools & Lanes
  - Separate Pools for independent organisations
  - Lanes for departments/roles/systes
- Message & Sequence Flows
  - Message Flows between Pools
  - Sequence Flows inside a Pool
  - Catch messages with Receiving Start- or Intermediate Event
  - Messages typically carry a Data Object
- Sequence Flows with Start- and End-Events
  - Connect all elements of every Pool with a closed sequence of Sequence Flows to a Start- and at least one End-Event

Result quality: comapny conventions in process modeling

Area

- Modeling granularity
- Element usage, e.g.
  - Aktivity with Message Flow and Standard End-Event vs. Message End-Event
- Naming/Terminology
- Layout, e.g.
  - Element positions
  - Edge alignment

Utility

- Reduced introductory effort
- Faster understandable
- Partly easier automation

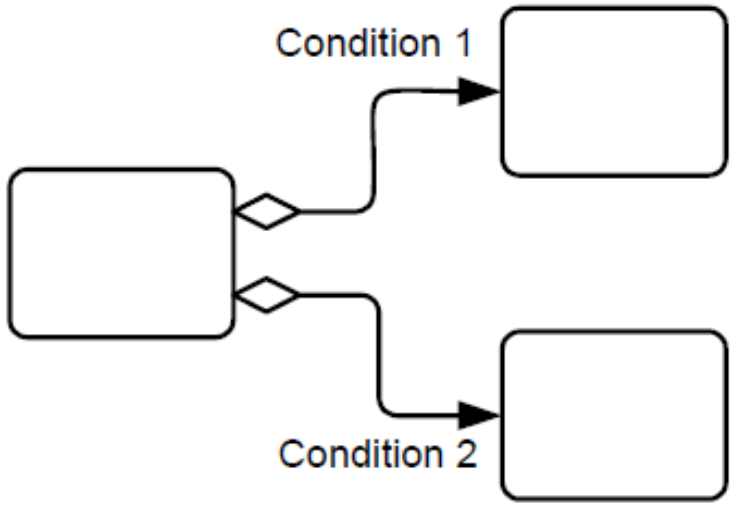
Inclusive Gateways – Alternatives

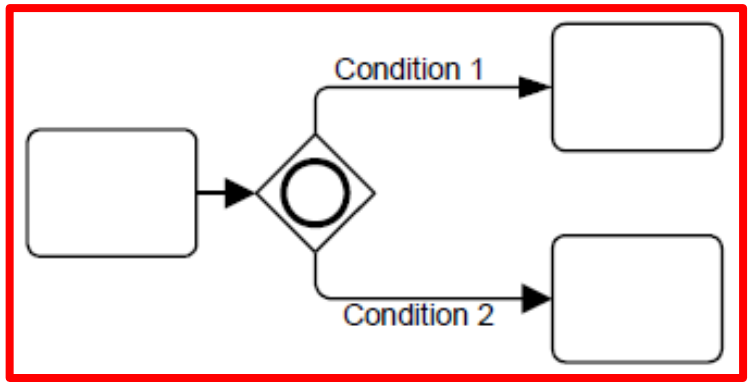
Inclusive

This Decision represents a branching point where Alternatives are based on conditional `Expressions` contained within the outgoing Sequence Flows (see page 292). In some sense it is a grouping of related independent Binary (Yes/No) Decisions. Since each path is independent, all combinations of the paths MAY be taken, from zero to all. However, it should be designed so that at least one path is taken. A Default Condition could be used to ensure that at least one path is taken.

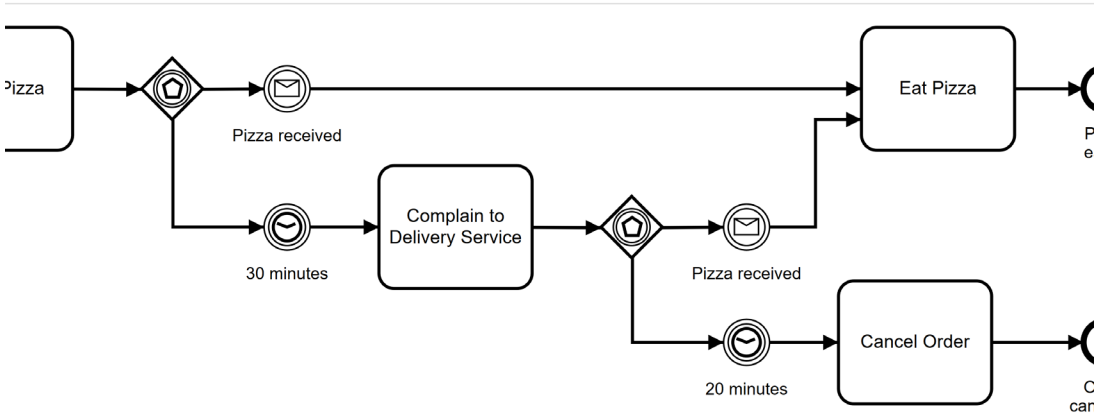
There are two versions of this type of Decision:

- The first uses a collection of conditional Sequence Flows, marked with mini-diamonds (see top-right figure).
- The second uses an Inclusive Gateway (see bottom-right picture)





Multi-Escalation Alternative 1: Event-based Gateways



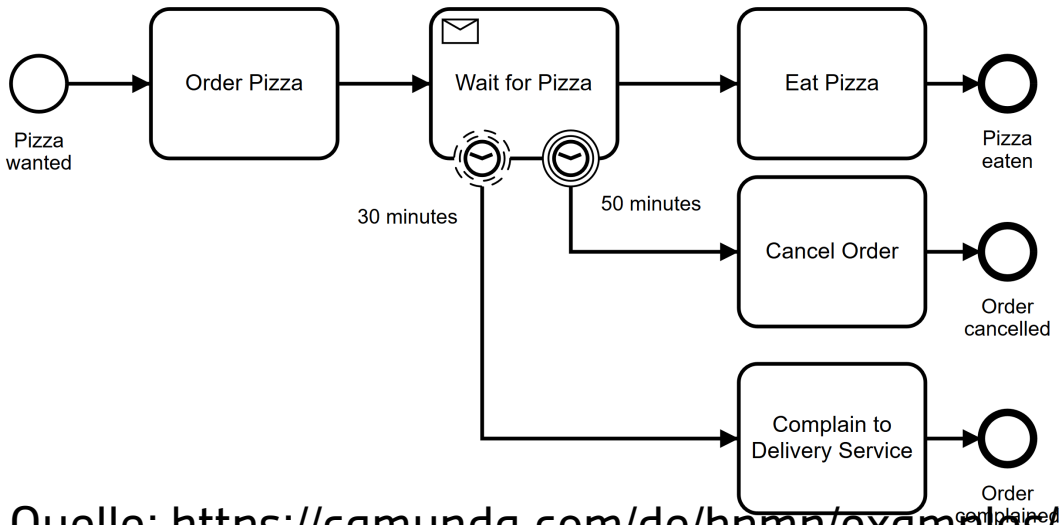
Quelle: https://camunda.com/de/bpmn/examples/

+ Explicit escalation steps

~ Event-based Gateway powerful modeling element

- Many modeling elements
  - Event „Pizza received“ twice

Multi-Escalation Alternative 2: Receive Task with Timers



Quelle: https://camunda.com/de/bpmn/examples/

+ Compact

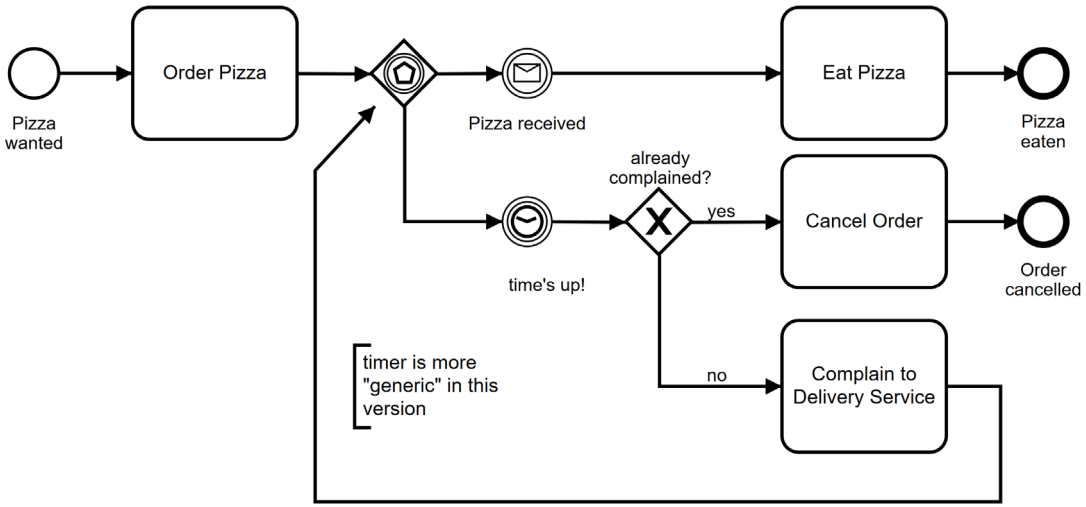
+ Extendable for additional layers

~ Developer view

- Non-intuitive especially for business departments

- Timer co-operation requires event understanding

Multi-Escalation Alternative 3: Event-based Gateway with generic timer



Quelle: https://camunda.com/de/bpmn/examples/

+ Compact generic solution

+ Applicability grows with the number of escalation levels

- Less explicit
  - Timer duration invisible

- Inappropriate for understanding only two escalation levels

Summary

- Process Modeling is a process! ;-)
  - Reproductible modeling steps lead to predictable, appropriate results.
- BPMN is the worldwide modeling standard.
  - Defines models and elements
- The plethora of models and elements offers modeling alternatives for many factual constellations.
  - Company conventions act as an enabler for easier understanding, especially in untrained people.

Thank you very much

For your attention!