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“Detection of Mistakes in Business Process Models as a part of Business Analysts E-Training”

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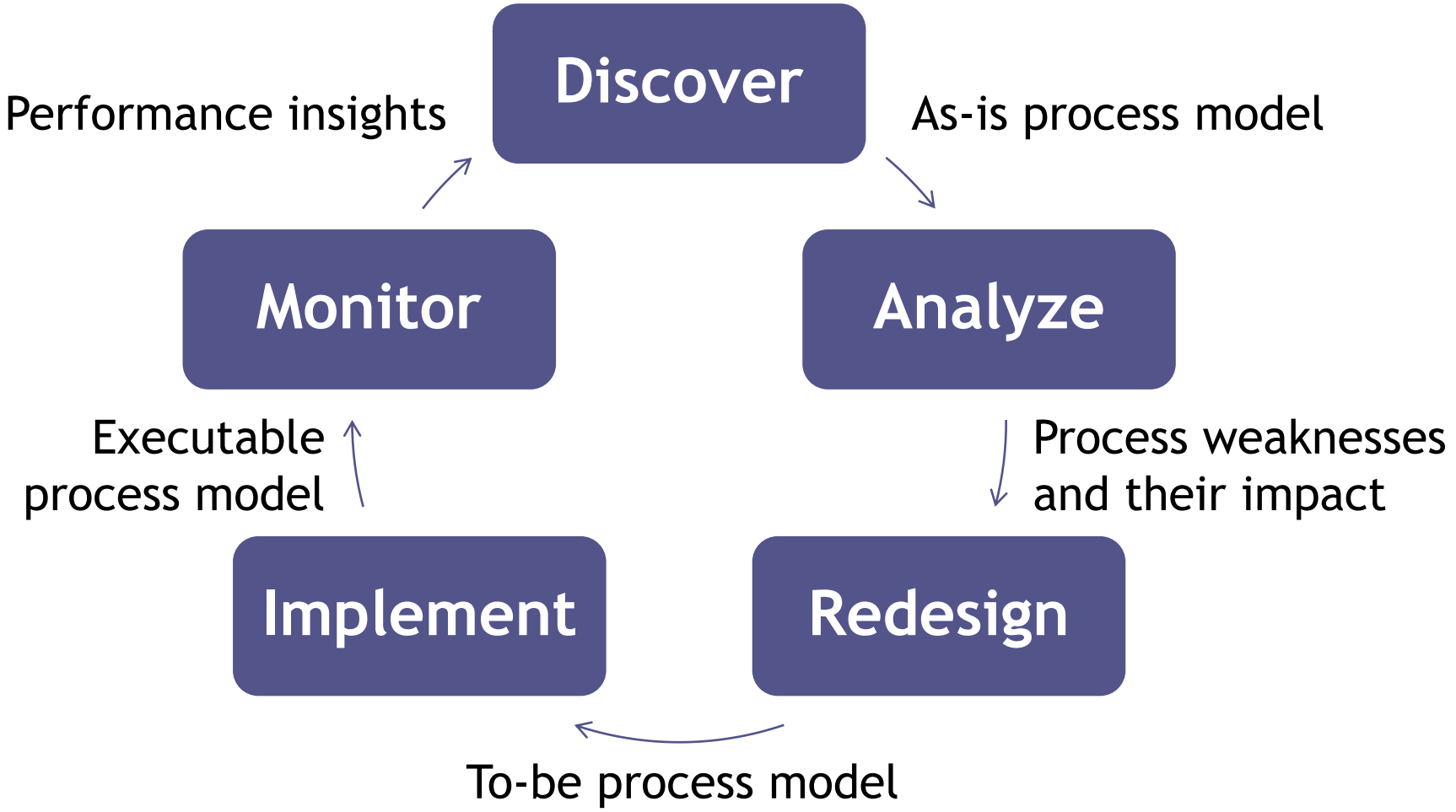
Business Process Management & Modeling Benefits

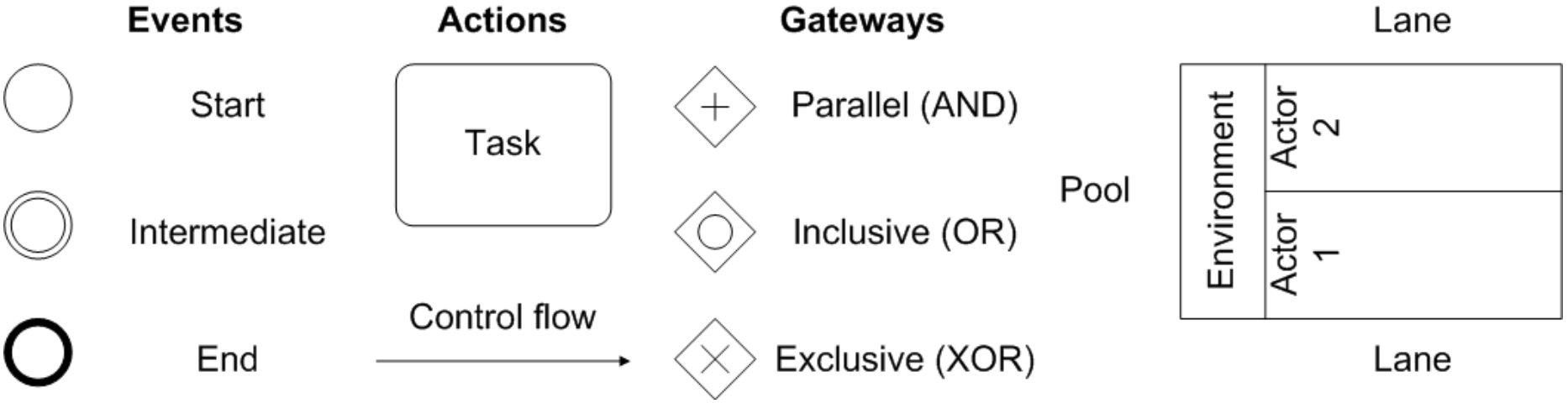
- Business Process Management (BPM) helps to analyze organizational activities to provide quality products and services and to find the ways to improve these activities
- Business Processes are scenarios of **Activities** (or Tasks) driven by **Events** and **Decisions**
- Models are used to describe business processes and help to design and analyze of information systems, and communicate with stakeholders

BPM Lifecycle



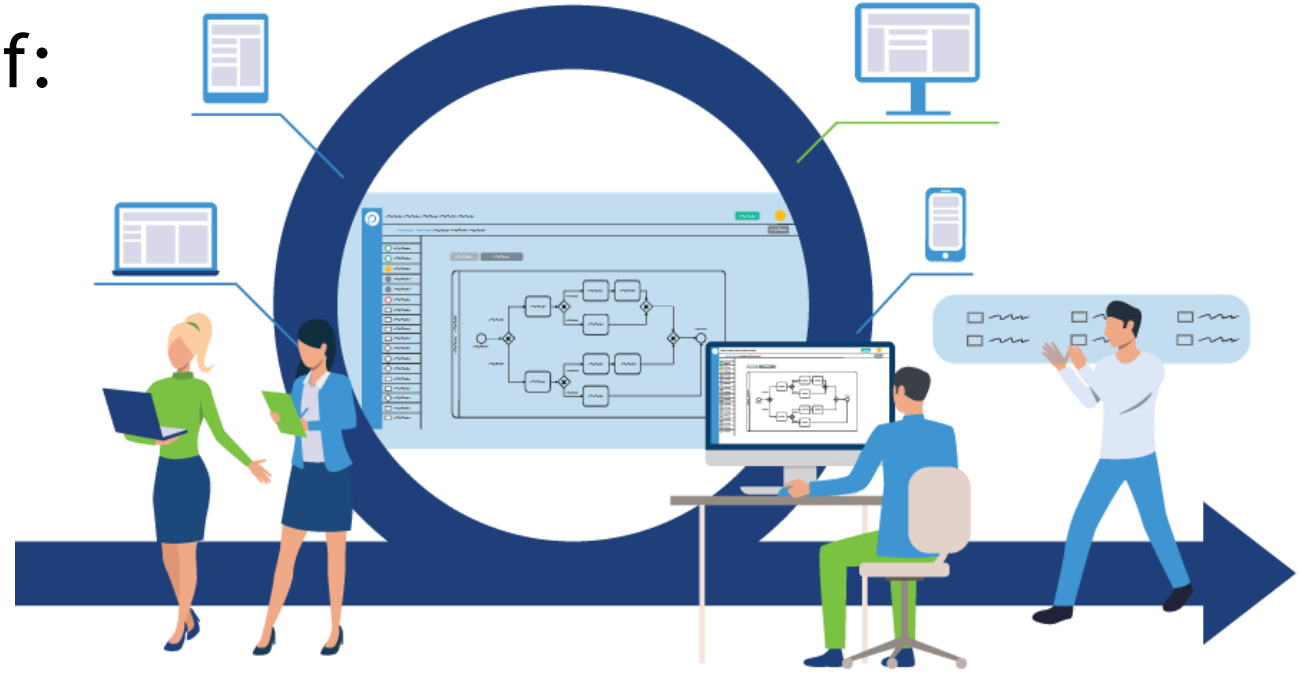
Business Process Model and Notation (BPMN)

- Object Management Group (OMG) standard
- Business-IT alignment and collaboration between stakeholders
- XML-based exchange file format (BPMN 2.0)



Business Process Modeling Mistakes and Bad Practices

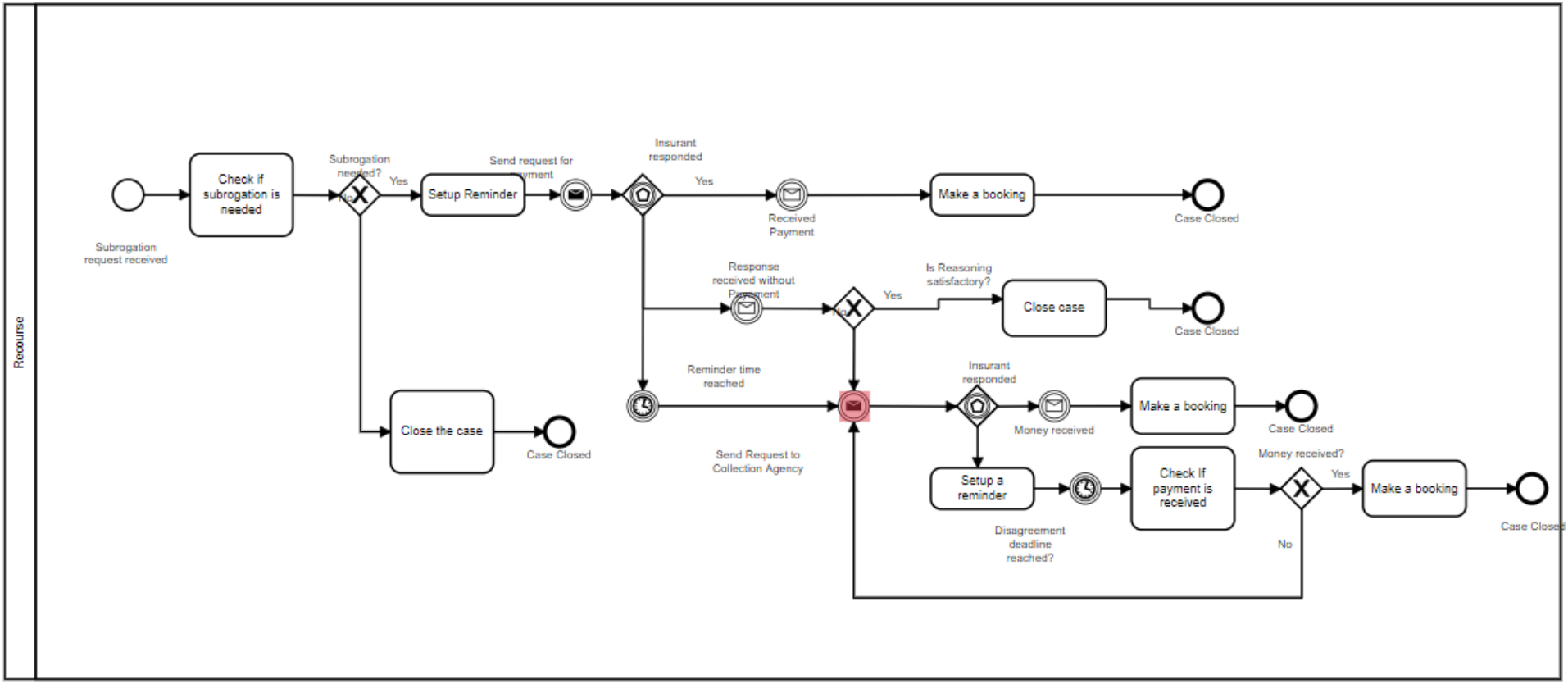
- Large model size
- Incorrect usage of:
  - Tasks
  - Events
  - Gateways



Business Process Modeling Mistakes and Bad Practices: Large Model Size

- There should be up to 8 activities in a business process model
- Larger models should be decomposed using sub-processes

Bad Practices

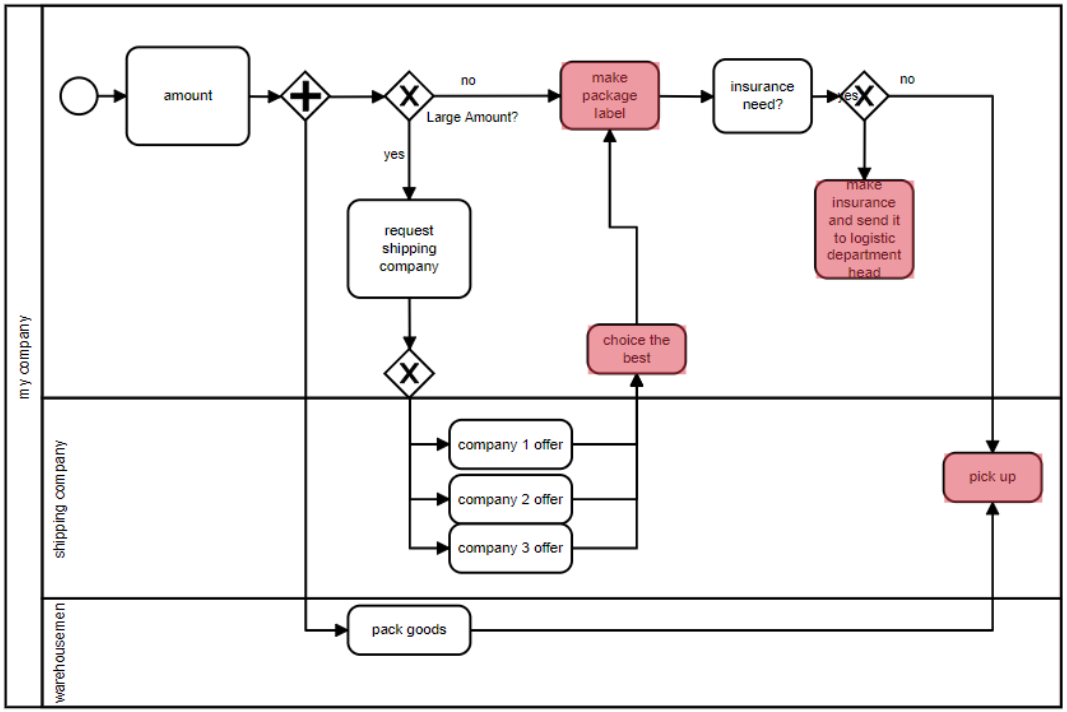


✗ Process is too large: it should be decomposed or split into several processes

Business Process Modeling Mistakes and Bad Practices: Incorrect Tasks Usage

- Tasks should have one incoming and one outgoing sequence flow

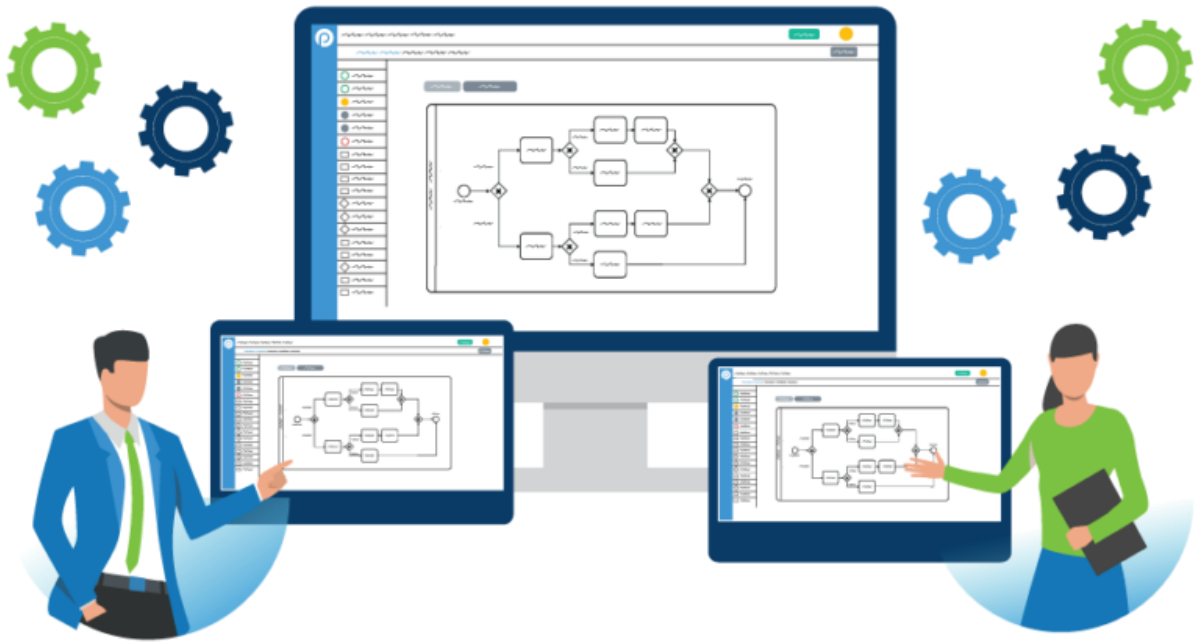
Bad Practices



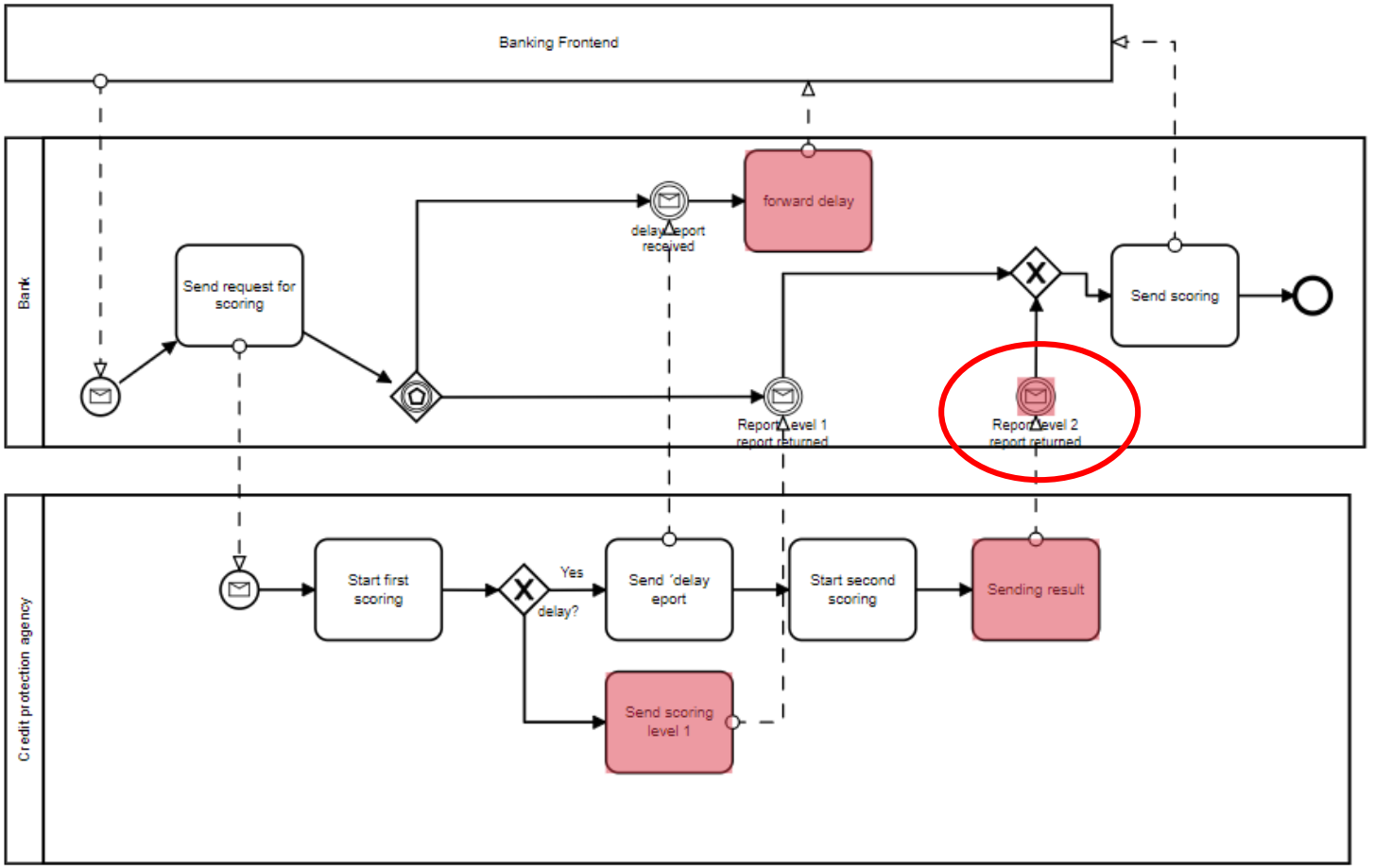
- ✗ Task **"make package label"** has several incoming flows (implicit merge/synchronization)
- ✗ Task **"choice the best"** has several incoming flows (implicit merge/synchronization)
- ✗ Task **"make insurance and send it to logistic department head"** does not have outgoing flows (implicit workflow end)
- ✗ Task **"pick up"** has several incoming flows (implicit merge/synchronization)
- ✗ Task **"pick up"** does not have outgoing flows (implicit workflow end)
- ✗ Process is too large: it should be decomposed or split into several processes

Business Process Modeling Mistakes and Bad Practices: Incorrect Events Usage

- Start events should have one outgoing sequence flow
- End events should have one incoming sequence flow
- Intermediate events should have one incoming and one outgoing sequence flow



Bad Practices

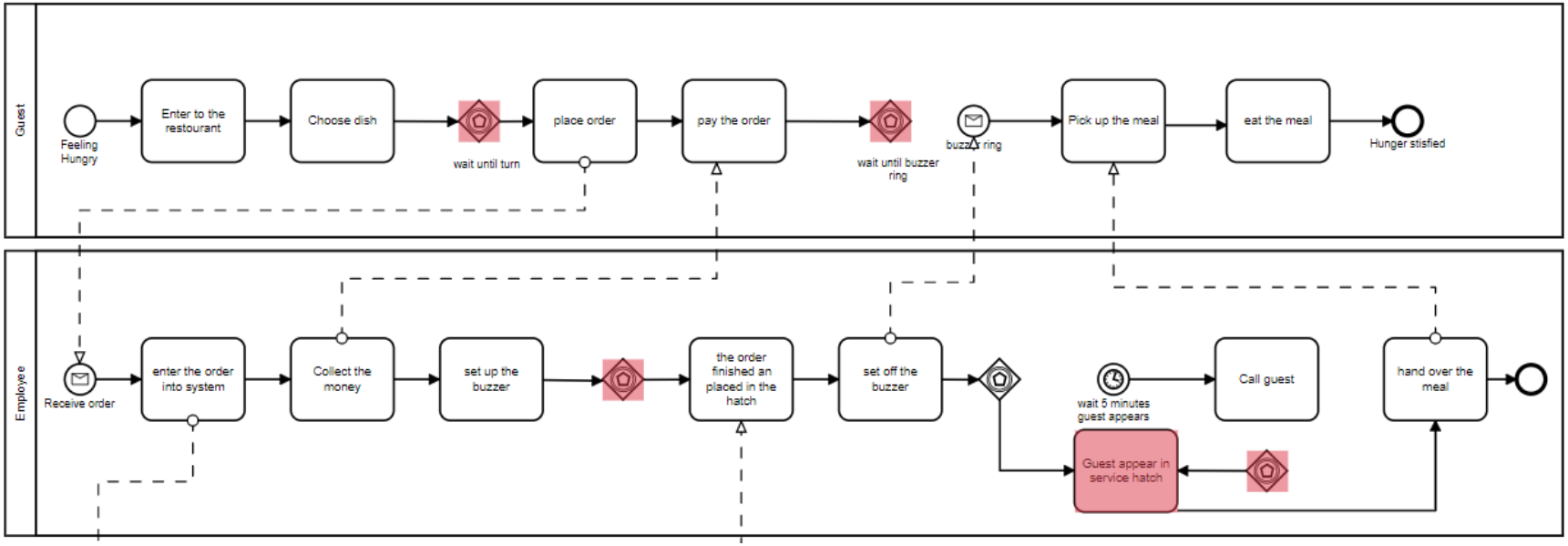


✗ Intermediate event **"Report level 2 report returned"** does not have incoming flows (implicit workflow start)

Business Process Modeling Mistakes and Bad Practices: Incorrect Gateways Usage

- Gateways should be either splits (one incoming and multiple outgoing sequence flows)
- or joins (multiple incoming and one outgoing sequence flows)

Bad Practices



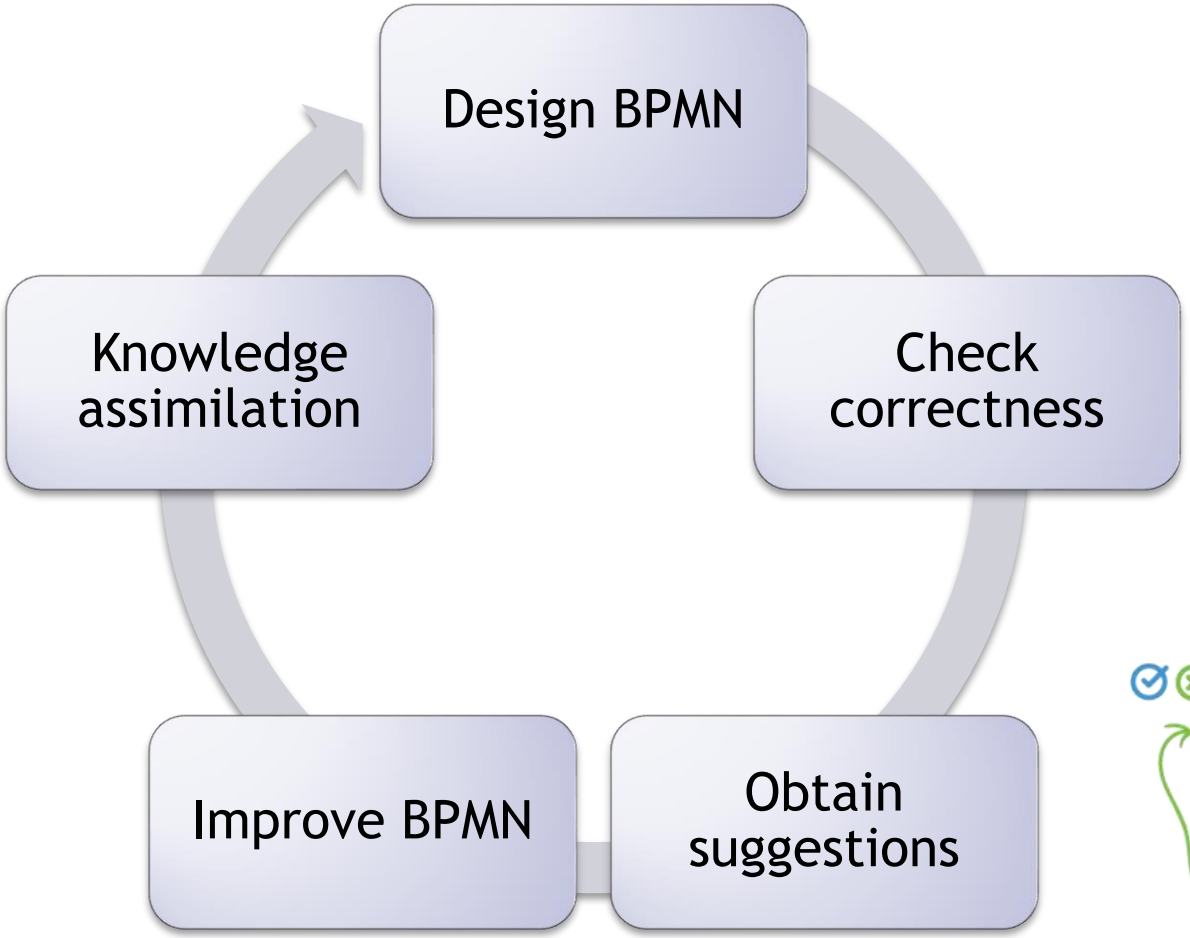
Process **"Guest"**

- ✗ Gateway **"wait until buzzer ring"** is neither split nor join: it has one incoming and one outgoing flow (redundant gateway)
- ✗ Gateway **"wait until turn"** is neither split nor join: it has one incoming and one outgoing flow (redundant gateway)

Process **"Employee"**

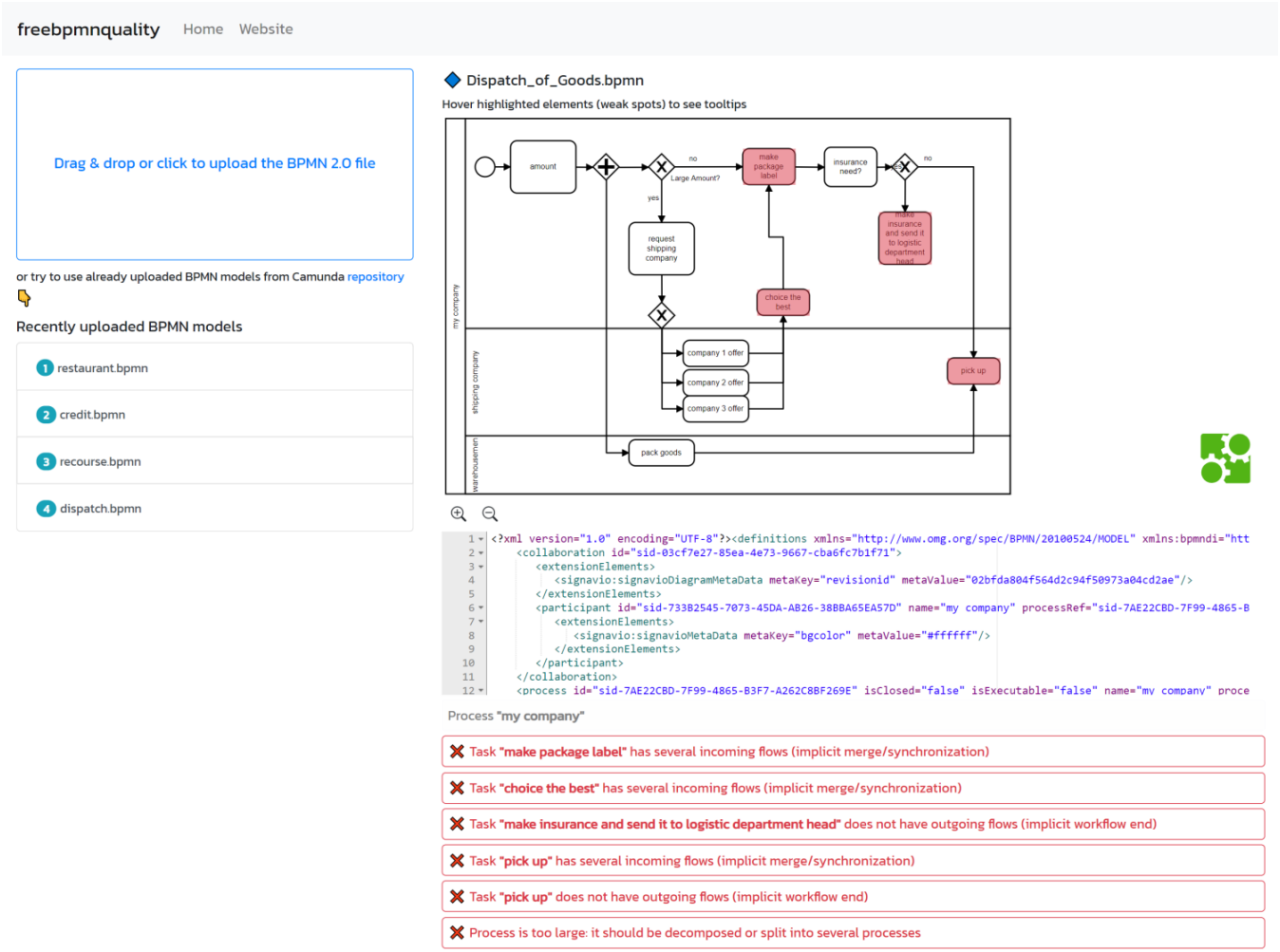
- ✗ Gateway **"sid-6B90A114-FD4B-4376-91ED-7B99BD06FEA4"** is neither split nor join: it has one incoming and one outgoing flow (redundant gateway)
- ✗ Task **"Guest appear in service hatch"** has several incoming flows (implicit merge/synchronization)
- ✗ Gateway **"sid-CF8D0533-9542-4DCA-901D-2723F15E2FD3"** does not have incoming flows (implicit workflow start)

Business Process Modeling E-Training Flow

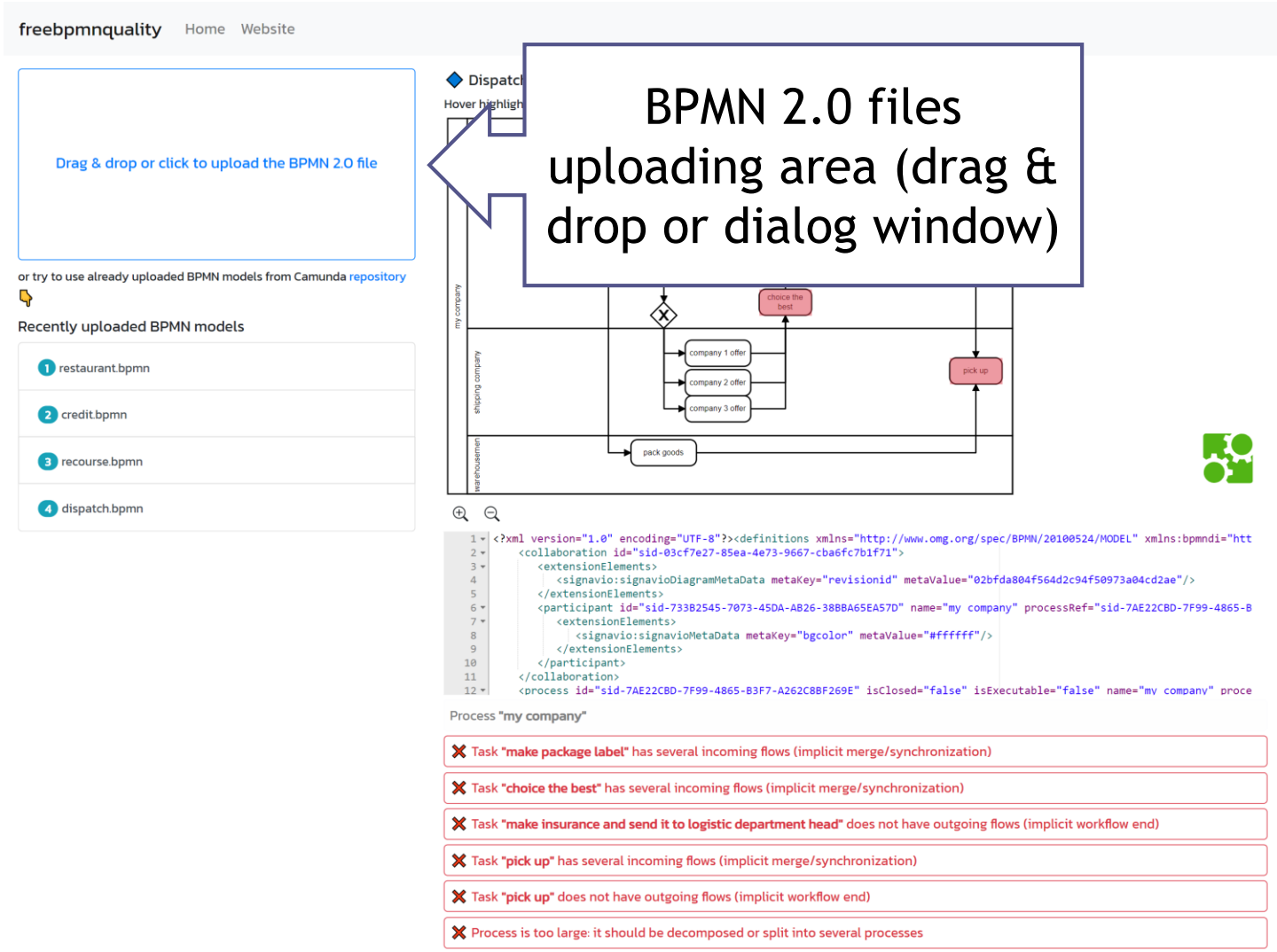


Software Solution – Overview

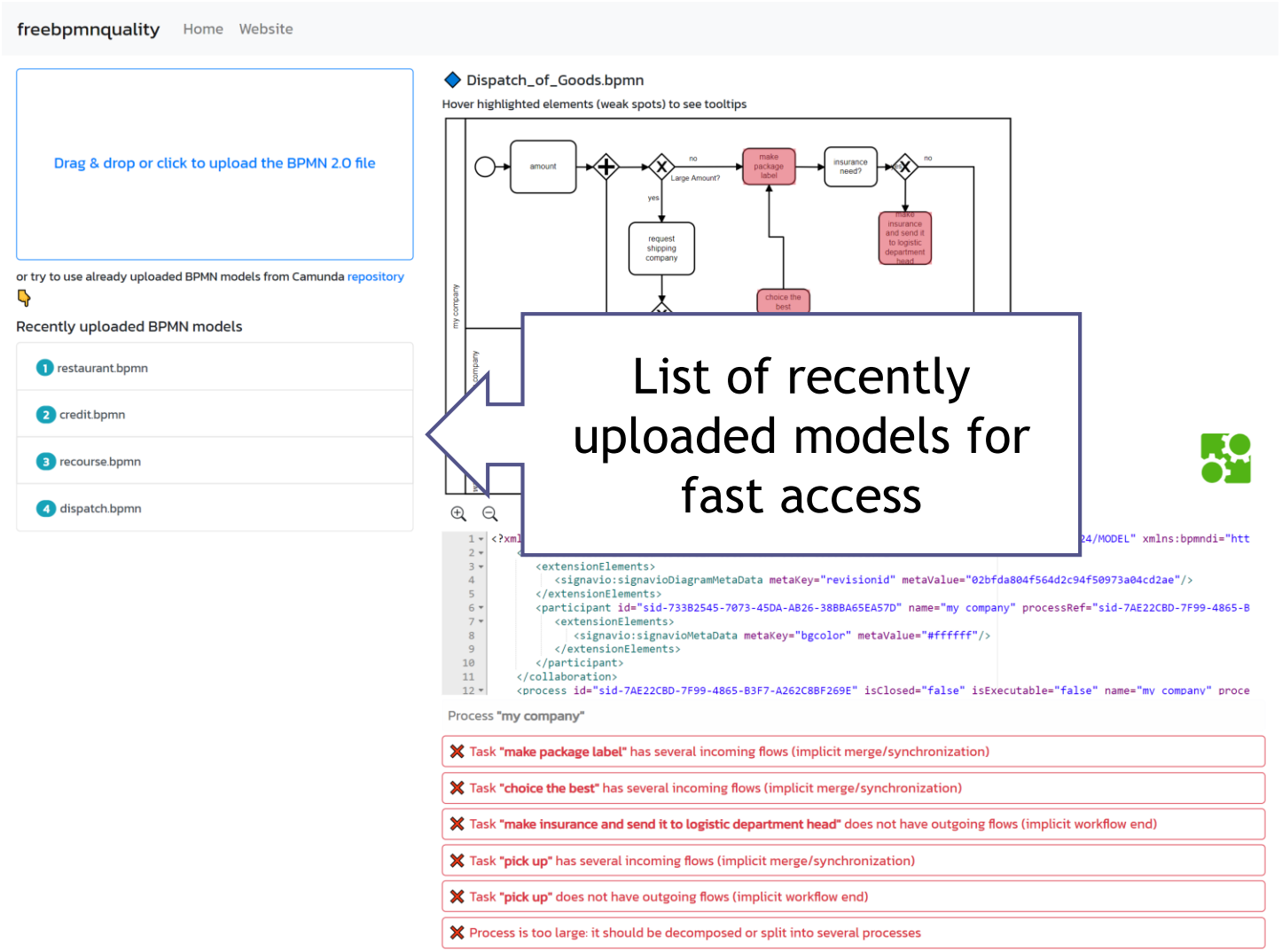
https://freebpmnquality.github.io/demo.html



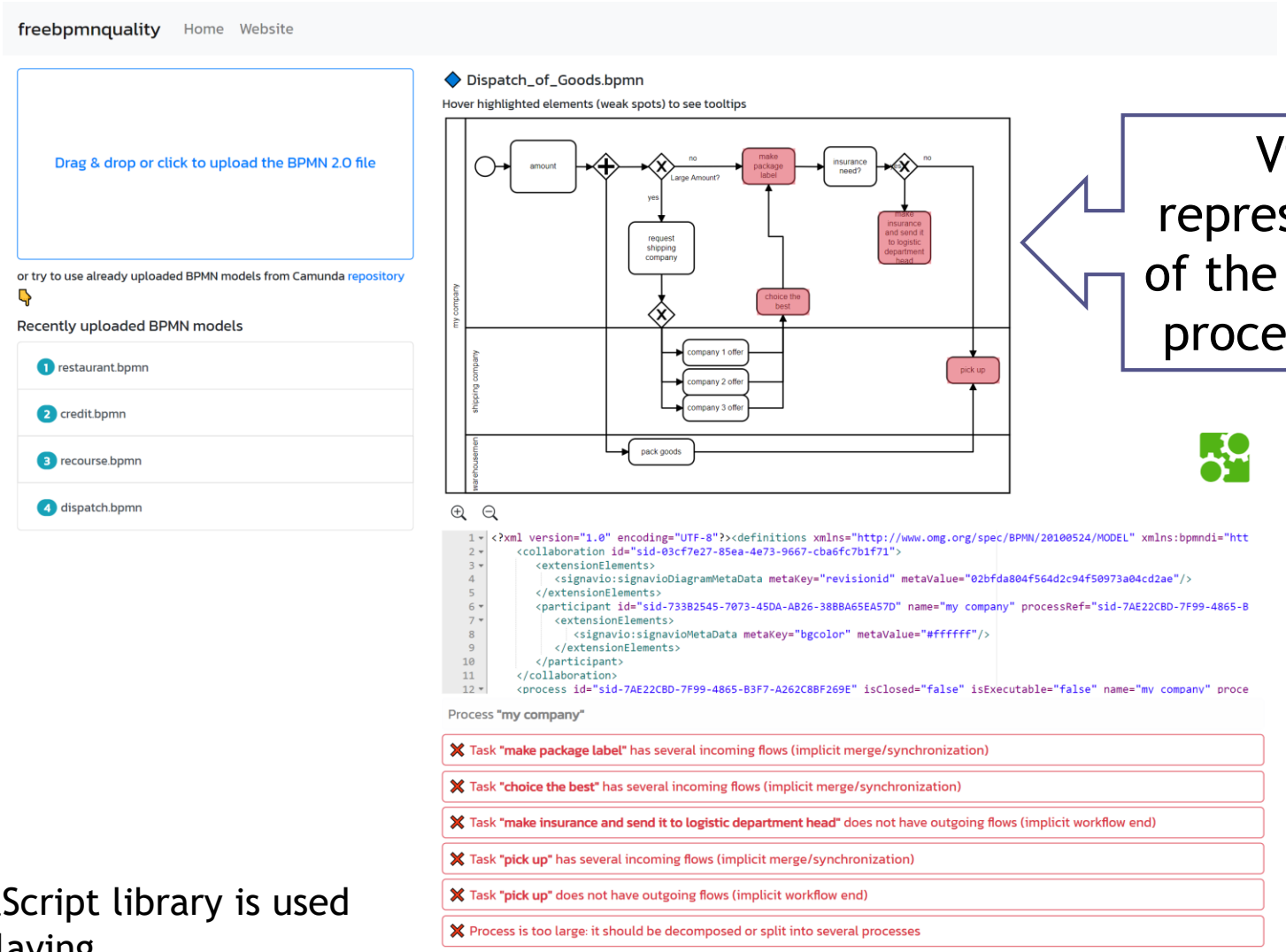
Software Solution – Models Uploading



Software Solution – Backlog



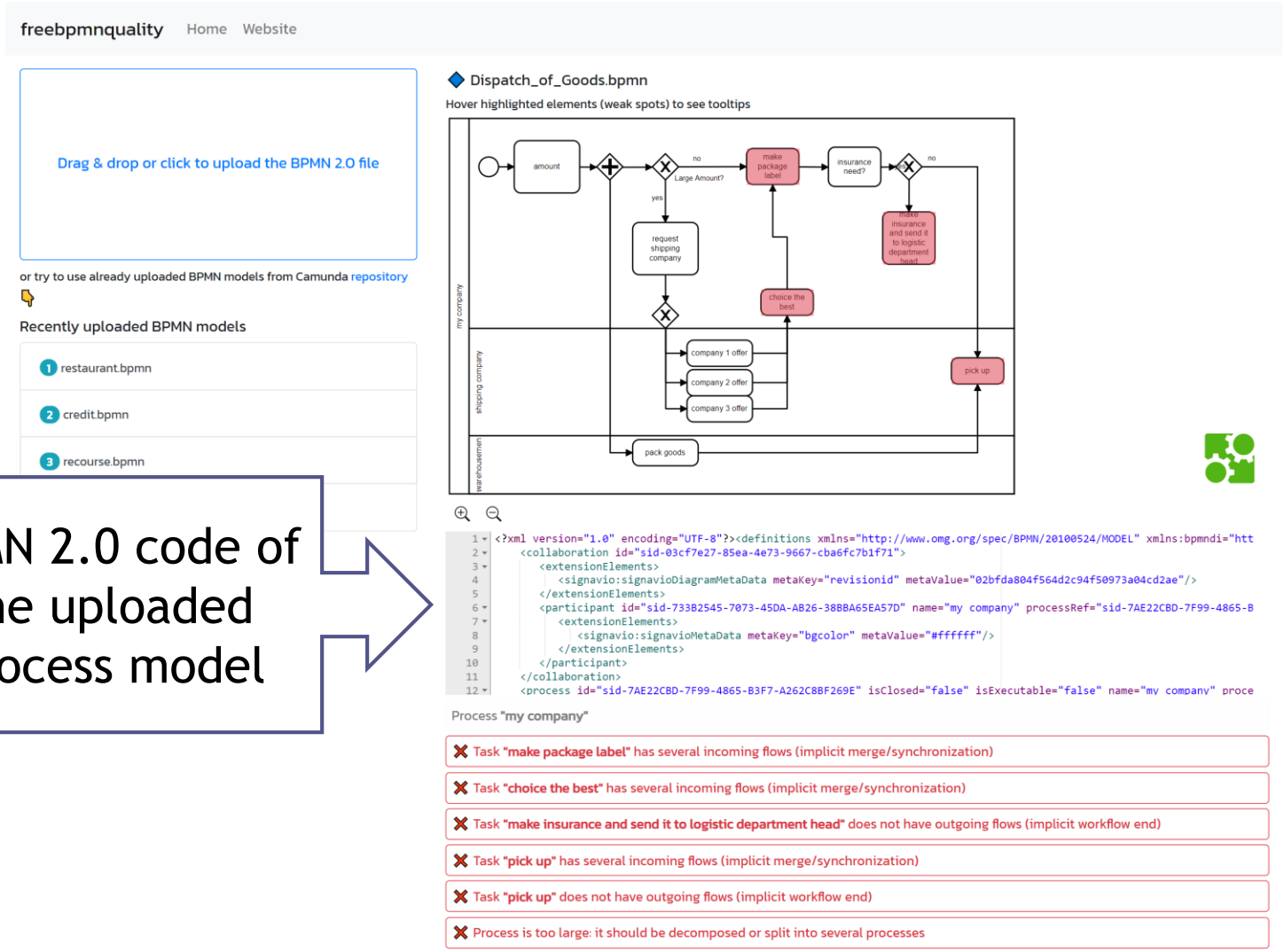
Software Solution – Model Displaying



Visual representation of the uploaded process model

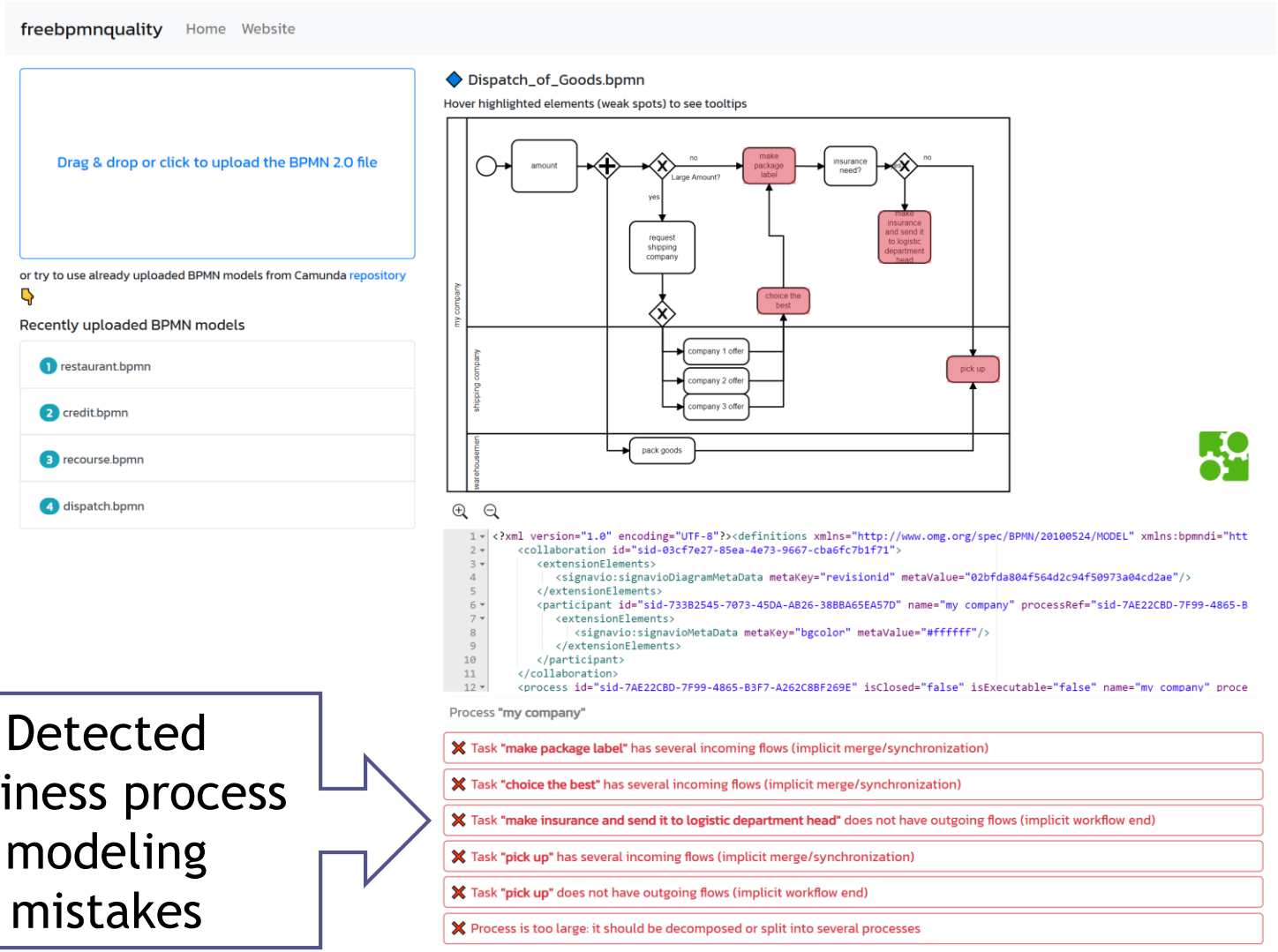
* bpmn.io JavaScript library is used for model displaying

Software Solution – Code Displaying



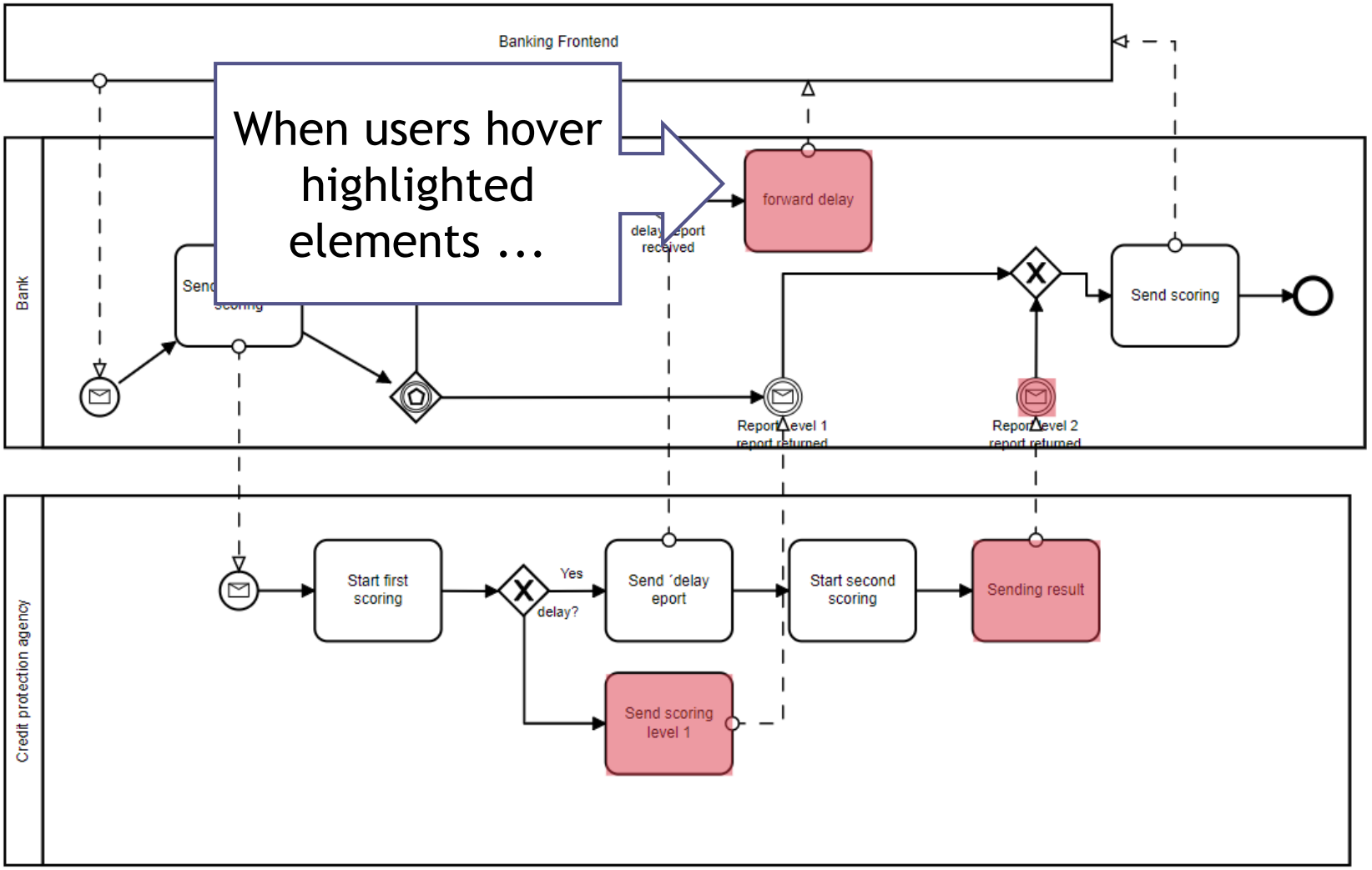
BPMN 2.0 code of the uploaded process model

Software Solution – Mistakes Detection

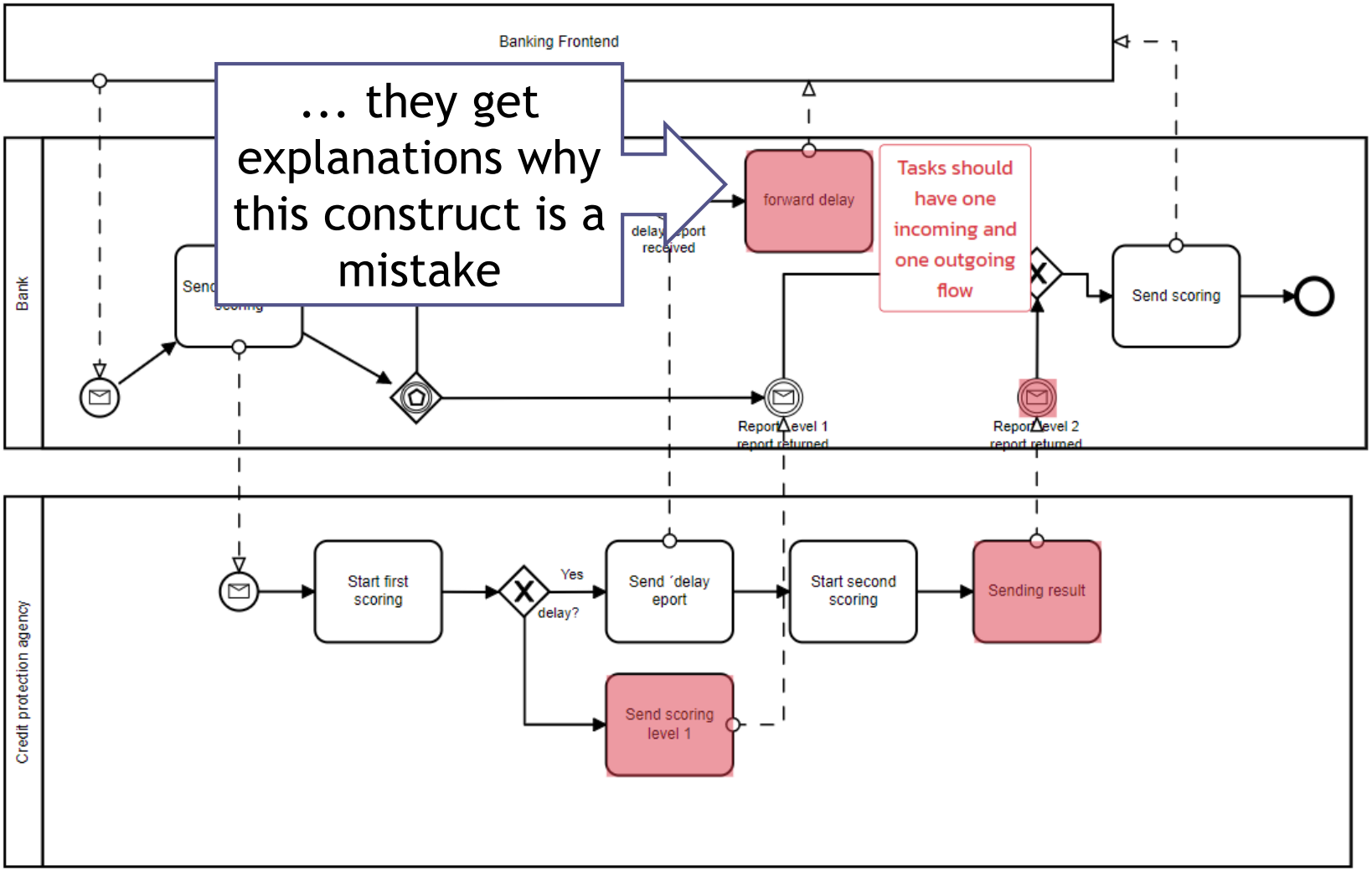


Detected business process modeling mistakes

Software Solution – Interaction



Software Solution – Explanations



Software Solution – Suggestions

Process "Bank"

- ✗ Intermediate event "**Report level 2 report returned**" does not have incoming flows (implicit workflow start)
- ✗ Task "**forward delay**" does not have outgoing flows (implicit workflow end)

Process "Credit protection agency"

- ✗ Task "**Sending result**" does not have outgoing flows (implicit workflow end)
- ✗ Task "**Send scoring level 1**" does not have outgoing flows (implicit workflow end)

Suggestions for the detected business process modeling mistakes are given in the bottom of a web page

Business Rules to Detect Business Process Modeling Mistakes (1)

- Rule 1. Detection of too complex business process models:

```
number of activities > 8
```

- Rule 2. Detection of incorrect tasks:

```
incoming sequence flows ≠ 1
     AND outgoing sequence flows ≠ 1
```

- Rule 3. Detection of incorrect start events:

```
outgoing sequence flows ≠ 1
```

Business Rules to Detect Business Process Modeling Mistakes (2)

- Rule 4. Detection of incorrect end events:

```
incoming sequence flows ≠ 1
```

- Rule 5. Detection of incorrect intermediate events:

```
incoming sequence flows ≠ 1
     AND outgoing sequence flows ≠ 1
```

- Rule 6. Detection of incorrect gateways:

```
NOT ((incoming sequence flows = 1
     AND outgoing sequence flows > 1) OR
     (incoming sequence flows > 1
          AND outgoing sequence flows = 1))
```

Rough Estimation of Business Process Modeling Mistakes Consequences (1)

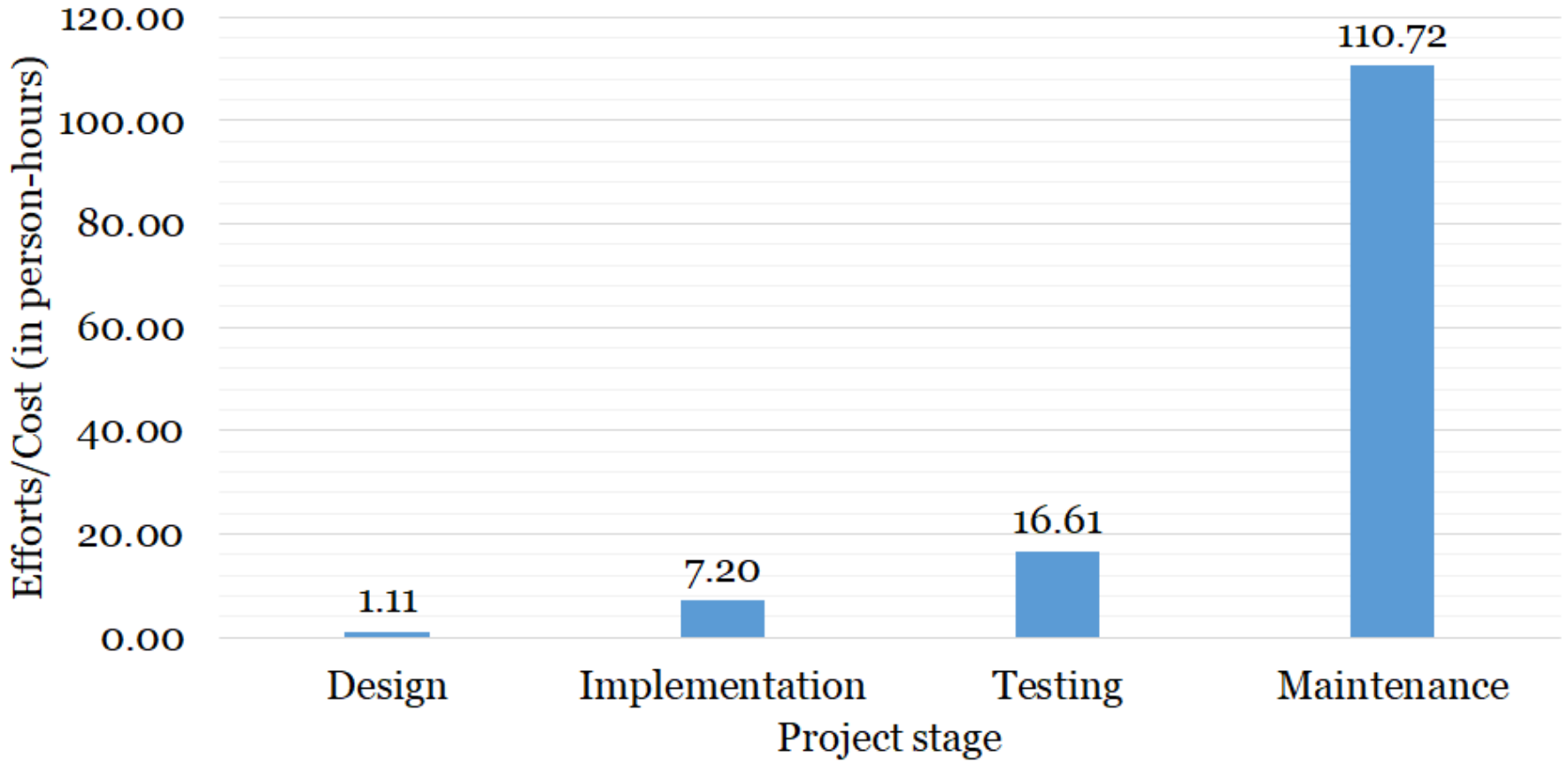
- Using the COCOMO (Constructive Cost Model):

$$\text{Efforts} = 2.4 \times [\text{Number of modeling mistakes}]^{1.05}$$

- And the Bug Fixing Cost Model:

Project stage	Design	Implementation	Testing	Maintenance
Efforts/Cost	1x	6.5x	15x	100x

Rough Estimation of Business Process Modeling Mistakes Consequences (2)



Conclusion

- Detection of mistakes in business process models as a part of business analysts e-training is motivated and explained
- The software tool is presented and the rough estimation of benefits from proper business process modeling is outlined
- Demo of the software tool is accessible by link: https://freebpmnquality.github.io/demo.html
- General project's website is accessible by link: https://freebpmnquality.github.io/

Thank you for attention!