

Smart Sustainability Simulation Game

Case 4: Recycling - Unit 1
18.06.2024

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Organizational information

Master-Lehrveranstaltung: Hackathon: Generative AI for Social Good



Allgemeine Informationen

- Mastermodul im kommenden WiSe 24/25
- Credits: 6 ECTS
- Einbringbarkeit in die Studiengänge Wirtschaftsinformatik (M.Sc.), Management (M.Sc.) und International Business and Economics (M.Sc.)
- Der Kurs wird auf **Deutsch** angeboten
- **Technische Vorkenntnisse** sind von großem Vorteil, die Bereitschaft zur deren Aneignung ist notwendig
- Durchgeführt von Prof. Dr. Henner Gimpel, Dr. Manfred Schoch und Dominik Fetzer
- Kontakt für Fragen:
dominik.fetzer@uni-hohenheim.de



Konzept & Ziel

Sie durchlaufen in selbstgewählten Teams (4-5 Personen) einen kompletten **KI-Innovationszyklus** - von der Exploration bis zur Umsetzung einer KI-basierten Anwendung. Der Fokus liegt dabei auf generativer KI.

Ziel: Entwicklung einer innovativen, LLM-basierten Anwendung für eine sozial relevante Problemstellung



Ablauf

1. **Ca. 4 Workshops von Oktober bis Dezember:** Wissensaufbau zu Innovationstechniken, Entwicklung LLM-basierter Anwendungen, UI/UX Design,...
2. **3-tägiger Hackathon im Januar:** Entwicklung einer lauffähigen, LLM-basierten Anwendung für eine spezifische sozial relevante Problemstellung

Detaillierte Infos
folgen bald auf
unserer Webseite:



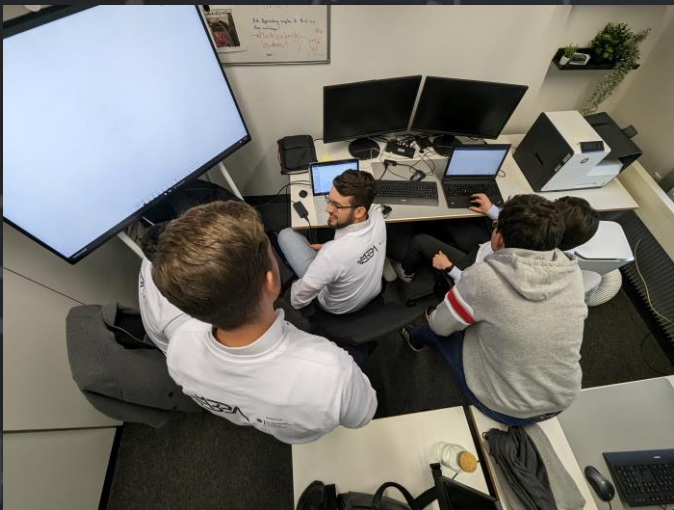
UNIVERSITÄT
HOHENHEIM

Digitales Management



AI FOR BUSINESS
BUSINESS FOR AI

Master-Lehrveranstaltung: Hackathon: Generative AI for Social Good



Examination performance

The **examination performance** consists of:

*Analysis results,
software code,
and decision quality for
four cases*

*Project
report*

Analysis results, software code, and decision quality for four cases

- Consists of **16** individual and clearly definable performances that are assessed individually.
 - 4** cases x **2** weeks per case x **2** results (code and analysis results per week)
- All 4 cases are weighted equally
- For each case, week 2 is more important than week 1
- You have the choice of submitting the deliverables individually or as a team.
- If you submit the deliverables as a team (which we recommend), indicate who did what (potentially: We made everything jointly).

Project report

- This is an at most five-page reflection on the content-related and methodical learning process and success as well as on teamwork.
- The project report is an individual performance.

Submission project report

The project report must be emailed to s3g@fim-rc.de as a PDF file by 02:00 PM on 15.07.2024:

Project report

This is an at most five-page reflection on the content-related and methodical learning process and success as well as on teamwork. The project report is an individual performance.



Submission

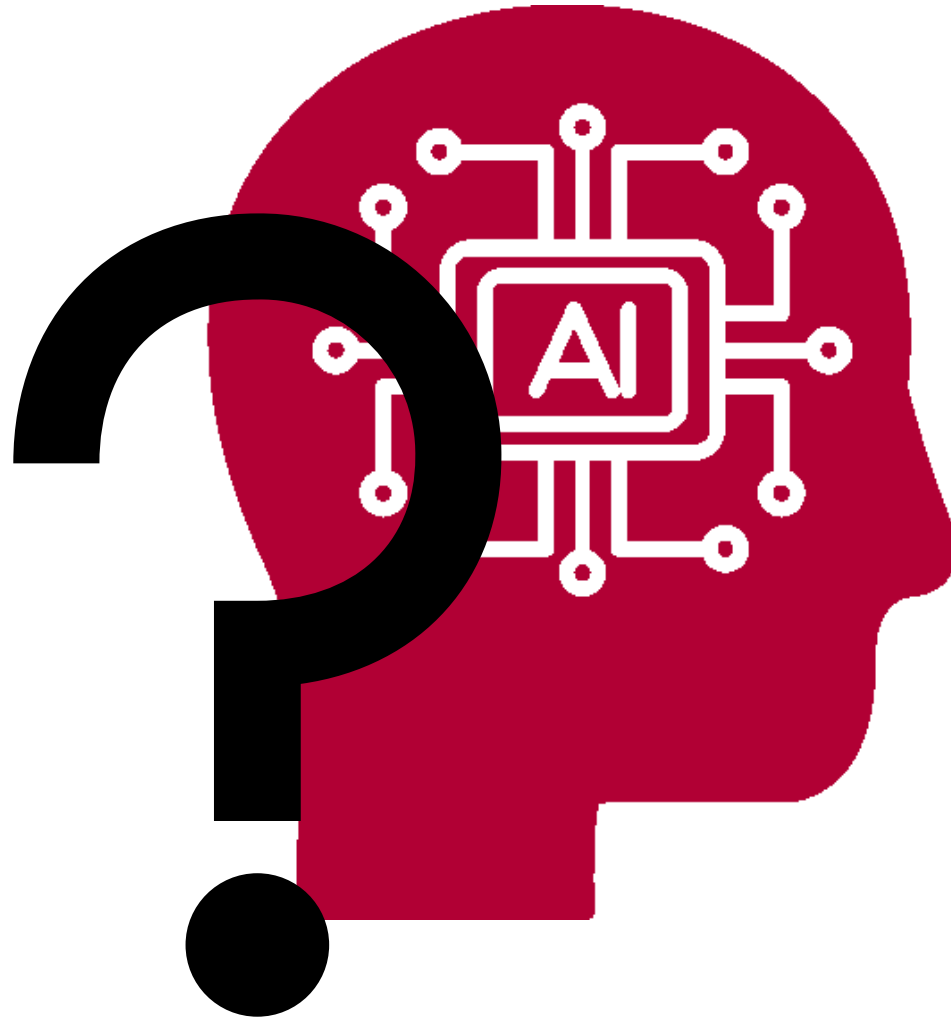
02

Case 2: Your results

Evaluation of your models for predictive maintenance

	A	B	C	D	E
1	Accuracies	Penguin	Dolphin	Ants	Goat
2	Robot 1	0.77966	0.98179	0.6698	tbd
3	Robot 2	0.54151	0.74007	0.78219	tbd
4	Robot 3	0.97503	0.83583	0.79962	tbd
5		0.7654	0.85256333	0.75053667	tbd
6					

Time for Feedback



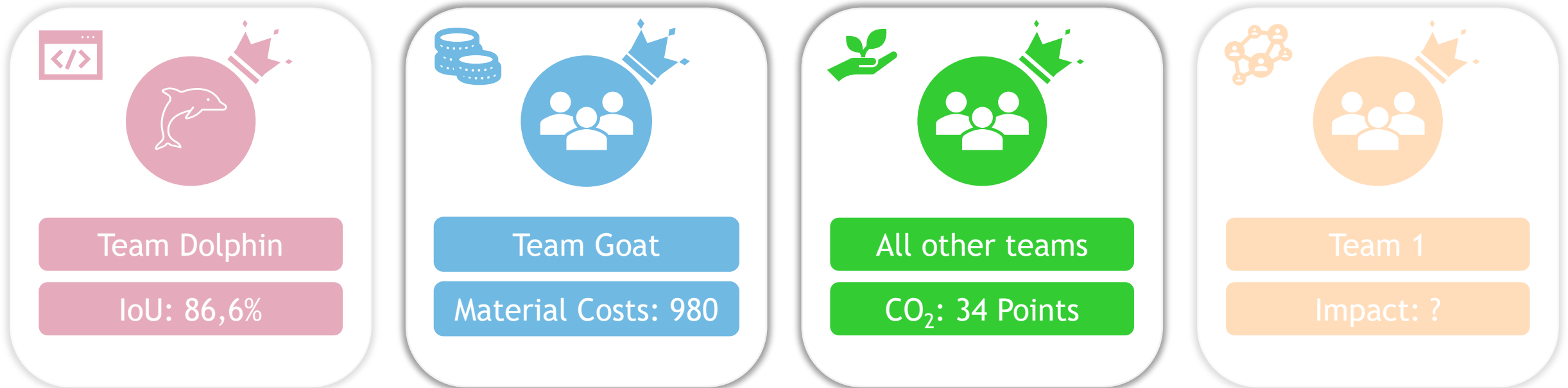
How was the
last week?

Any Questions?

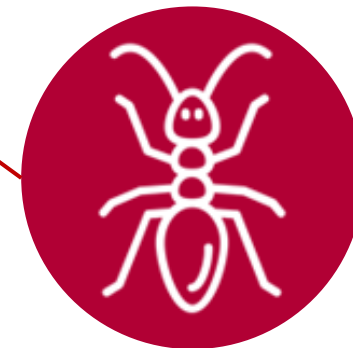
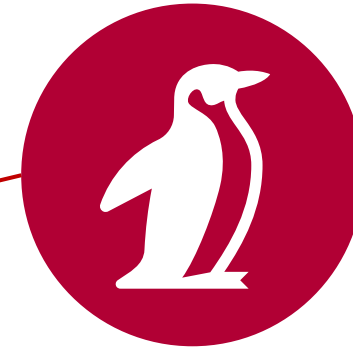
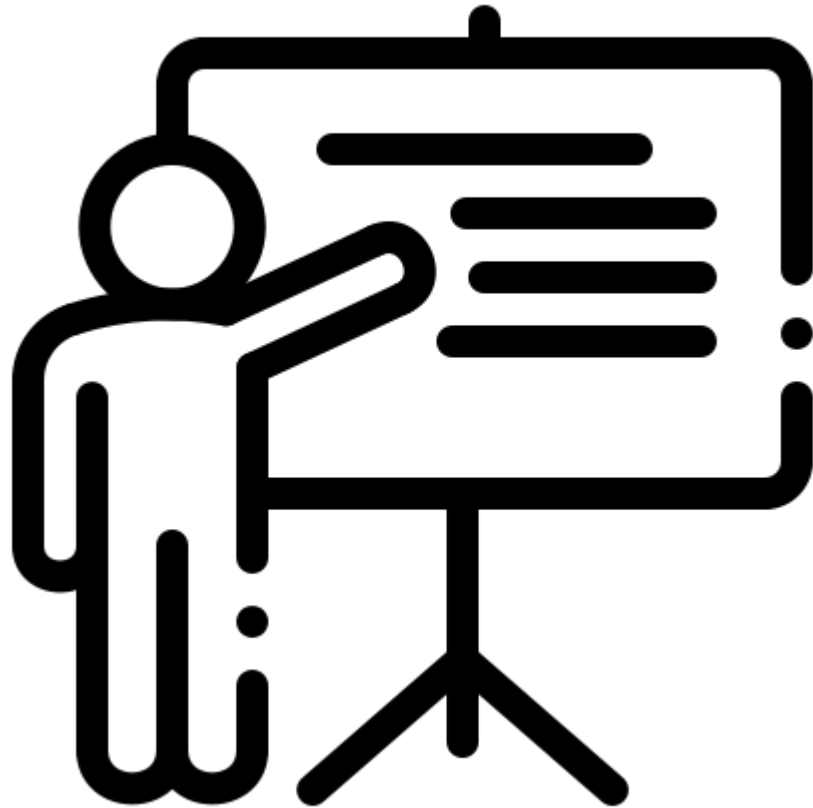
03

Case 3: Your results

Case 3: Leaderboard



Case 3: Presentation of results



04

Case 4: Recycling - Unit 1

Overview of the cases

Case 1: Material procurement

- What materials should I buy and when?
 - Value chain level: Procurement
- Time Series Analysis

Case 2: Predictive Maintenance

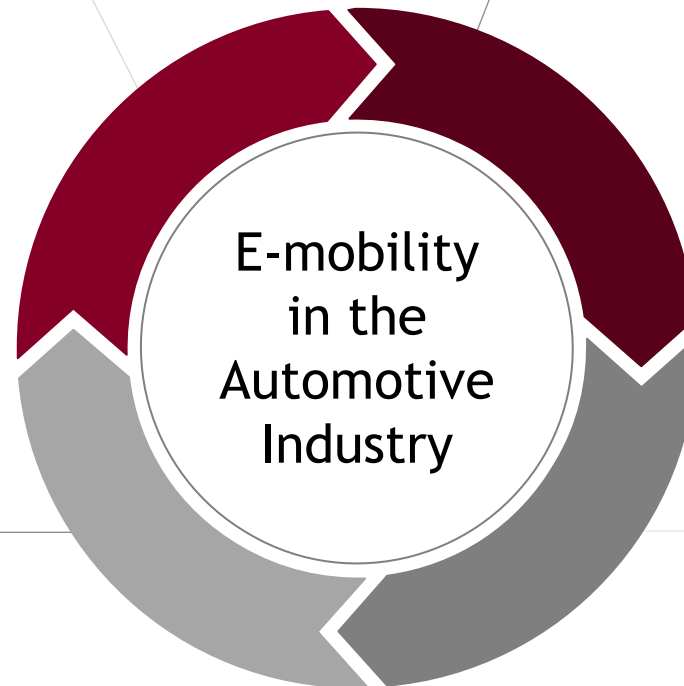
- How often and when should I maintain my machine?
 - Value chain level: Operations/production
- Predictive Analytics

Case 4: Recycling

- How much effort do I put into recycling?
 - Value chain level: After-sales-services
- Process Mining

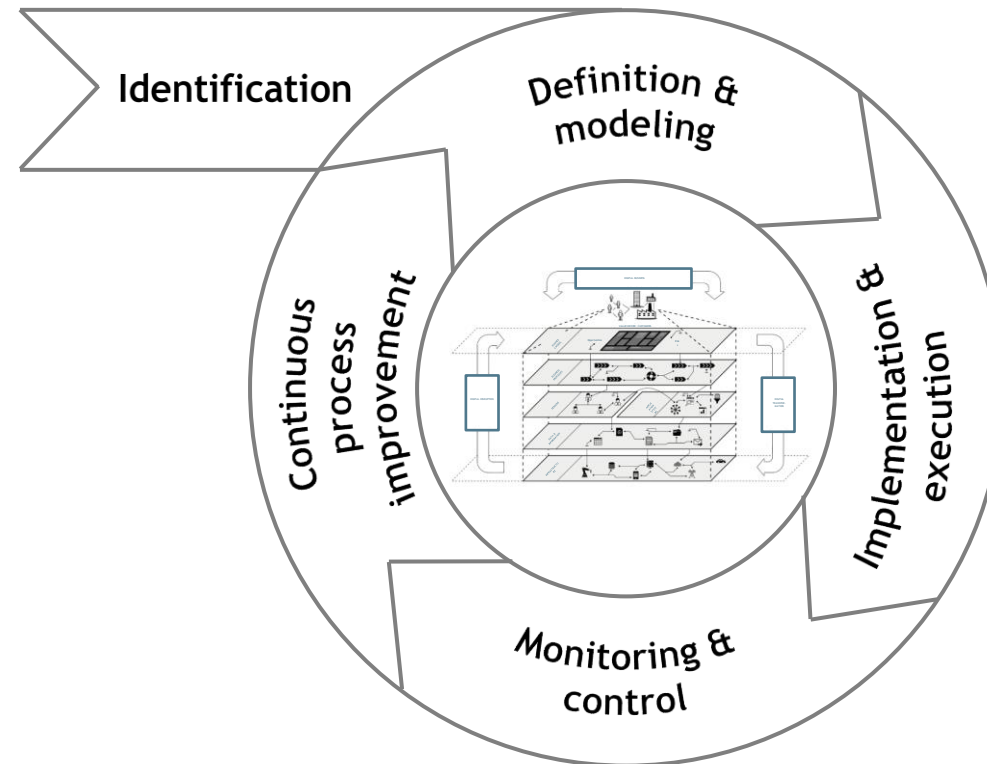
Case 3: Quality Management

- How to ensure good quality?
 - Value chain level: Operations/production
- Computer Vision

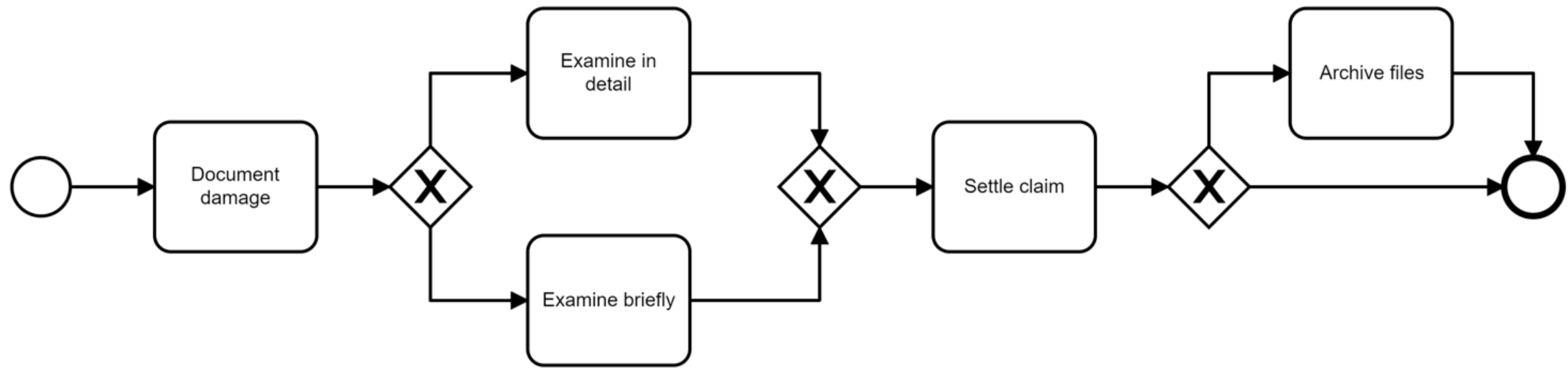


What is business process management?

“**Business Process Management (BPM)** is the art and science of overseeing how work is performed in an organization to **ensure consistent outcomes** and **take advantage of improvement opportunities**. (Dumas et al. 2013)



Which elements can be distinguished?



What is a process model and what is process modeling?

Process model and process modeling

A process model describes the actual state of a real process in a company (focus: analysis) or the target state of a process yet to be developed (focus: design). In both cases, a process model comprises a **set of potential paths**.

In process modeling, the modeler focuses on the behavior of a company in terms of the **flow objects** (e.g., activities, events, gateways), **connecting objects** (e.g., sequence flows, message flows), and **data objects** (e.g., data input and data output) involved.

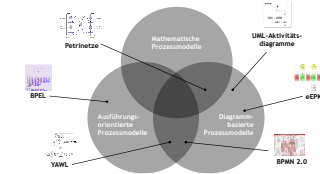
Depending on the intended use and user group, a suitable process model type must be used.

Business process model and notation

Definition










Business Process Model and Notation (BPMN)

BPMN is a graphical and formally based description language for processes. BPMN process models belong to the diagram-based and execution-oriented process models.

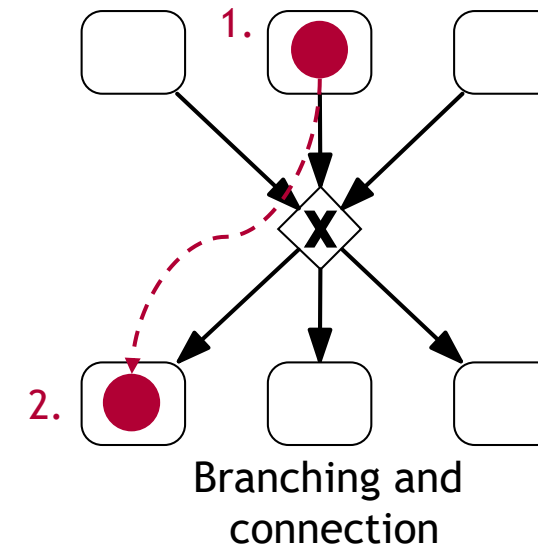
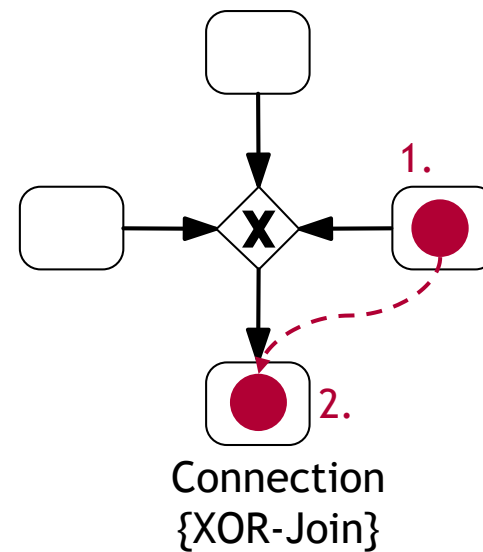
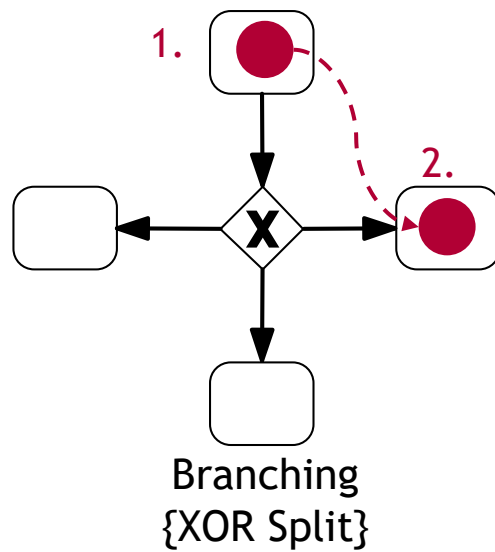


With BPMN, neither a procedure nor a development method are described. **BPMN is not a method!**

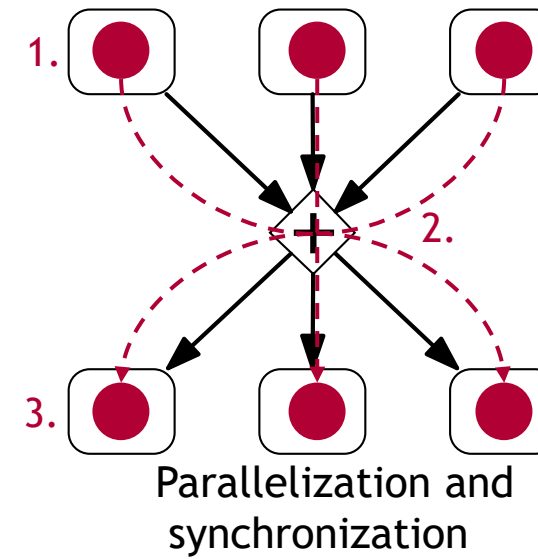
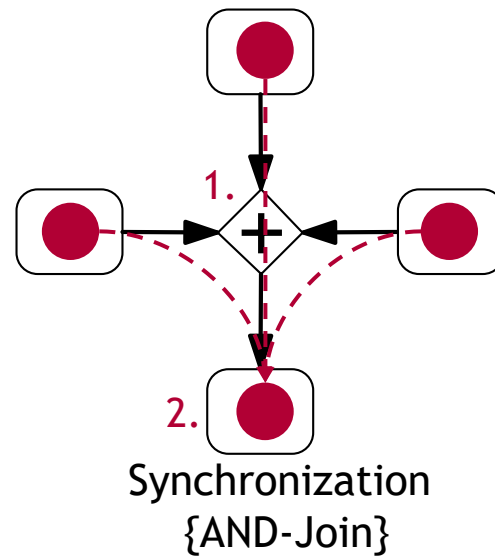
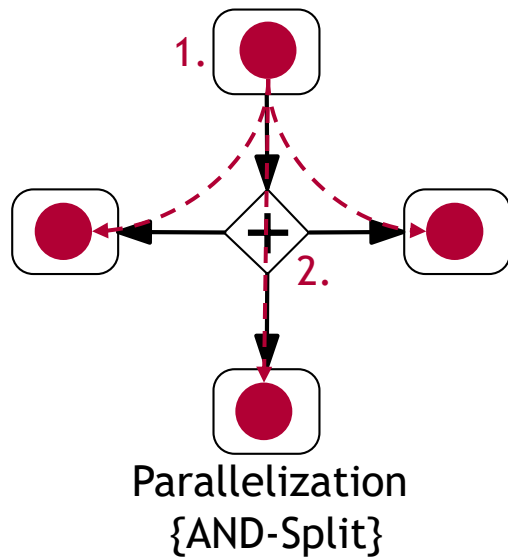
Basic elements of BPMN 2.0

Element	Notation	Description
Task (or activity)		A single step that is considered atomic for the level of abstraction chosen for modeling
Data object		Input or output parameters of an activity
Events		
Start event		Event that starts the execution of a process
Intermediate event		Event that is throwing or catching during a sequence
End event		Event that marks the end of a sequence
Gateways		
Exclusive gateway		Selects <u>exactly one</u> of several alternative sequences or connects several alternative sequences (XOR logic)
Parallel gateway		Splits the process into <u>several</u> concurrent sequences or synchronizes several concurrent sequences (AND logic)
Inclusive gateway		Describes an <u>And/Or</u> situation with <u>one or more</u> concurrent sequences (OR logic)
Complex gateway		Allows the definition of own decision rules

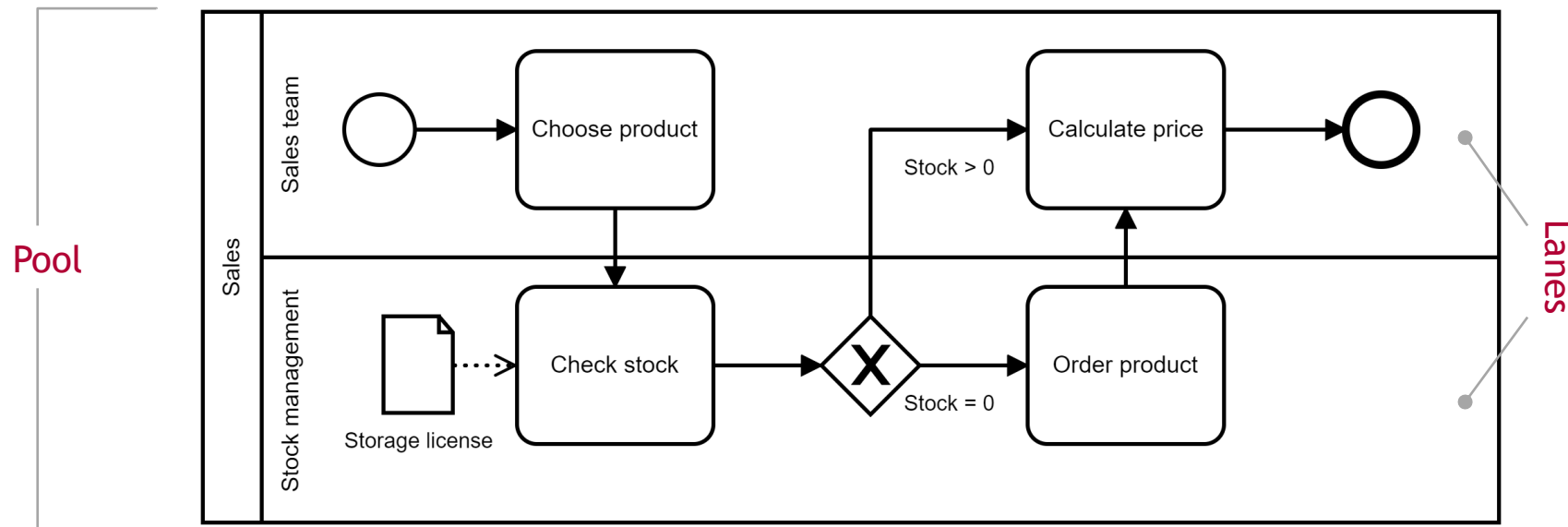
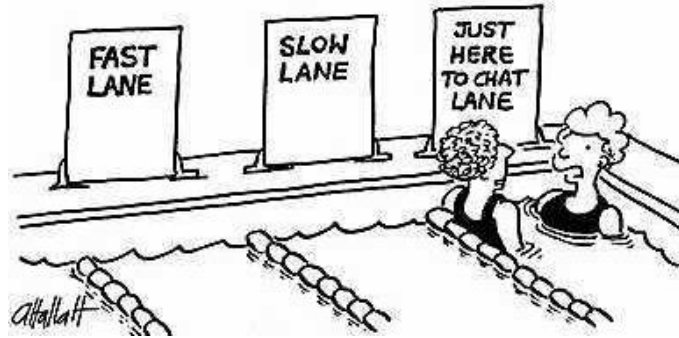
Exclusive gateway



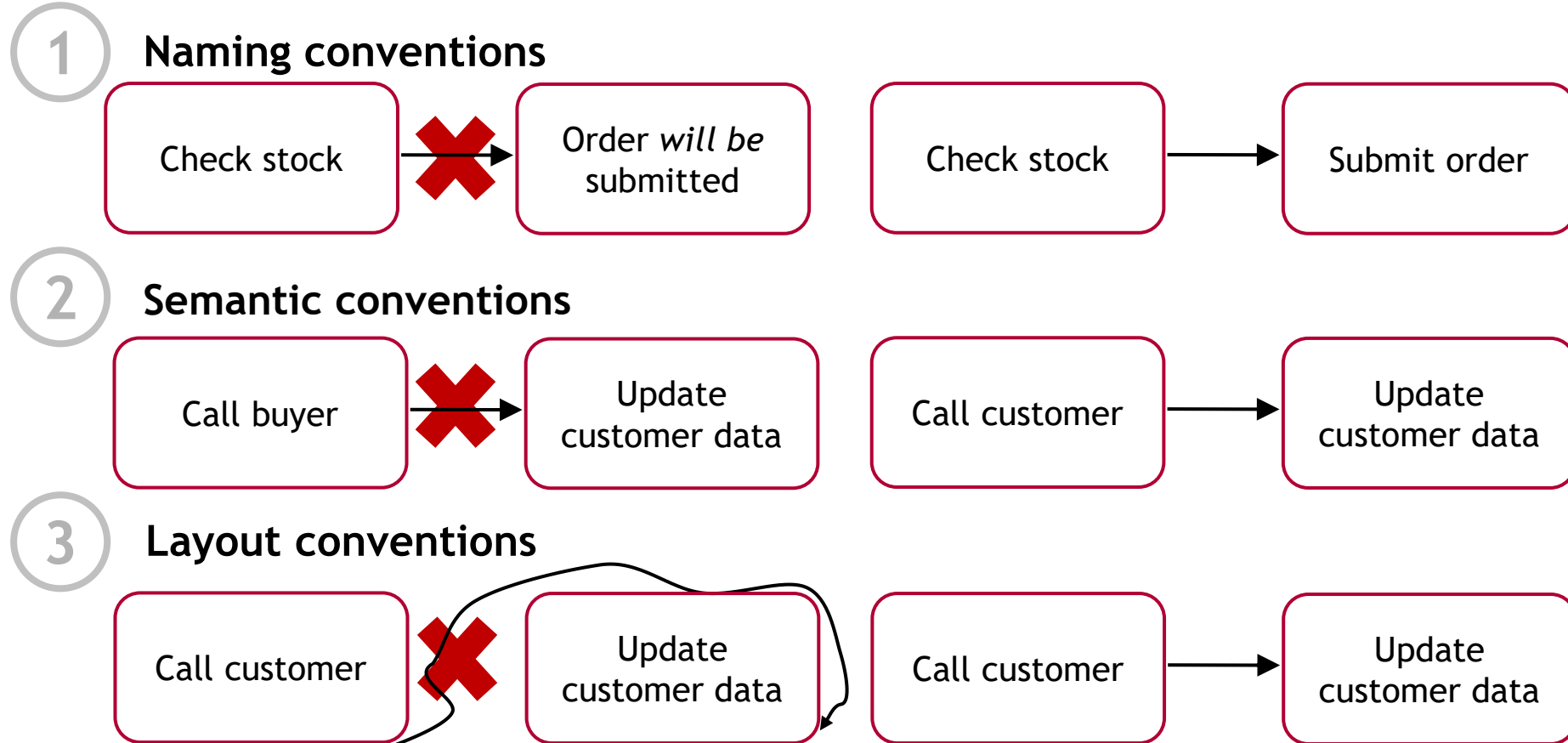
Parallel gateway



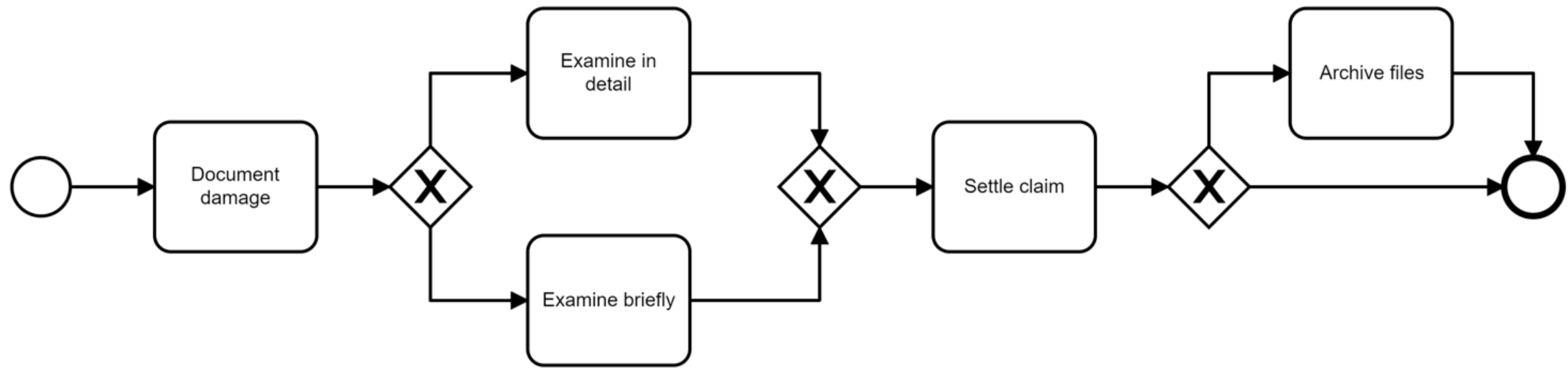
Lanes & Pools



Conventions for the construction of process models in a company



Which further information provide process models?

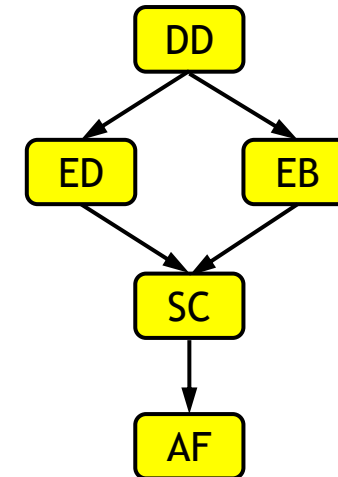
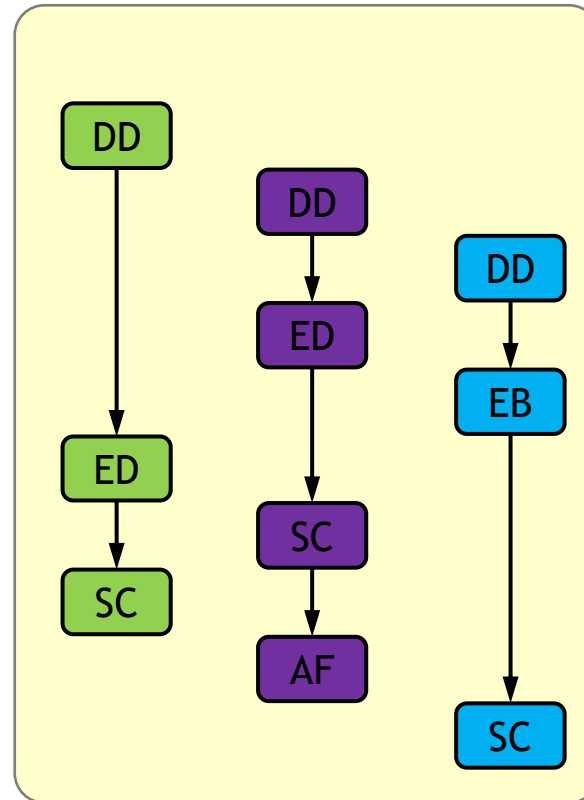


Related information

Instance	Start time	End Time	Task	Person
1	08:35	08:44	Document damage	Alex
2	09:44	09:56	Document damage	Jonas
3	10:13	10:23	Document damage	Alex
2	12:53	13:52	Examine detailed	Jonas
3	13:27	13:37	Examine briefly	Jonas
1	14:09	15:12	Examine detailed	Alex
2	15:17	15:30	Settle claim	Carsten
1	15:39	15:52	Settle claim	Carsten
2	16:23	20:40	Archive files	Michael
3	16:49	17:02	Settle claim	Carsten

Fundamental process mining approach

Instance	Task
1	DD
2	DD
3	DD
2	ED
3	EB
1	ED
2	SC
1	SC
2	AF
3	SC



DD = Document damage
ED = Examine in detail

EB = Examine briefly
AF = Archive files

SC = Settle claim

What is process mining?

The idea of **process mining** is to discover, monitor, and improve real processes (i.e., not assumed processes) by extracting knowledge from event logs readily available in today's (information) systems. Event logs ideally originate from application systems but can also be (re-)constructed from multiple sources. (van der Aalst et al. 2012)

Reference process of process mining



Example snippet of an event log

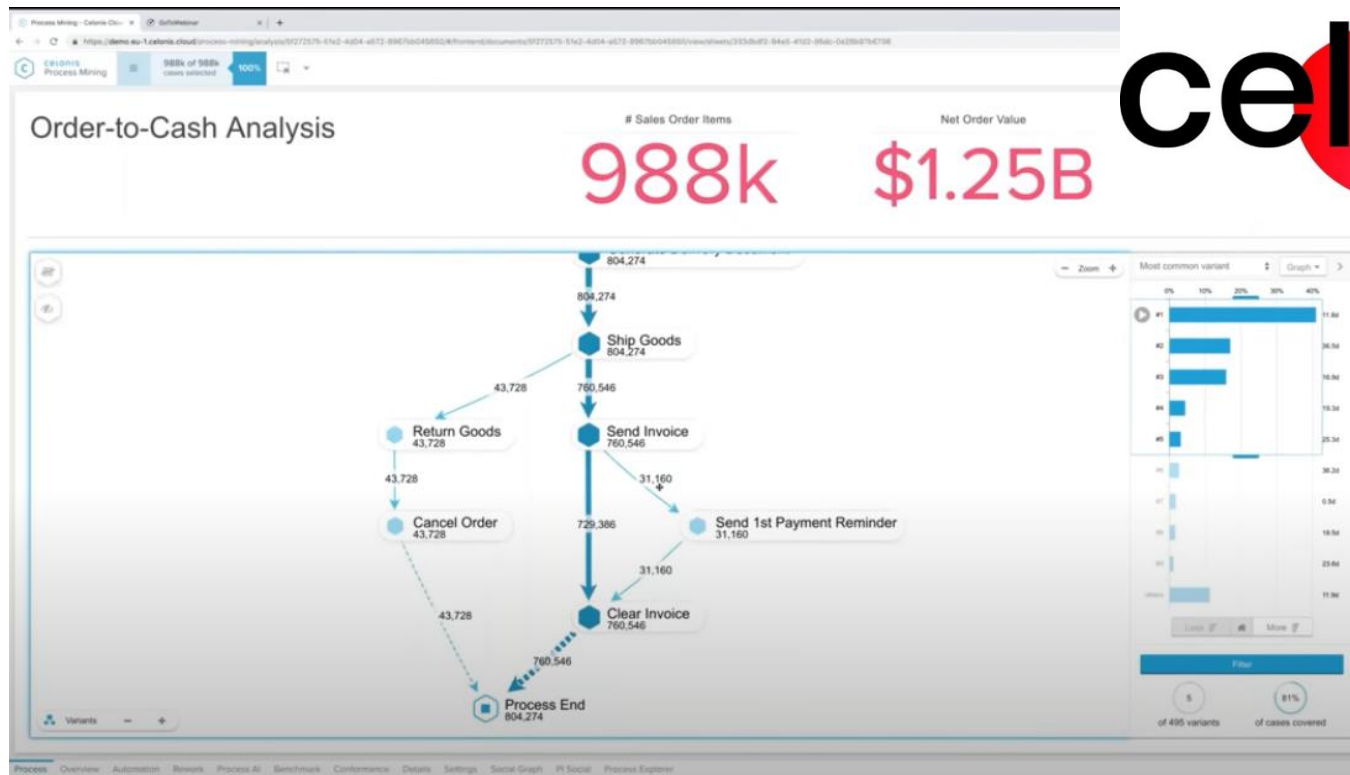
```

<event>
  <date key="time:timestamp" value="2011-11-15T11:06:56.406+0100"/>
  <string key="concept:name" value="Welcome to Start Process"/>
  <string key="lifecycle:transition" value="unknown"/>
  <string key="lifecycle:instance" value="1.1"/>
</event>
<event>
  <date key="time:timestamp" value="2011-11-15T11:06:56.450+0100"/>
  <string key="concept:name" value="Welcome to Start Process"/>
  <string key="lifecycle:transition" value="start"/>
  <string key="lifecycle:instance" value="1.1"/>
  <string key="org:resource" value="PA-6477f285-8b81-4b01-a2f1-9e5be1670810"/>
</event>
<event>
  <date key="time:timestamp" value="2011-11-15T11:08:27.553+0100"/>
  <string key="concept:name" value="Welcome to Start Process"/>
  <string key="lifecycle:transition" value="complete"/>
  <string key="lifecycle:instance" value="1.1"/>
  <string key="org:resource" value="PA-6477f285-8b81-4b01-a2f1-9e5be1670810"/>
  <string key="production" value="Magic Movie"/>
</event>
<event>
  <date key="time:timestamp" value="2011-11-15T11:08:27.652+0100"/>
  <string key="concept:name" value="Welcome to Start Process"/>
  <string key="lifecycle:transition" value="complete"/>
  <string key="lifecycle:instance" value="1"/>
</event>

```

← New event captured
 ← Exact time
 ← No. of the instance and Task no.
 ← Start of task
 ← UserID
 ← User has entered values
 ← Task finished

Demo



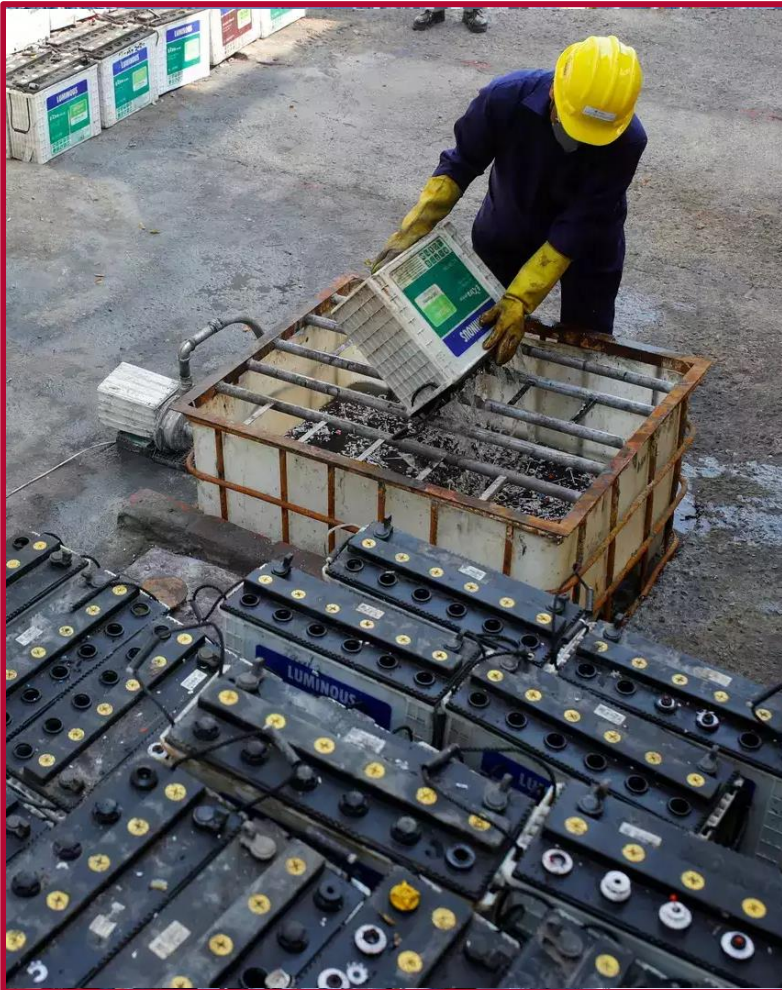
celonis

Link to video demo: <https://www.youtube.com/watch?v=9yA0H246fTE>, accessed 2021-09-23

Case 4: Battery Recycling of Edison Cars AG



Case 4: Battery Recycling of Edison Cars AG



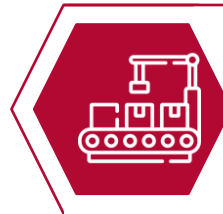
Battery Recycling

- Recycling as a central component in the value chain of Edison Cars GmbH
- Massive expansion of the use of secondary materials in the production of e-vehicle batteries



Benefits of Battery Recycling

- Reduces the need for raw materials in the production of e-vehicle batteries
- Prevents hazardous materials from escaping that may cause danger to customers



The Challenges

- Current processes are not fully understood by the head of recycling at the Edison Cars GmbH
- It is assumed that there is still some potential for optimization in the processes

Case 4: Battery Recycling of Edison Cars AG

The recycling department turns to your team because they need support in the tracking and improvement of the recycling processes. Your team requests the following information.



- Process logs documenting the process
- The data is collected either automatically or by manual entry into the ERP system



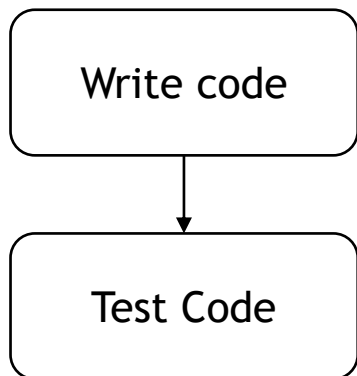
- Interviews with people involved in the process
- This involves asking people with different roles about their perceptions of the process

Recording and documentation of the actual process of battery recycling

Case 4: Battery Recycling of Edison Cars AG

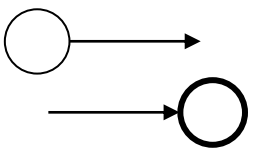
A process model is a representation of a business process that describes how work is done within an organization. BPM models can be used to analyze and improve processes, and to communicate process information to stakeholders.

Tasks



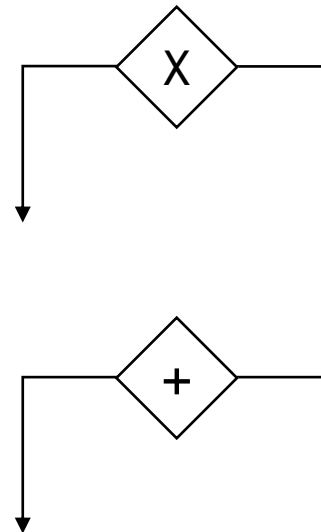
- Individual units of work
- Represent specific activities that must be completed by a person or system to move the process forward
- Typically have a specific goal or objective

Start/End



- Represent the start point
- Represent the end point

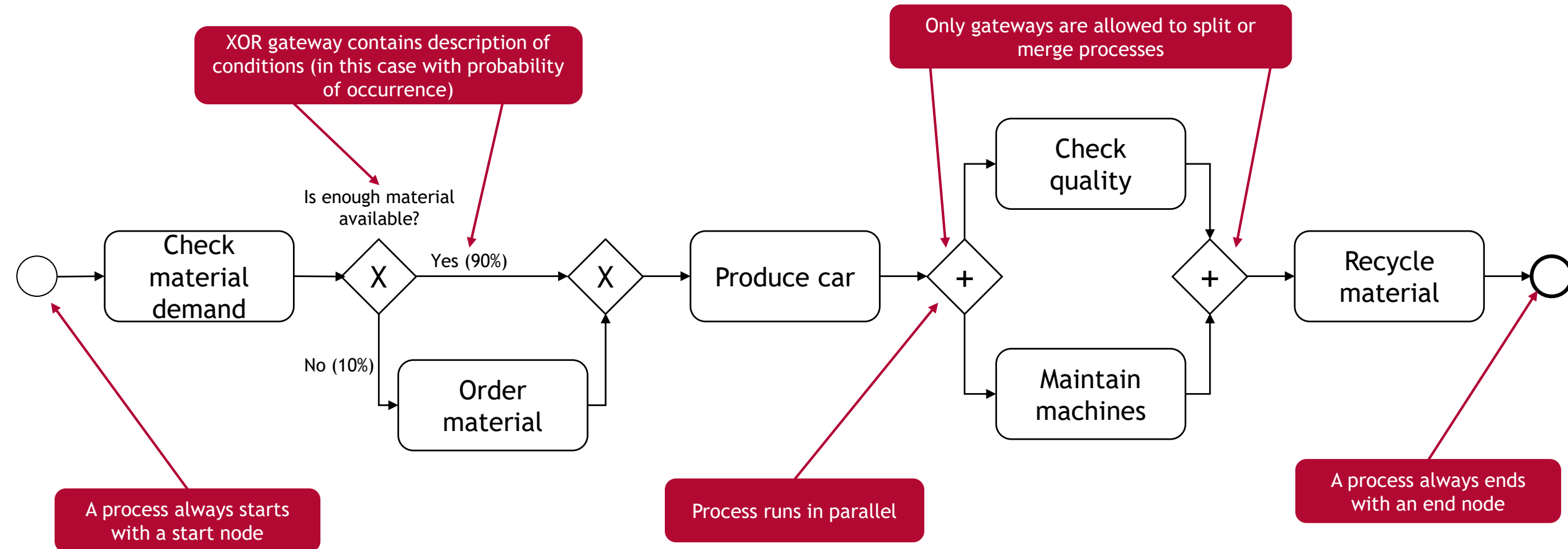
Gateways



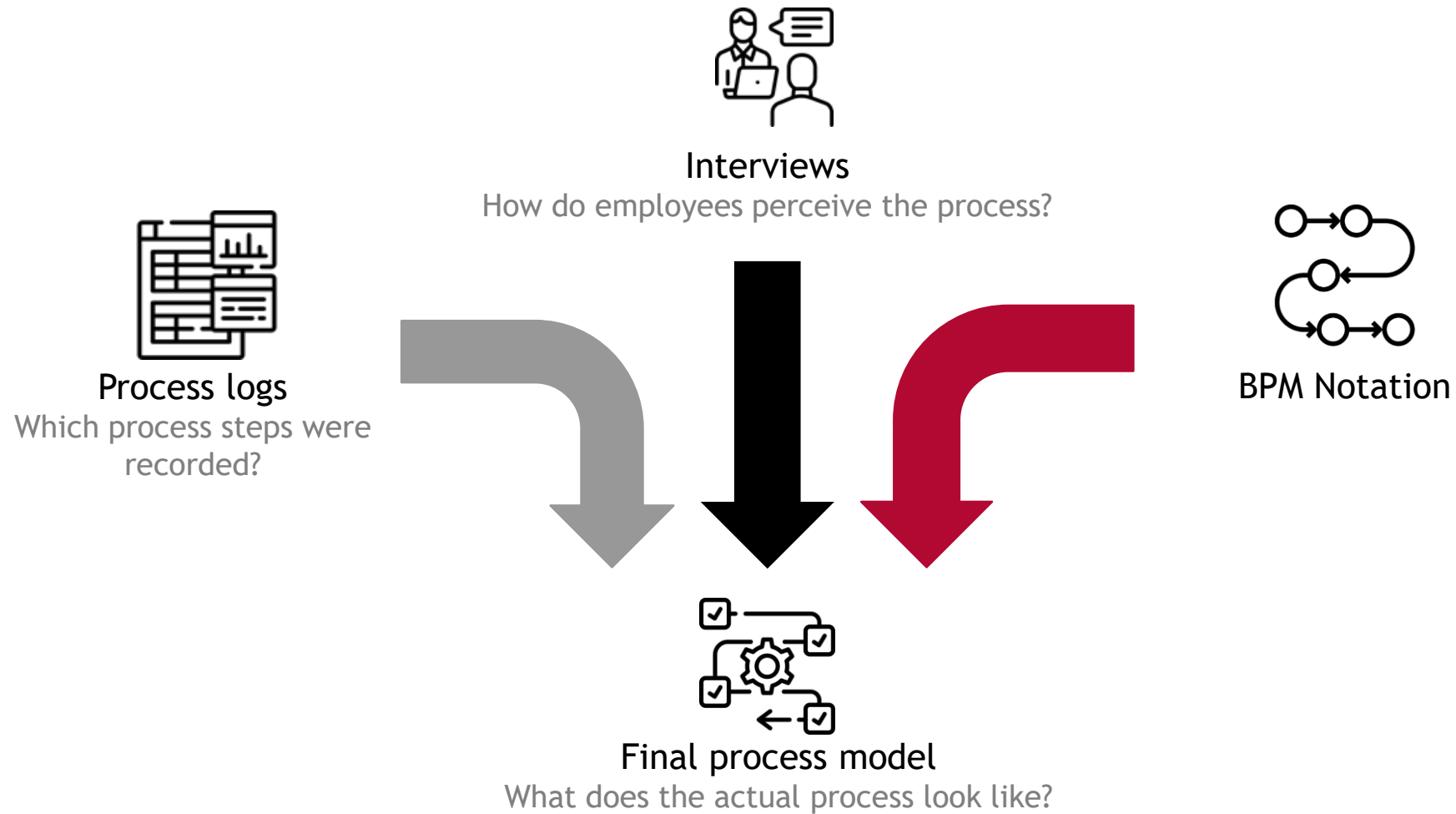
- Gateways are used to model decision points in a process where the flow of the process must diverge or converge
- Exclusive Gateway (XOR): Used to represent a decision point where only one of the possible paths can be taken based on a set of conditions
- AND gateway: Is often used to model synchronization points in a process

A variety of other modeling possibilities exist, but we will ignore them for this course!

Case 4: Battery Recycling of Edison Cars AG



Case 4: Battery Recycling of Edison Cars AG



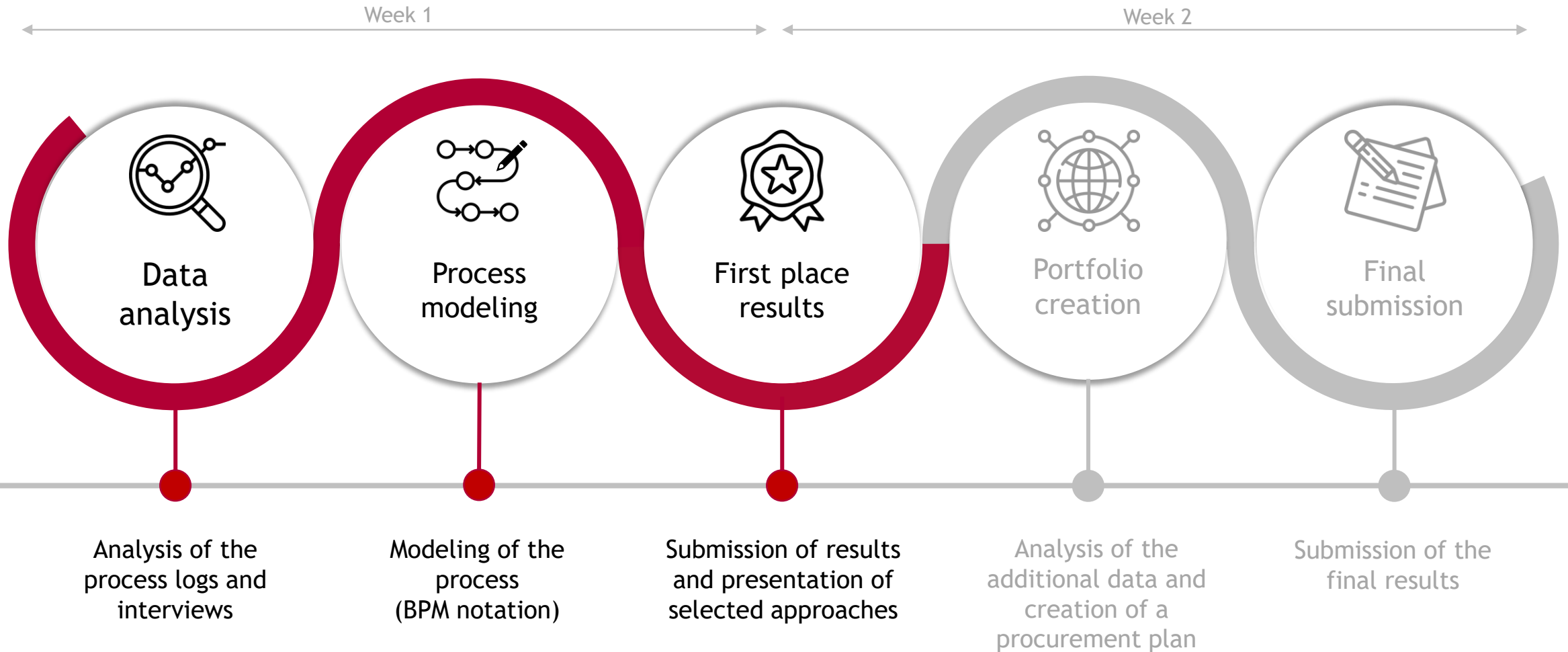
Case 4: Battery Recycling of Edison Cars AG

Determine from the given **process logs** as well as **interview information** with the help of the basic elements of business process model and notation the **process of battery recycling** at the Edison Cars GmbH. Also point out **activities that provide space for economic, environmental or social improvements** throughout the process.

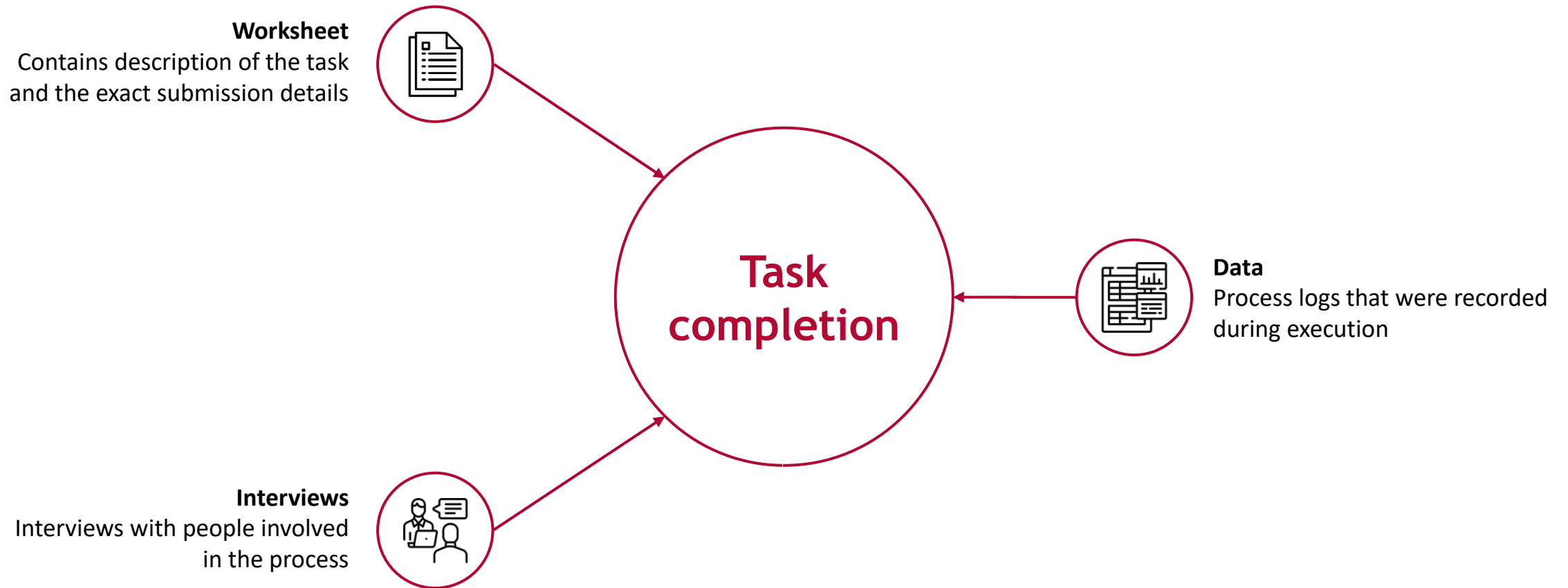


The management of Edison Cars AG would like you to record and document the process of battery recycling.

Case 4: Time schedule



Case 4: Input



Case 4: Submission

The following documents must be emailed to s3g@fim-rc.de as one zip folder by 02:00 PM on 24.06.2024:

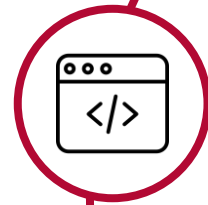
Final process model

Complete representation of the process (BPM Notation)
with tasks, gateways, descriptions and probabilities



Code (optional)

Code file(s) for reproducing
your results, with installation
instructions if necessary



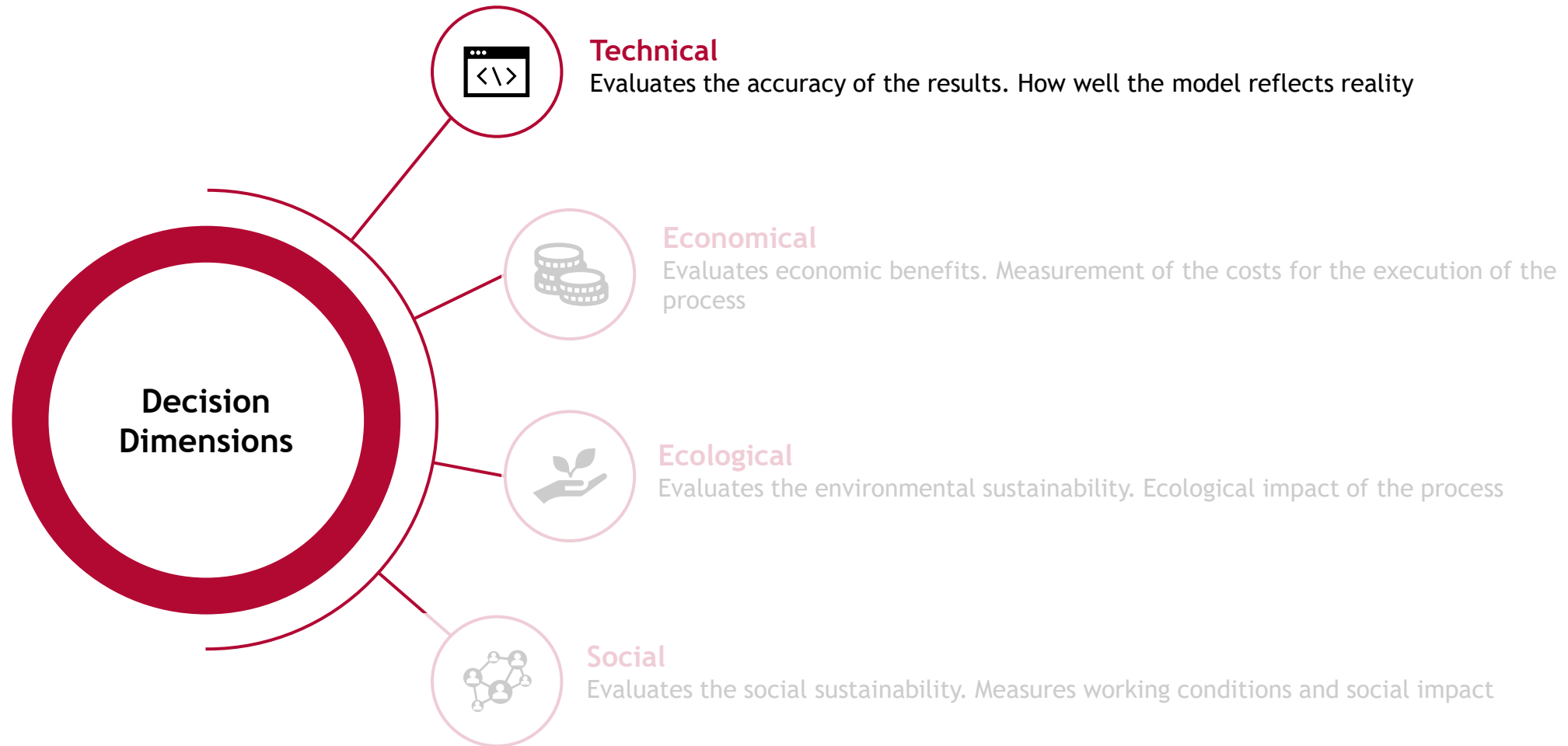
Submission

Presentation

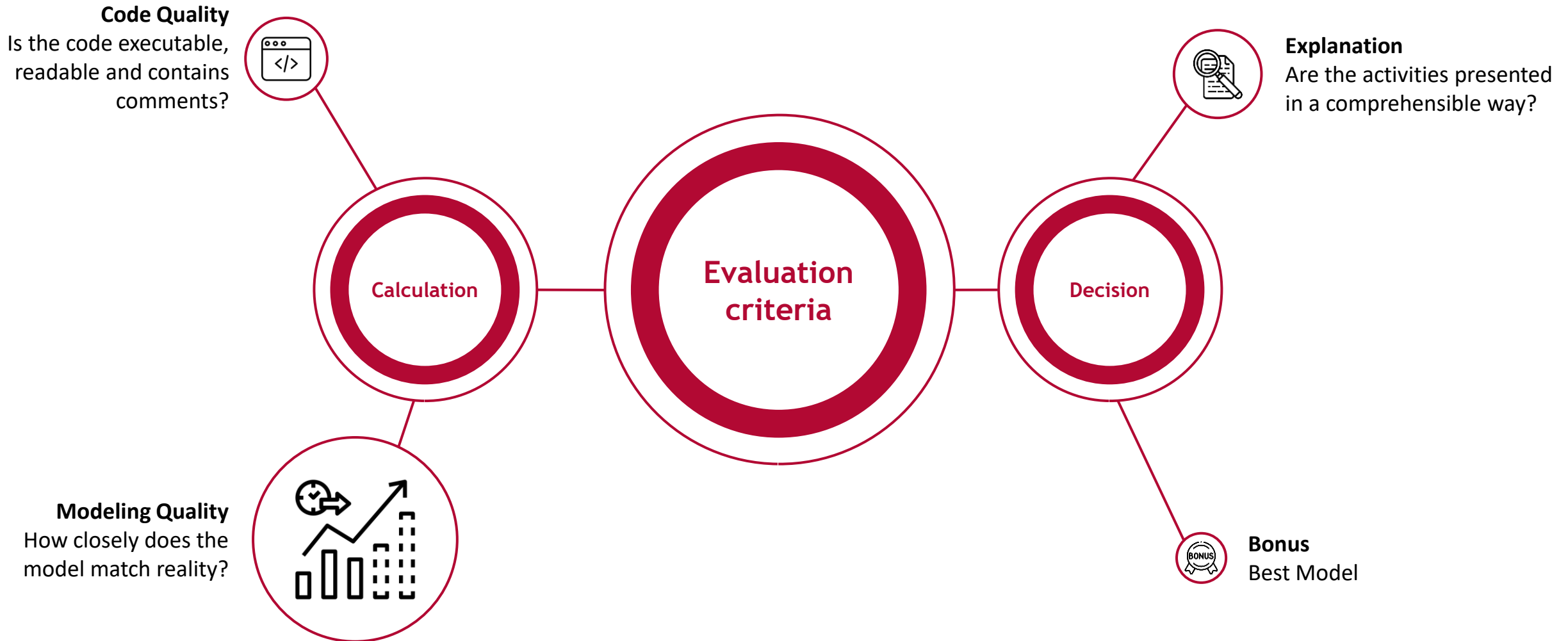
A PowerPoint presentation
explaining your decisions



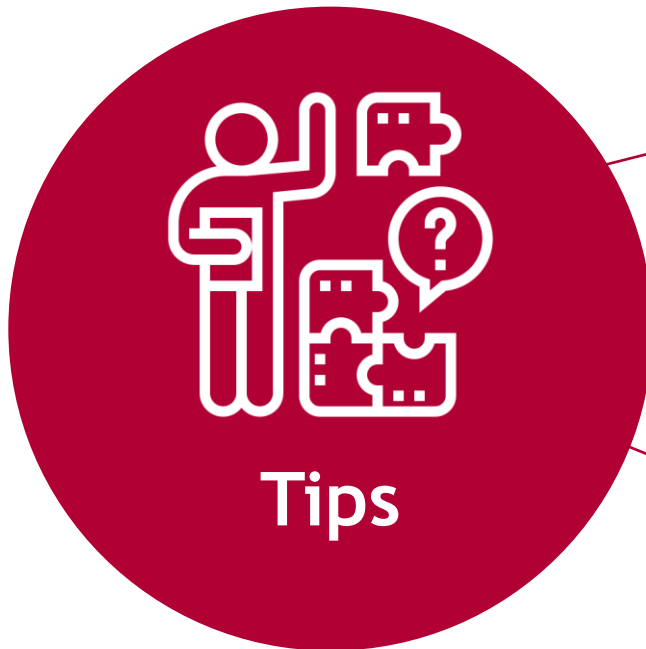
Case 4: Dimensions of decision-making



Case 4: Evaluation criteria



Case 4: Tips for the implementation

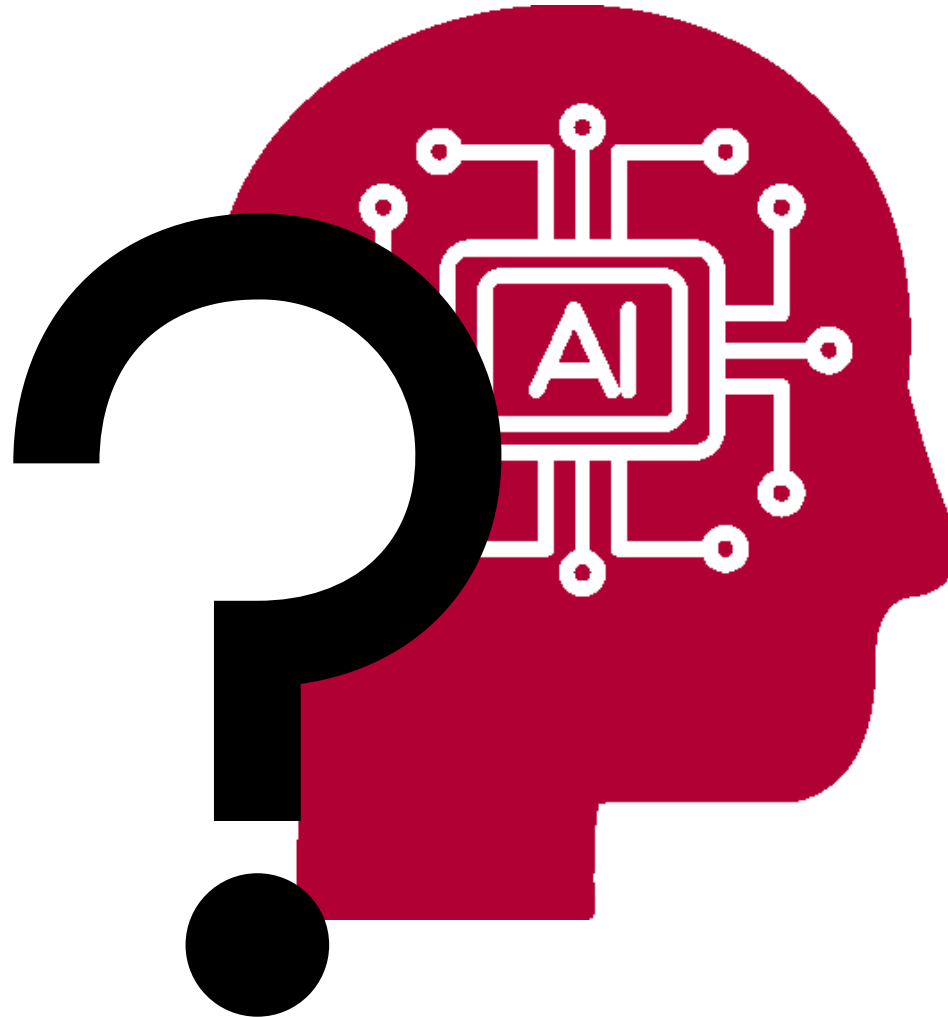


Be aware that a mere look at the process logs is not enough.

Use further information to determine space for economic, environmental or social improvements.

Make use of established tools for process modelling.

Case 4: Any Questions?



Any Questions?