



UNIVERSITY OF TARTU

MTAT.03.083 Systems Modelling

Business Process Modelling

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Co-Founder of Apromore



UNIVERSITY OF TARTU

MTAT .03.083 系统建模

业务流程建模

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阿普罗摩尔联合创始人

**Issue
delivery
receipt**

**Load
truck**

**Package
products**

**Issue
invoice**

**Prepare
shipment**

**Schedule
payment**

**Schedule
delivery**

**Check &
confirm
PO**

**Unload
truck**

**Notify
shipment**

**Obtain
PO
confirm.**

**Check
Invoice**

**Request
PO change**

**Match
incoming
payment**

问题
送货
收据

Load
卡车

包裹
产品

问题
发票

准备
运输

安排付款

日程
送货

查看 &
确认
PO

卸下
卡车

通知
运输

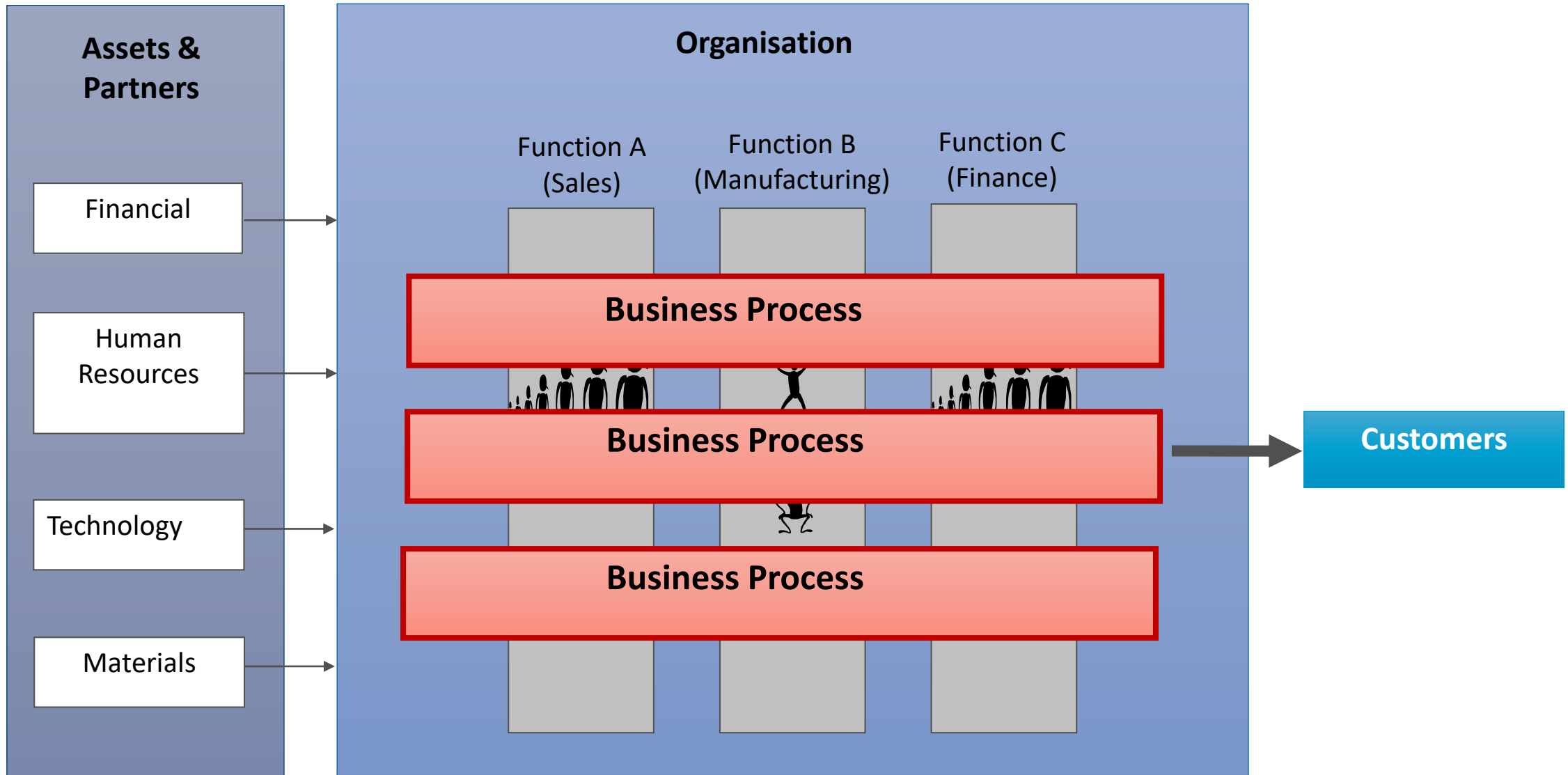
获得
PO
确认。

查看
发票

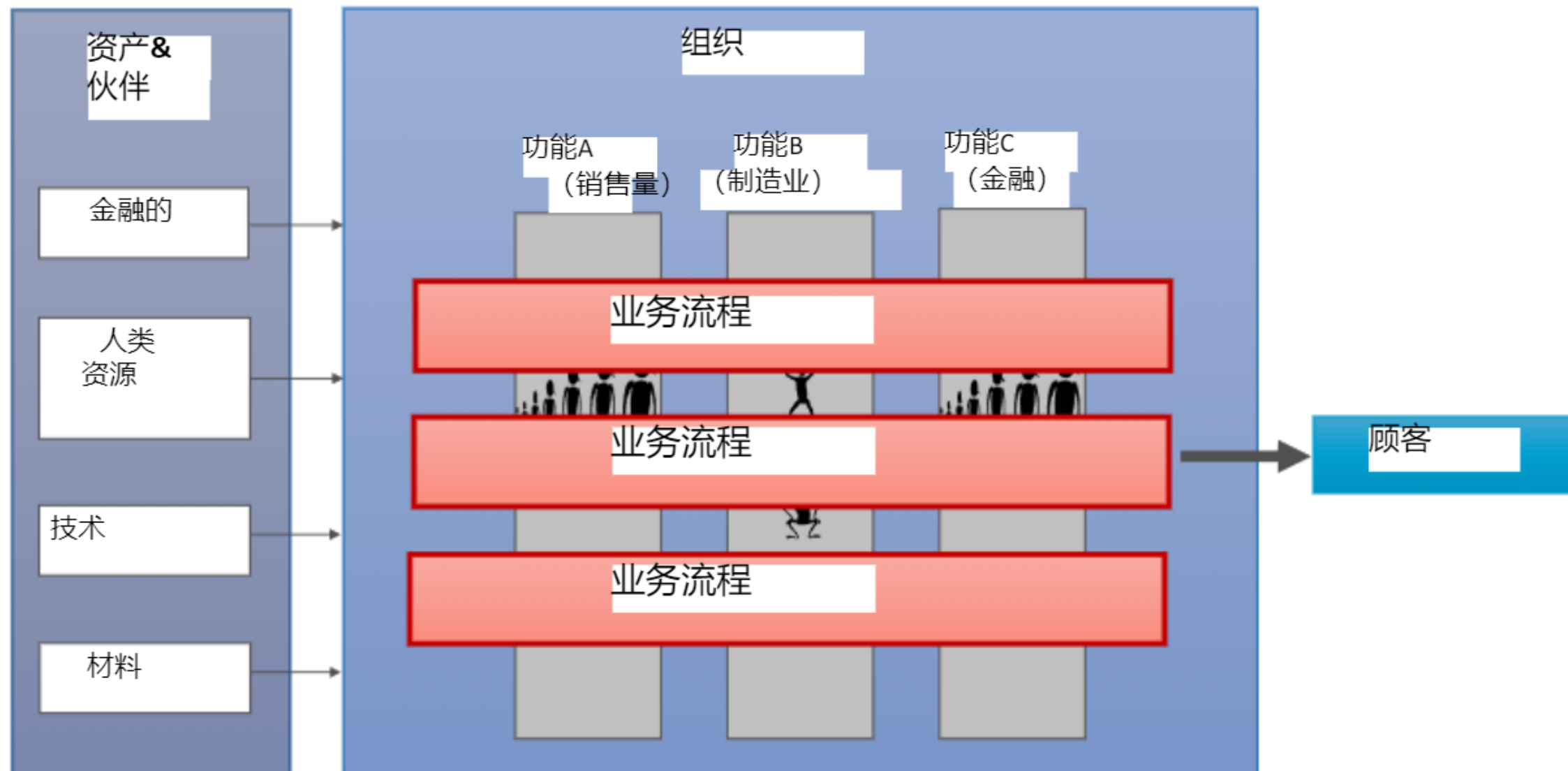
要求
采购订单变更

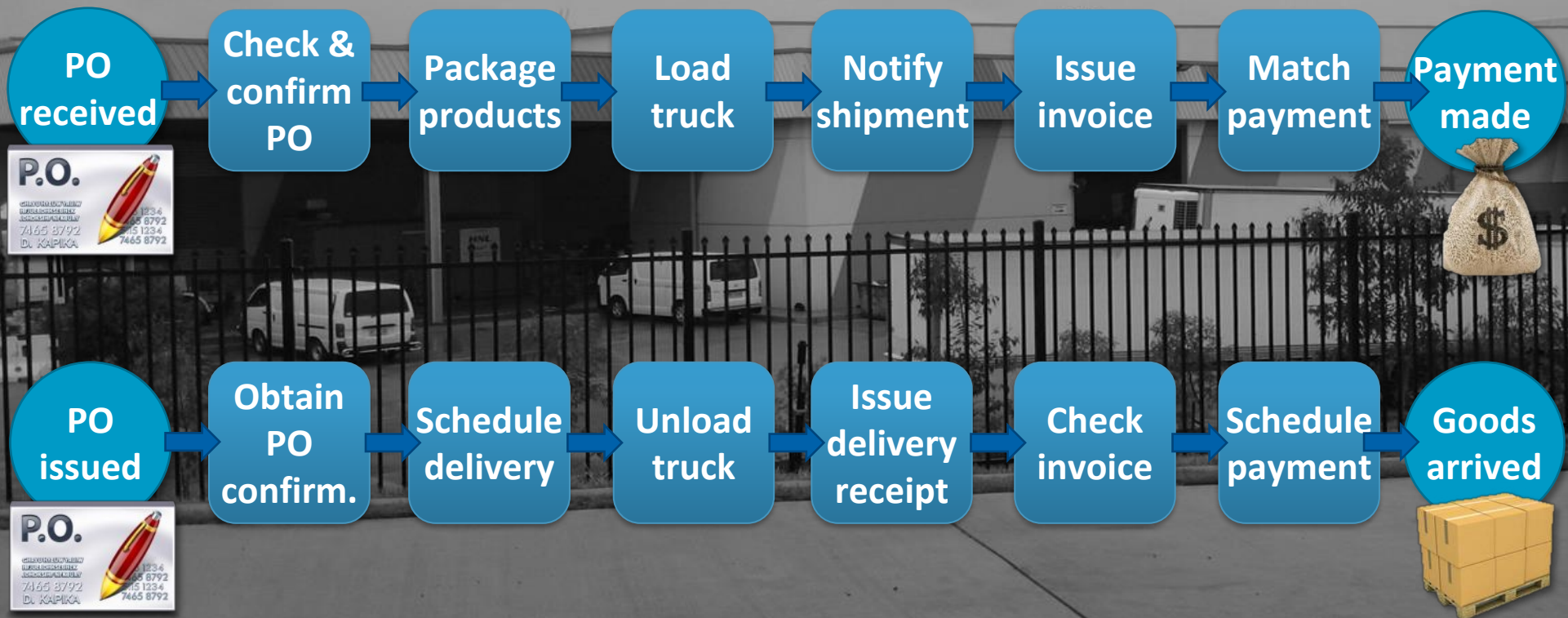
匹配
传入
支付

Business processes



业务流程







A business process is...

*a chain of **events**, **activities** and **decisions**
...involving several **actors** and **objects**,
....triggered by a **need**
and leading to an **outcome** that is of **value** to a **customer**.*

Examples:

- Order-to-Cash
- Procure-to-Pay (aka Purchase-to-Pay)
- Application-to-Approval
- Issue-to-Resolution



业务流程是...

一系列事件、活动和决策..... 涉及多个参与者和对象, 由需求触发并导致对客户有价值的结果。

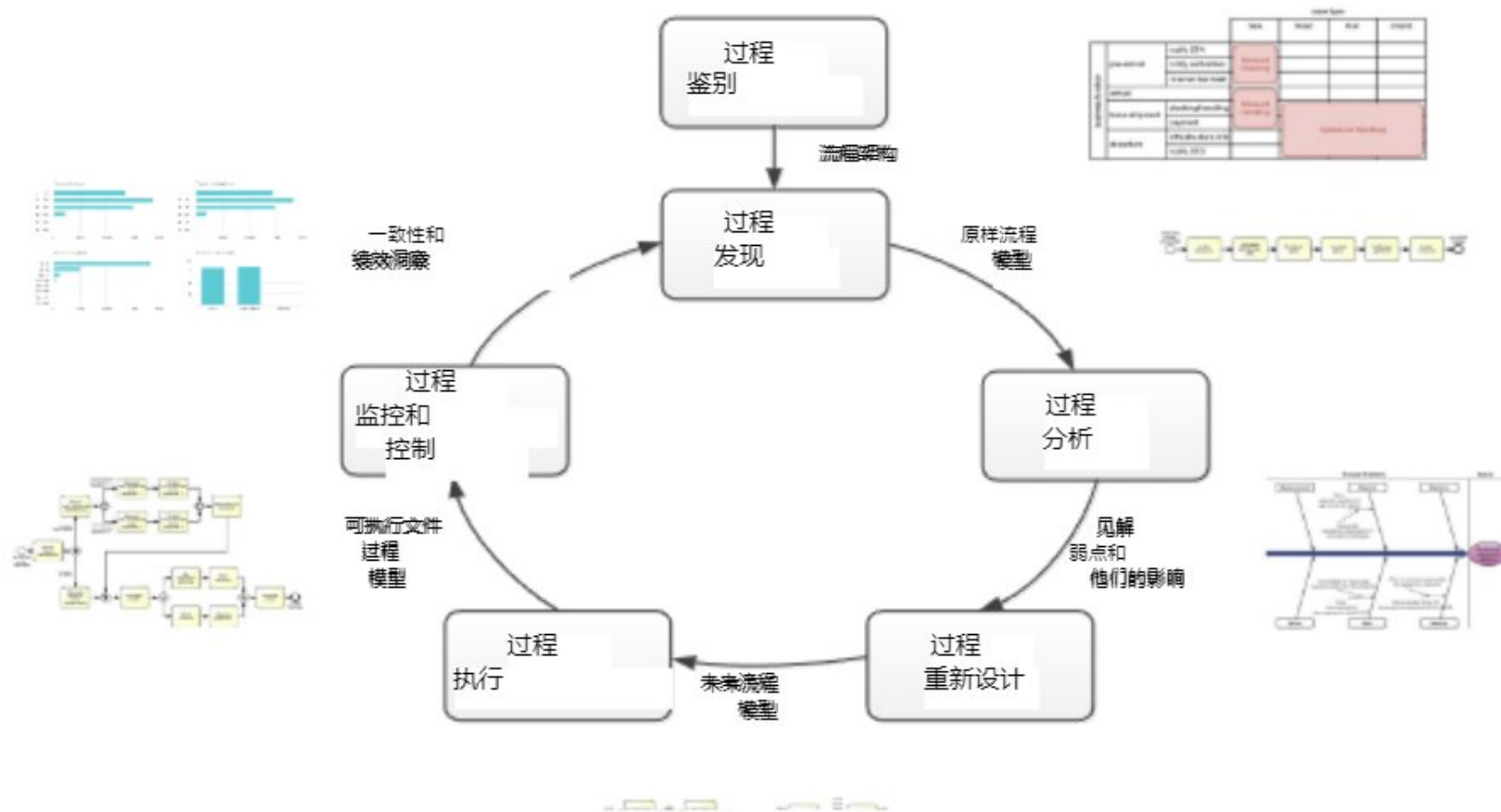
例子:

- 订单到现金
- 采购到付款 (又称采购到付款)
- 申请到批准
- 问题到解决



业务流程管理 (BPM)

用于设计、分析、执行和监控业务流程的原则、方法和工具，旨在提高其绩效。



Why BPM?

“The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency.

The second is that automation applied to an inefficient operation will magnify the inefficiency.”

Bill Gates



为什么选择业务流程管理？

“企业中使用任何技术的首要规则是，应用于高效运营的自动化将提高效率。

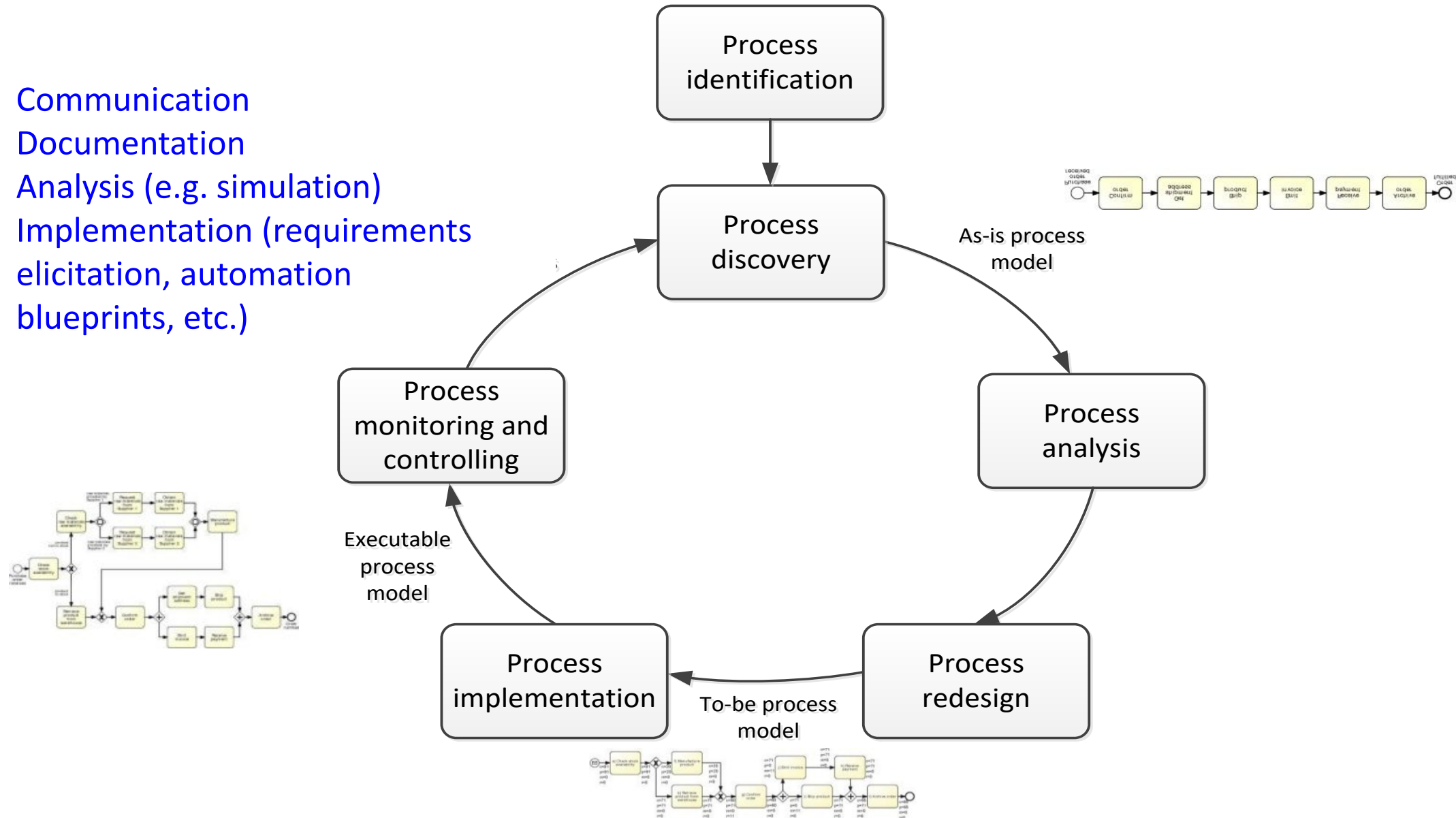
其次，自动化应用于效率低下的运营会加剧效率低下。”

比尔盖茨



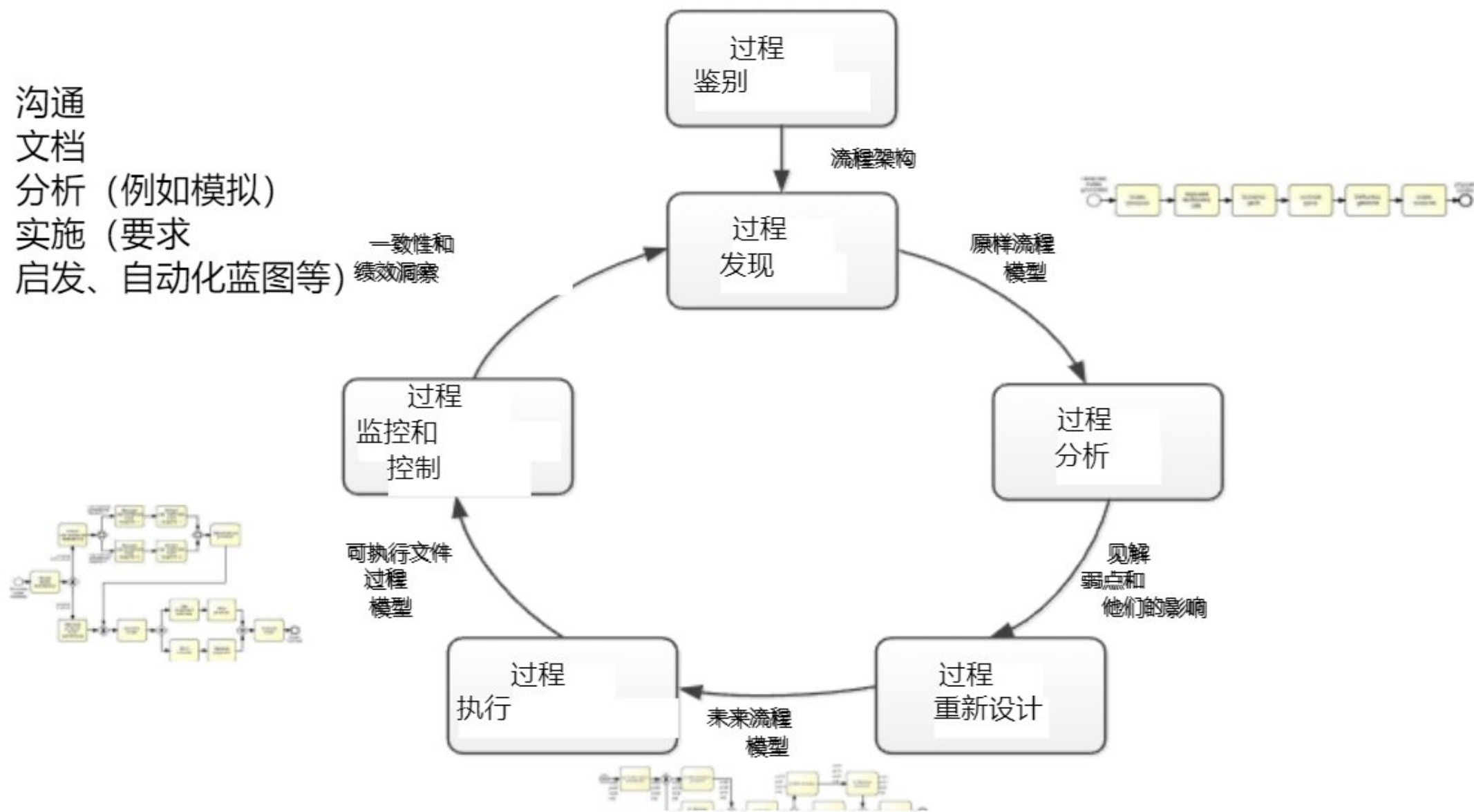
Process modeling

- Communication
- Documentation
- Analysis (e.g. simulation)
- Implementation (requirements elicitation, automation blueprints, etc.)



流程建模

- 沟通
- 文档
- 分析（例如模拟）
- 实施（要求启发、自动化蓝图等）



Business Process Model and Notation (BPMN)

- OMG standard
- Suitable for capturing models for process discovery, analysis, and implementation
- Supported by numerous tools, incl.
 - Apromore – <https://apromore.cloud.ut.ee>
 - Signavio – <https://academic.signavio.com>
 - Cawemo - <https://cawemo.com/>
 - Bizagi Process Modeler - <https://www.bizagi.com/en/platform/modeler>
 - GBTEC BIC Design
 - Etc.



业务流程模型和表示法 (BPMN)

- 奥美格标准
- 适用于捕获模型以进行流程发现、分析和实施
- 由众多工具支持，包括。
 - Apromore – <https://apromore.cloud.ut.ee>
 - Signavio – <https://academic.signavio.com>
 - 卡韦莫 - <https://cawemo.com/>
 - Bizagi 流程建模器 - <https://www.bizagi.com/en/platform/modeler>
 - GBTEC BIC 设计
 - Etc.

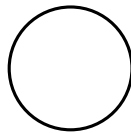


BPMN from 10,000 miles...

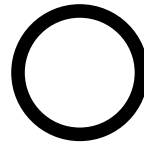
A BPMN process model is a graph consisting of four types of **core elements**:



activity

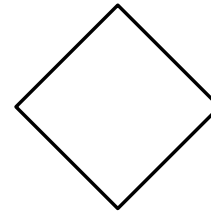


start

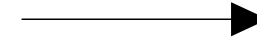


end

event



gateway



sequence
flow

10,000 英里处的 BPMN ...

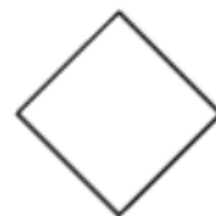
BPMN 流程模型是由四种核心元素组成的图：



活动网关事件序列



开始结束



flow

Let's start modeling

Order-to-cash

An order-to-cash process is triggered by the receipt of a purchase order from a customer. Upon receipt, the purchase order has to be checked against the stock to determine if the requested item(s) are available. Depending on stock availability the purchase order may be confirmed or rejected.

If the purchase order is confirmed, an invoice is emitted and the goods requested are shipped. The process completes by archiving the order.

让我们开始建模

订单到现金

收到客户的采购订单后会触发订单到现金流程。收到后，必须对照库存检查采购订单，以确定所请求的商品是否可用。根据库存情况，采购订单可能会被确认或拒绝。

如果采购订单得到确认，则会开具发票并发货所需的货物。该过程通过归档订单来完成。

Let's start modeling – break it down

Order-to-cash

- An order-to-cash process is triggered by the receipt of a purchase order from a customer.
- Upon receipt, the purchase order has to be checked against the stock to determine if the the requested item(s) are available.
- Depending on stock availability the purchase order may be confirmed or rejected.
- If the purchase order is confirmed, an invoice is emitted and the goods requested are shipped. The process completes by archiving the order.

让我们开始建模——分解它

订单到现金

- 收到客户的采购订单后会触发订单到现金流程。
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Order-to-cash

- An order-to-cash process is triggered by the receipt of a purchase order from a customer.
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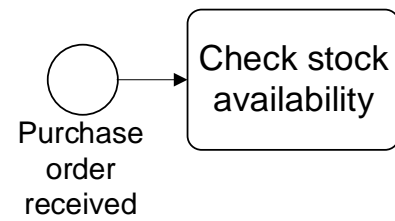
让我们开始建模——分解它

订单到现金

- 收到客户的采购订单后会触发订单到现金流程。
- 收到后，必须对照库存检查采购订单，以确定所请求的商品是否可用。

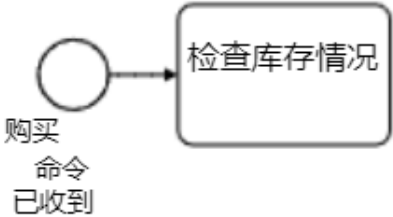
BPMN Model

Order-to-cash



BPMN 模型

订单到现金



Let's start modeling – break it down

Order-to-cash

- An order-to-cash process is triggered by the receipt of a purchase order from a customer.
- Upon receipt, the purchase order has to be checked against the stock to determine if the the requested item(s) are available.
- **Depending on stock availability the purchase order may be confirmed or rejected.**
- **If the purchase order is confirmed, an invoice is emitted and the goods requested are shipped. The process completes by archiving the order.**

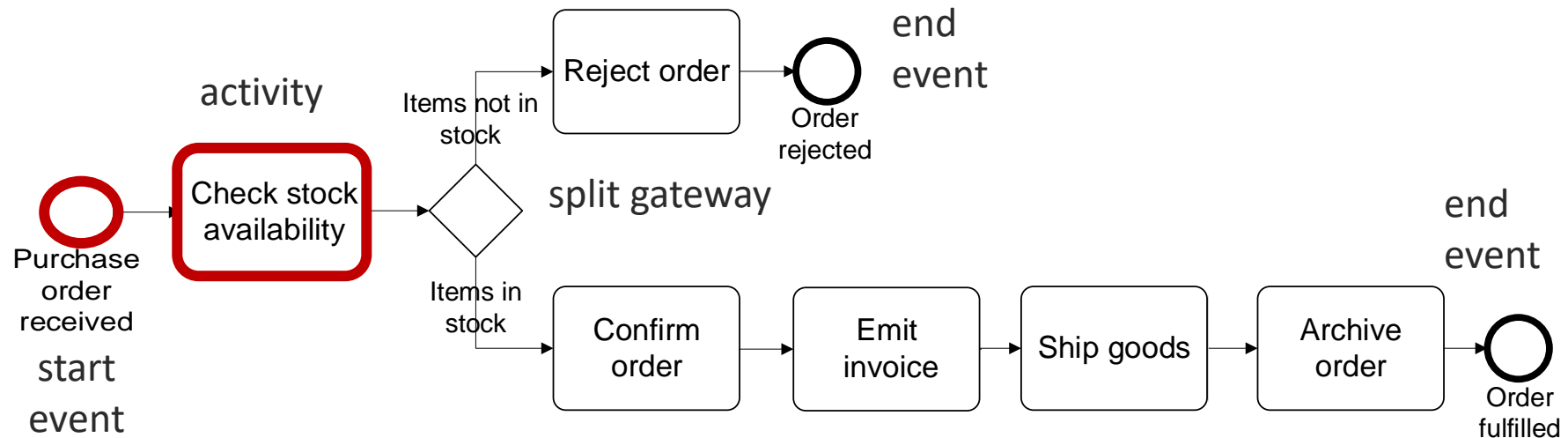
让我们开始建模——分解它

订单到现金

- 收到客户的采购订单后会触发订单到现金流程。
- 收到后，必须对照库存检查采购订单，以确定所请求的商品是否可用。
- 根据库存情况，采购订单可能会被确认或拒绝。
- 如果采购订单得到确认，则会开具发票并发货所需的货物。该过程通过归档订单来完成。

BPMN Model

Order-to-cash

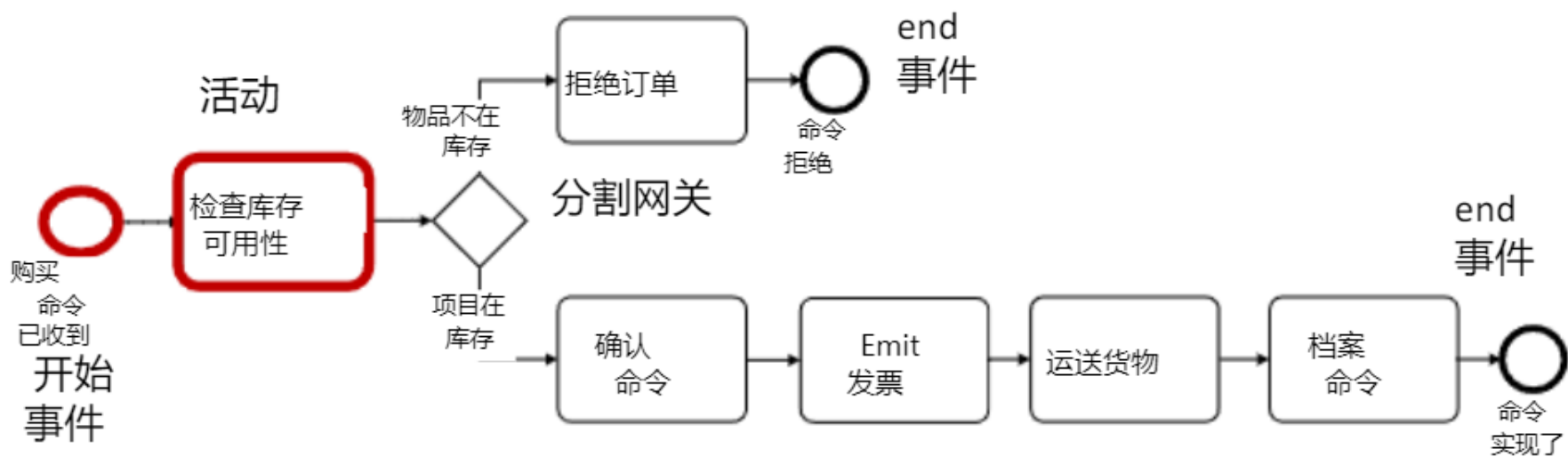


Naming conventions

- Event: noun + past-participle verb (e.g. insurance claim lodged)
- Activity: verb + noun (e.g. assess credit risk)

BPMN 模型

订单到现金

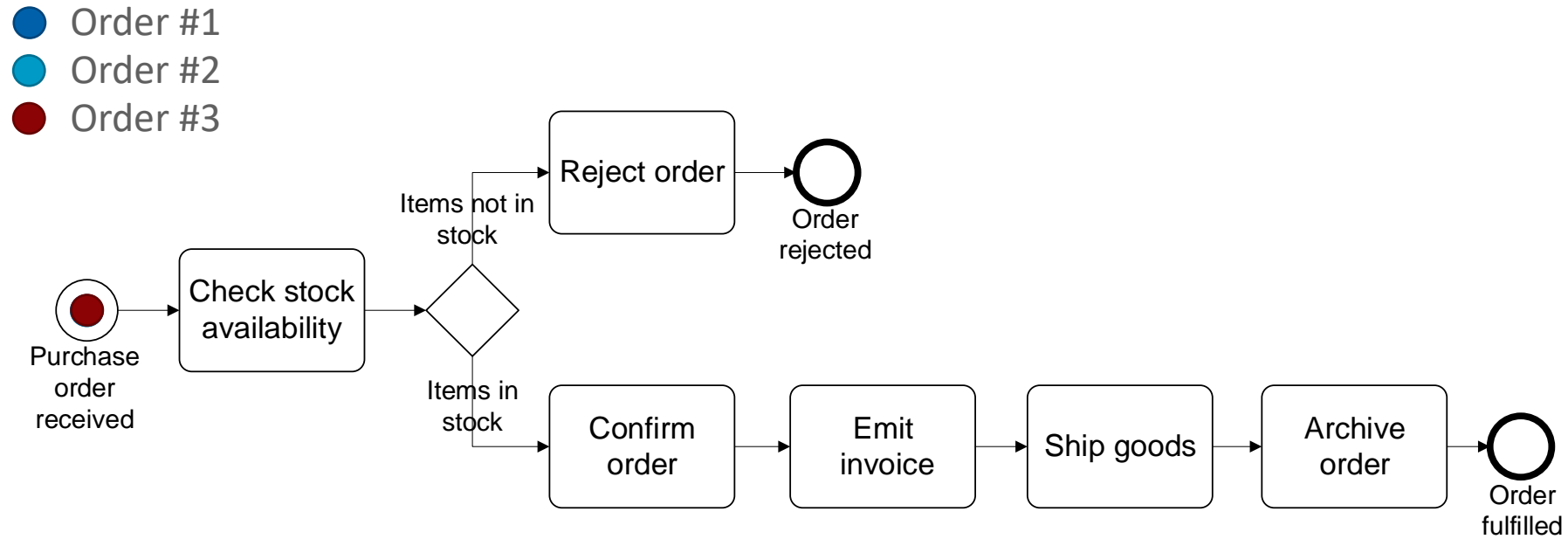


命名约定

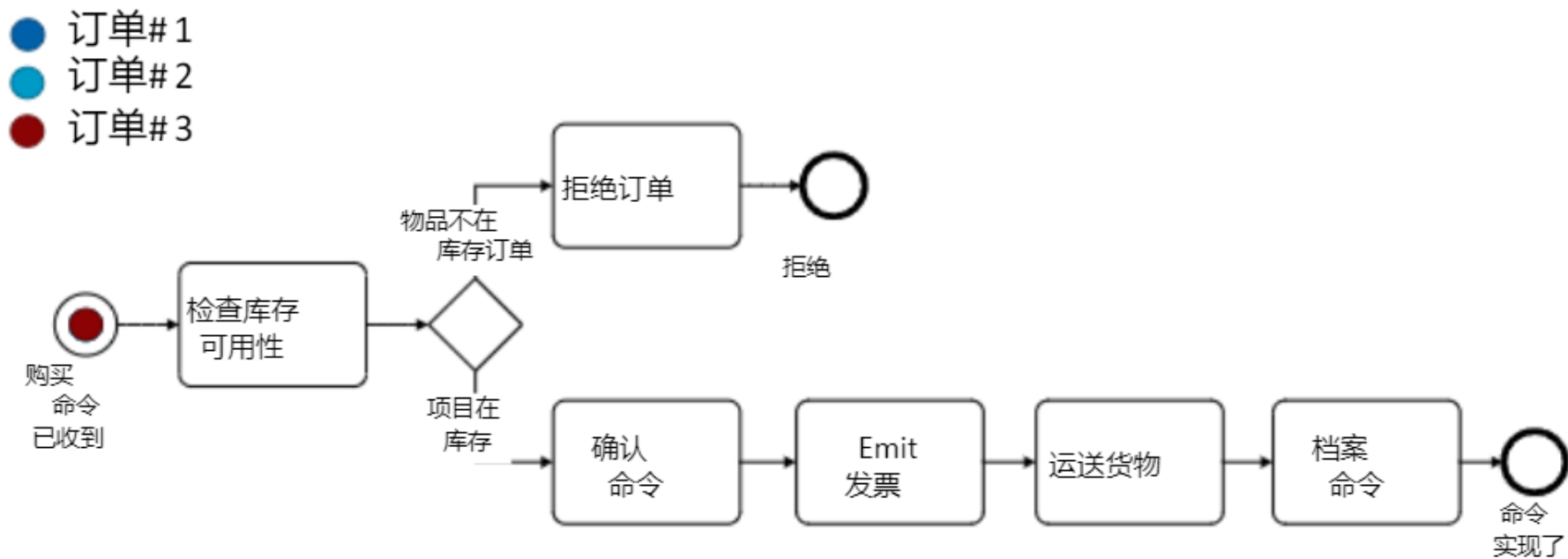
- 事件：名词 + 过去分词动词（例如提出保险索赔）
- 活动：动词+ 名词（例如评估信用风险）

Execution of a process model

The “token game”



流程模型的执行“令牌游戏”



A little bit more on events...

A *start event* triggers a new process instance by generating a token that traverses the sequence flow (“tokens source”)



An *end event* signals that a process instance has completed with a given outcome by consuming a token (“tokens sink”)



关于事件的更多信息.....

启动事件通过生成遍历序列流的令牌（“令牌源”）来触发新的流程实例



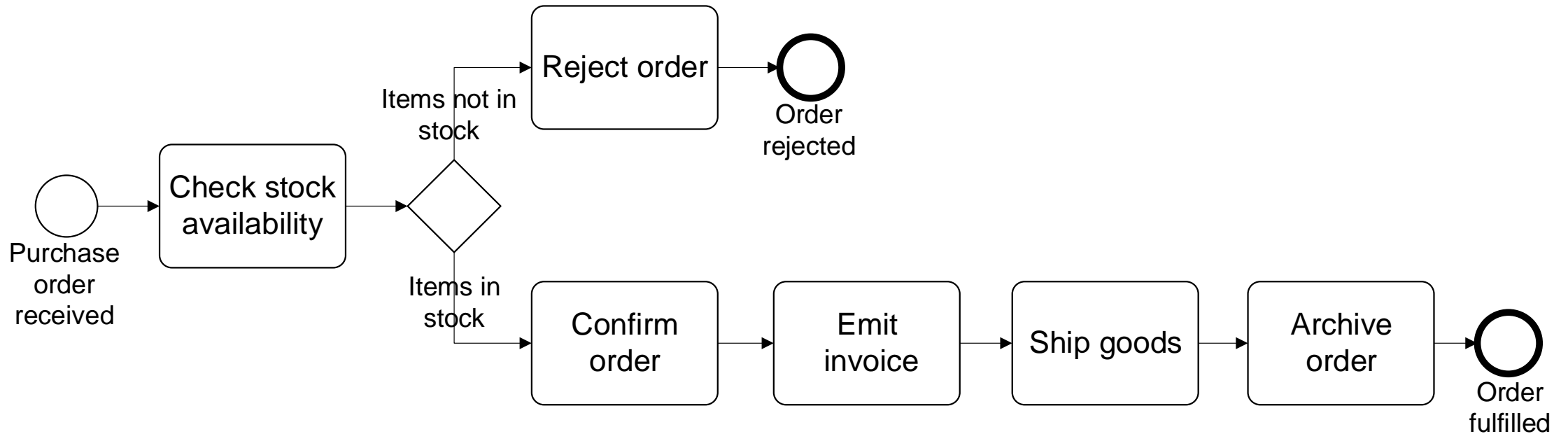
结束事件通过消耗信号表明流程实例已完成并具有给定的结果



令牌（“令牌接收器”）

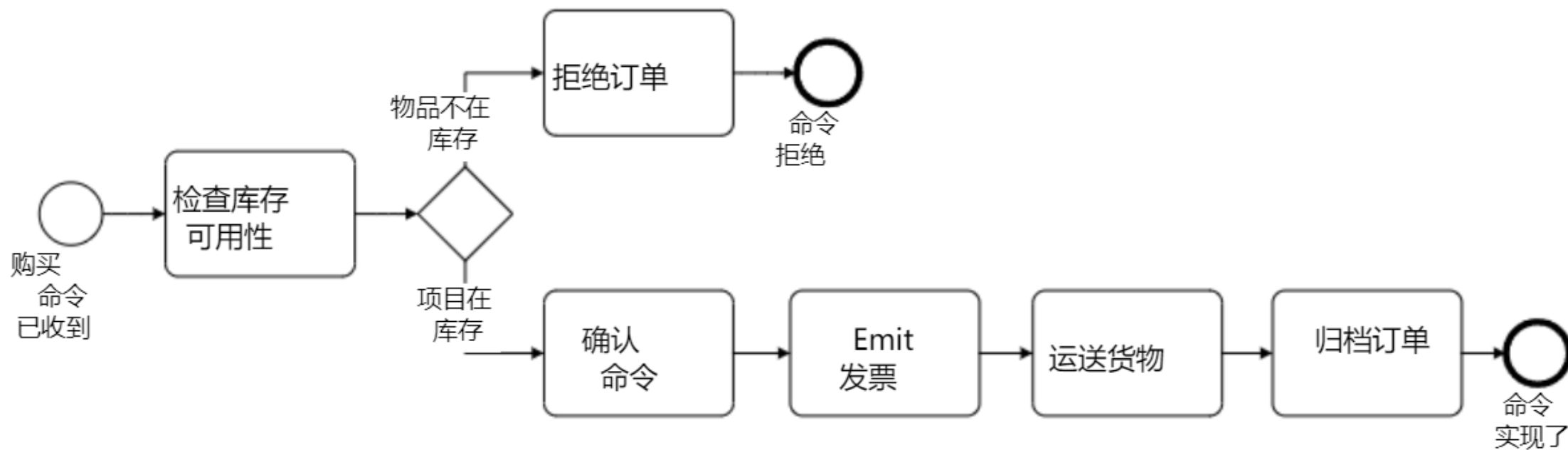
Order-to-cash example revisited...

[...] If the purchase order is confirmed, **an invoice is emitted and the goods requested are shipped (in any order)**. The process completes by archiving the order.
[...]



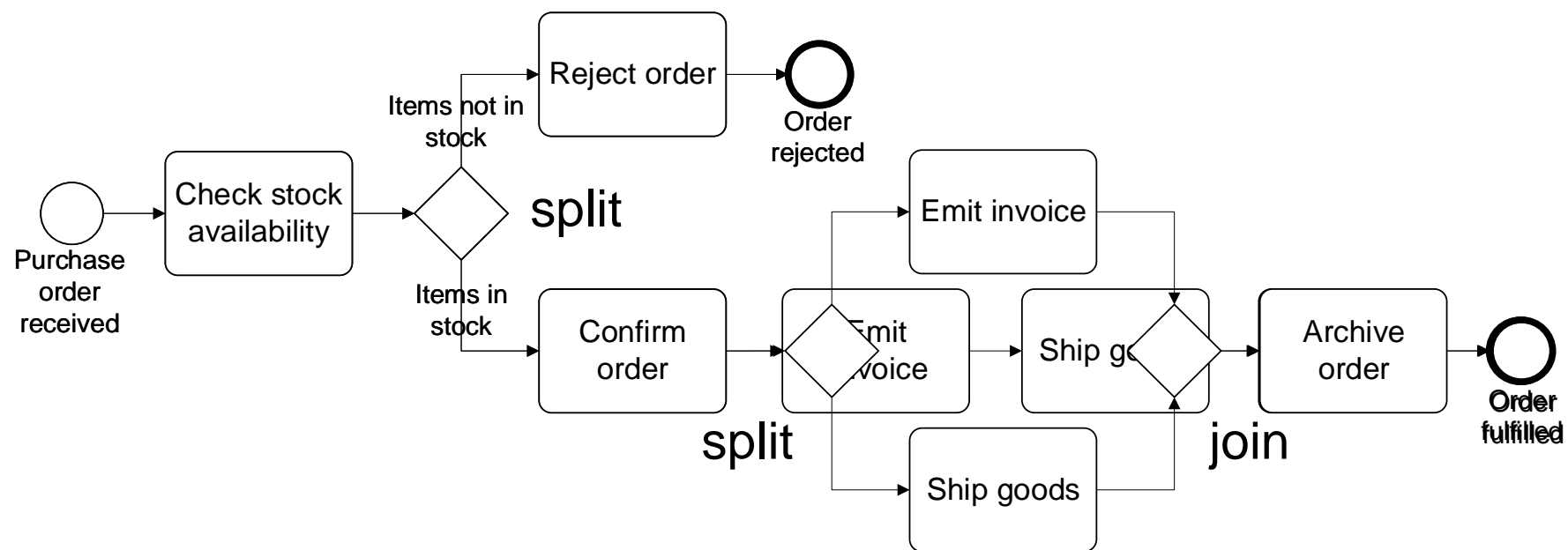
重新审视订单到现金的例子.....

[...] 如果采购订单得到确认，则会开具发票并发货所需的货物（以任何顺序）。该过程通过归档订单来完成。 [...]



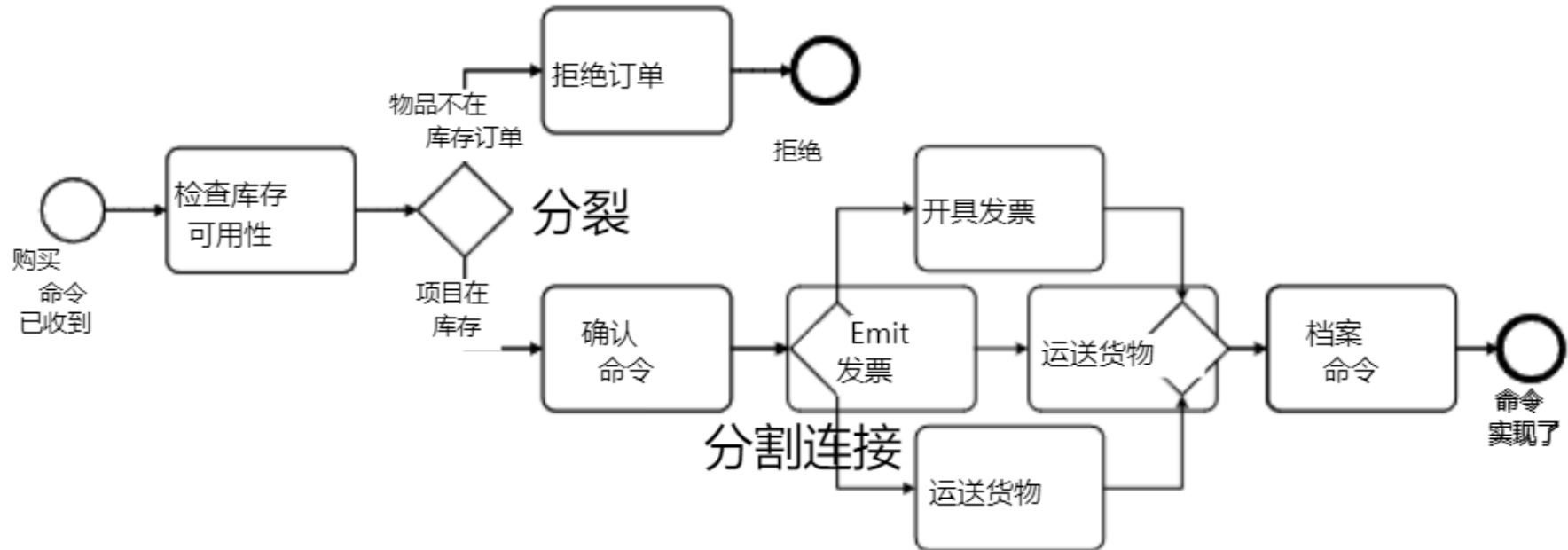
First try

Order-to-cash

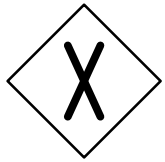


第一次尝试

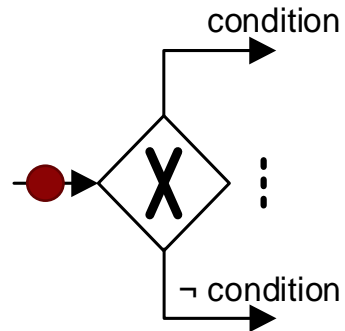
订单到现金



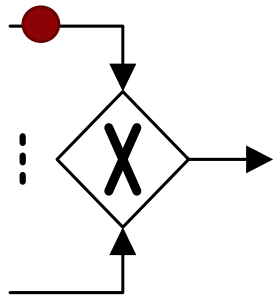
A little more on gateways: XOR Gateway



An *XOR Gateway* captures decision points (XOR-split) and points where alternative flows are merged (XOR-join)



XOR-split ➔ takes **one** outgoing branch

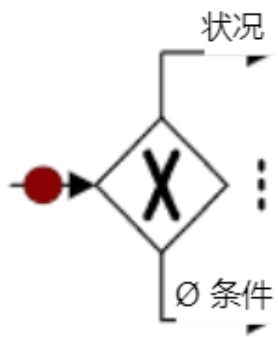


XOR-join ➔ proceeds when **one** incoming branch has completed

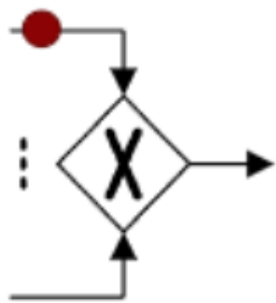
有关网关的更多信息：XOR 网关



XOR 网关捕获决策点 (XOR 分割) 和替代流合并的点 (XOR 合并)



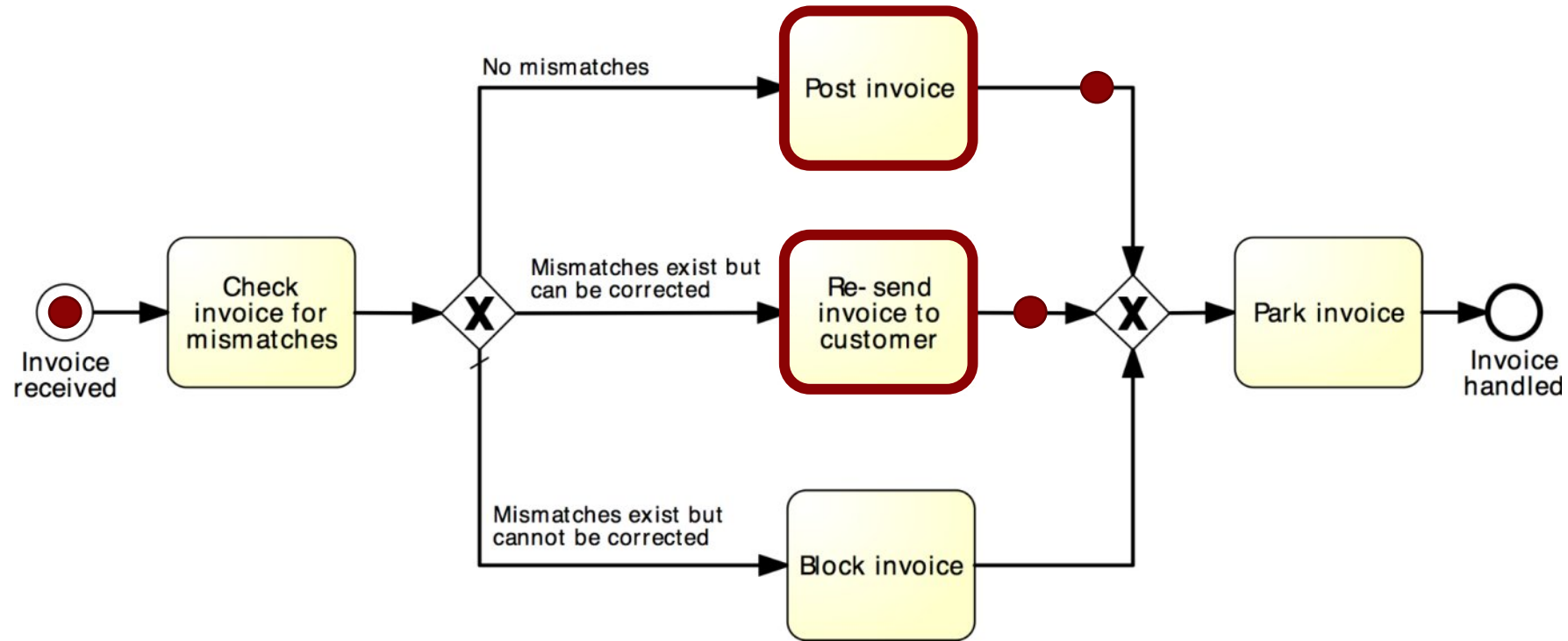
XOR 分割 → 采用一个传出分支



XOR -join → 当一个传入分支完成时继续

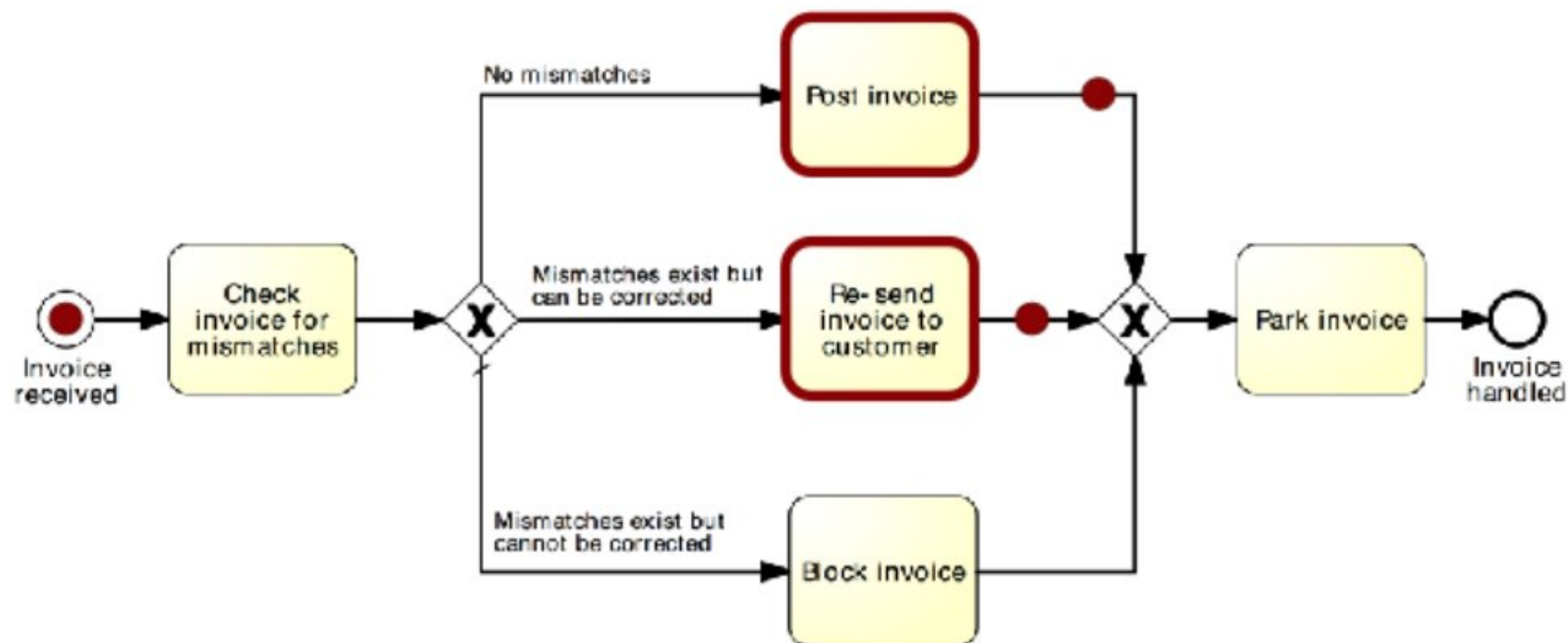
Example: XOR Gateway

Invoice checking process

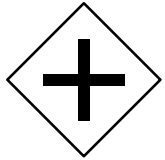


示例：异或网关

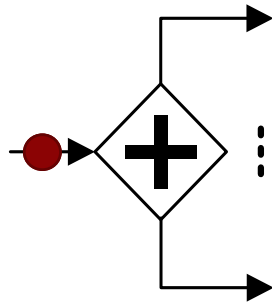
发票核对流程



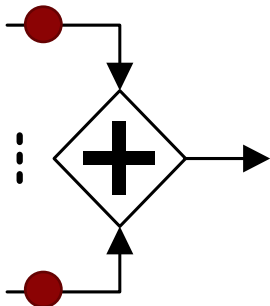
A little more on gateways: AND Gateway



An *AND Gateway* provides a mechanism to create and synchronize “parallel” flows.



AND-split ➔ takes **all** outgoing branches

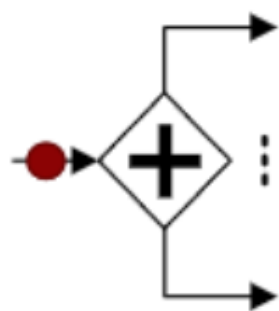


AND-join ➔ proceeds when **all** incoming branches have completed

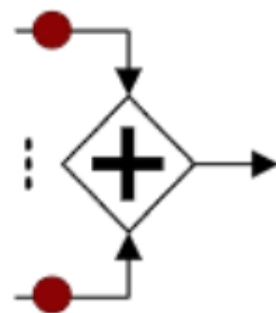
有关网关的更多信息：AND 网关



AND 网关提供了一种创建和同步“ 并行” 流的机制。



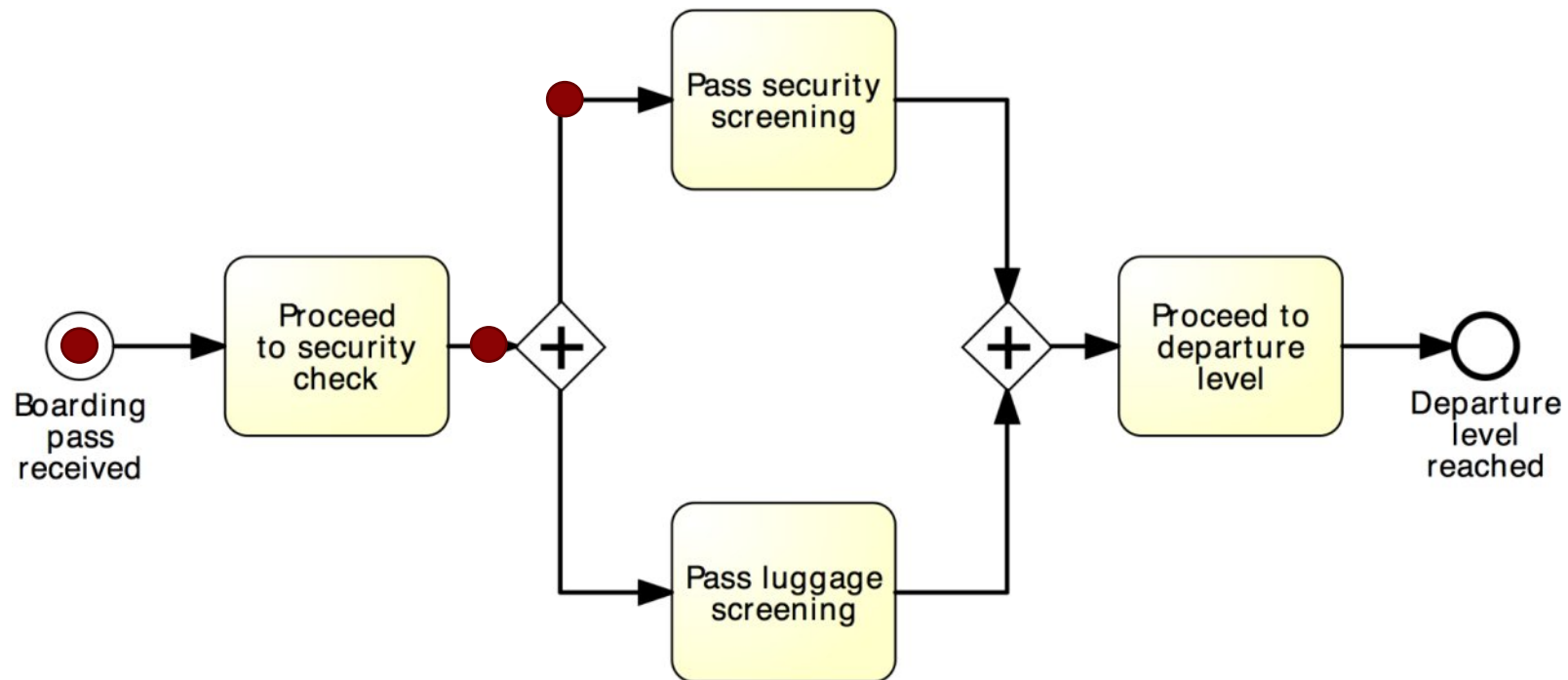
AND 分割 → 获取所有传出分支



AND -join → 在所有传入分支完成后继续

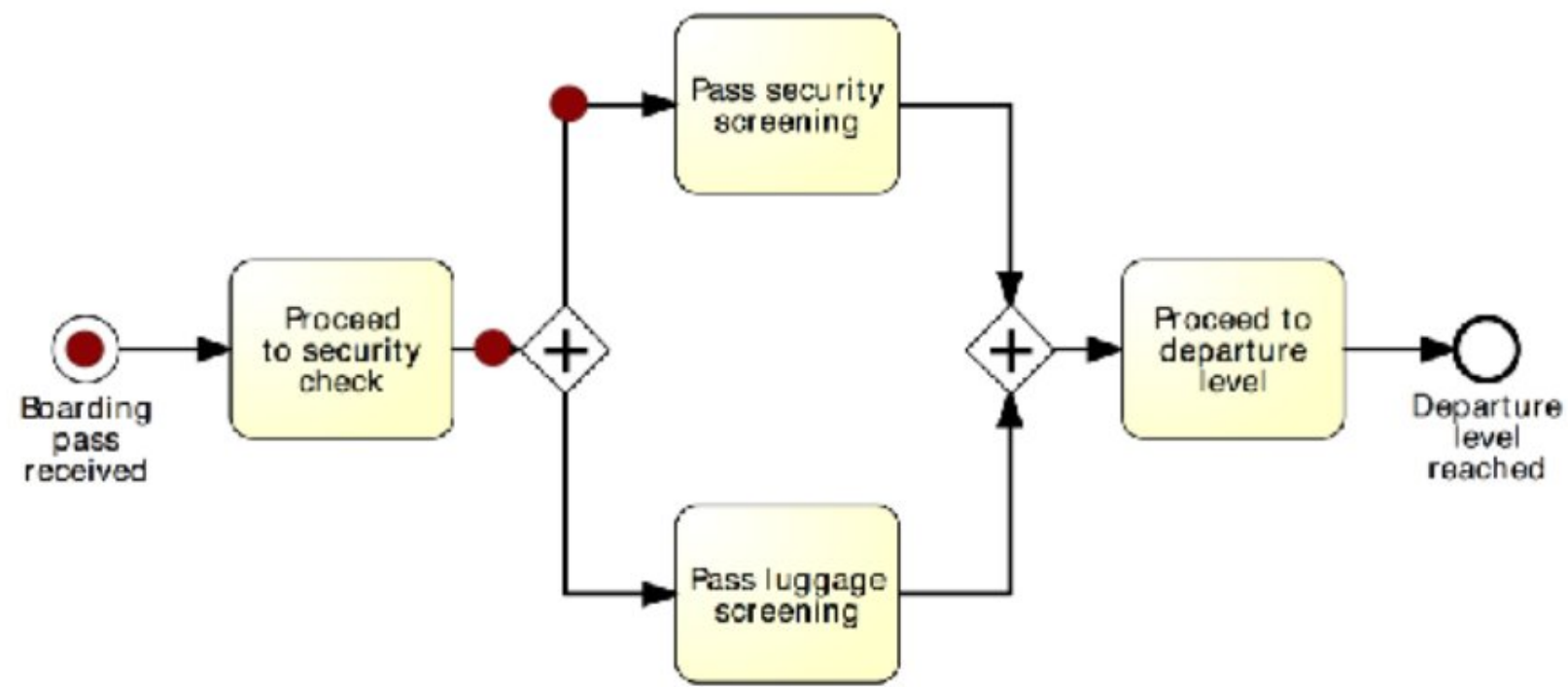
Example: AND Gateway

Airport security check

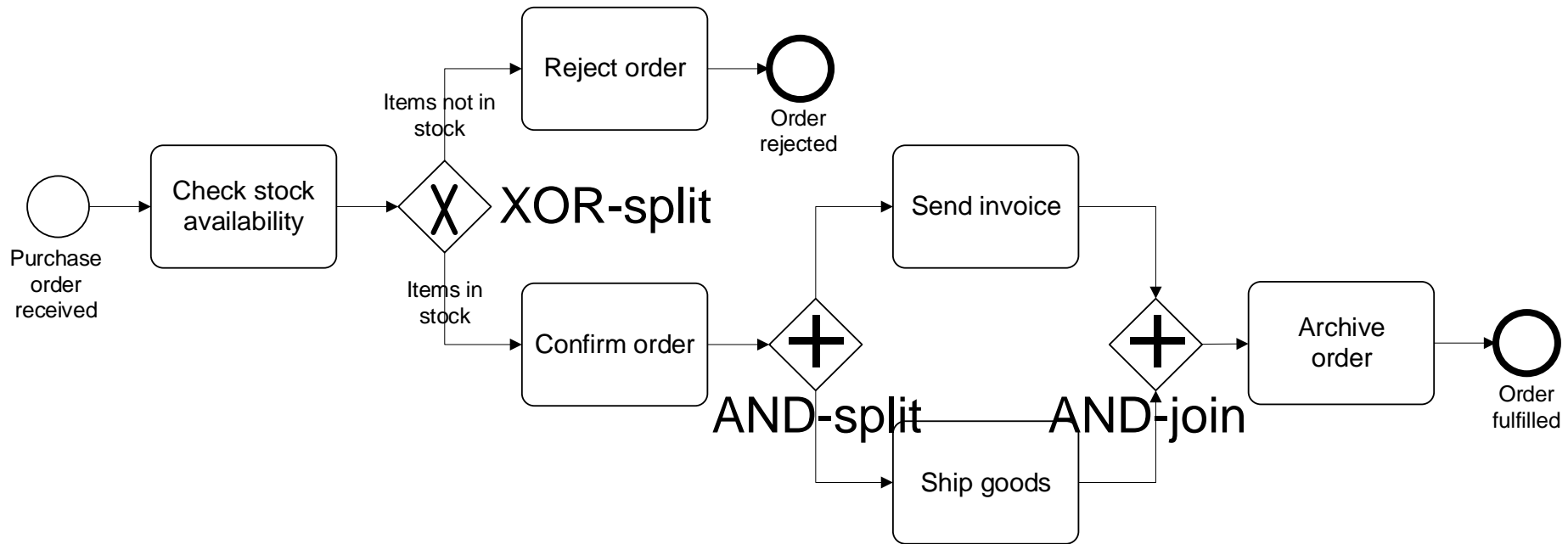


示例：AND 网关

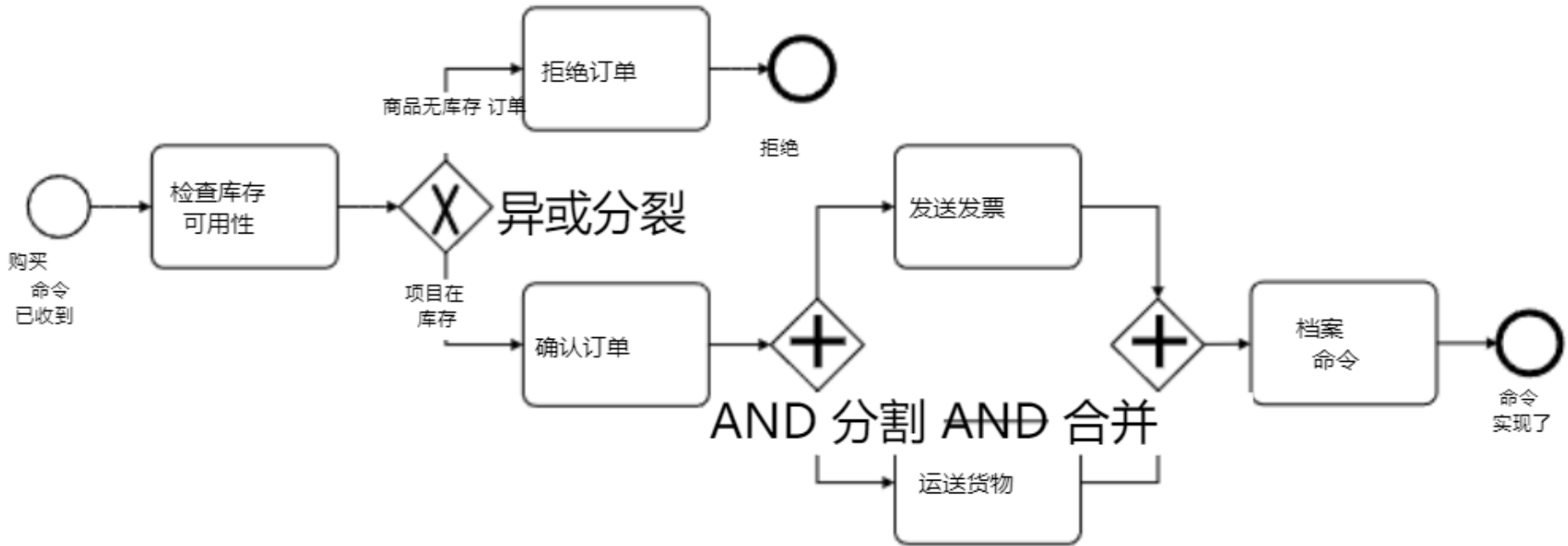
机场安检



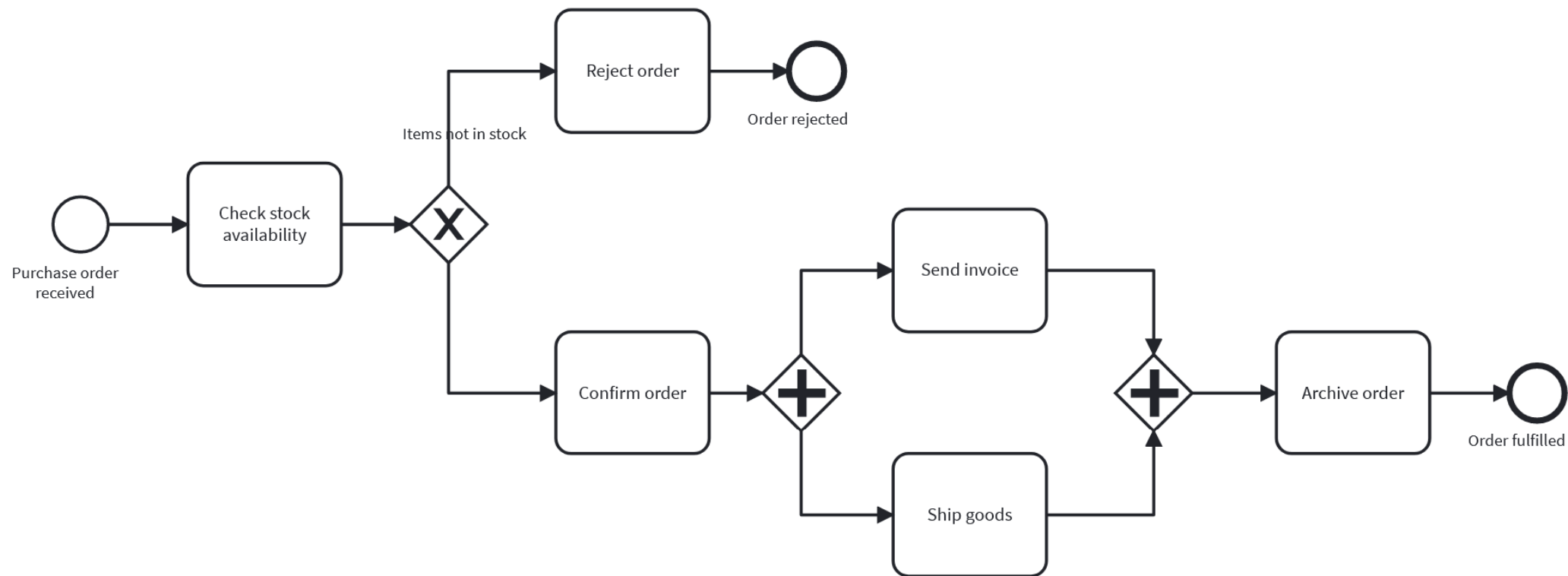
Revised order-to-cash process model



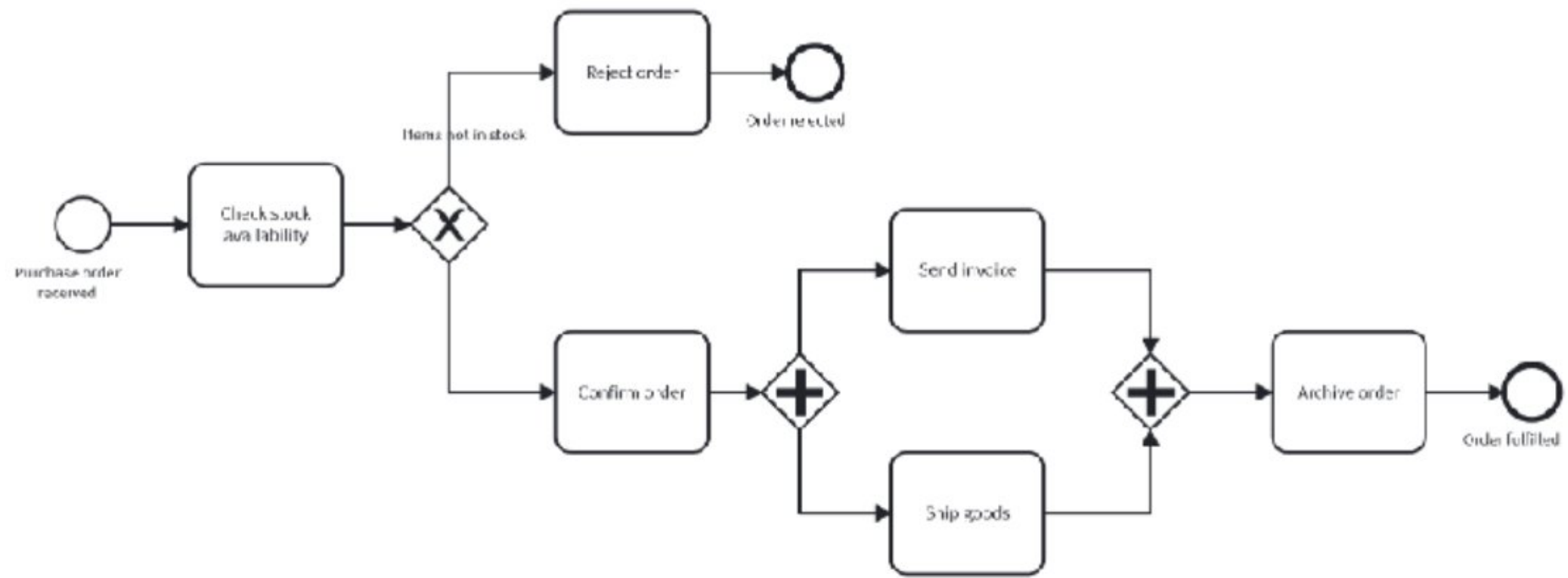
修改后的订单到现流程模型



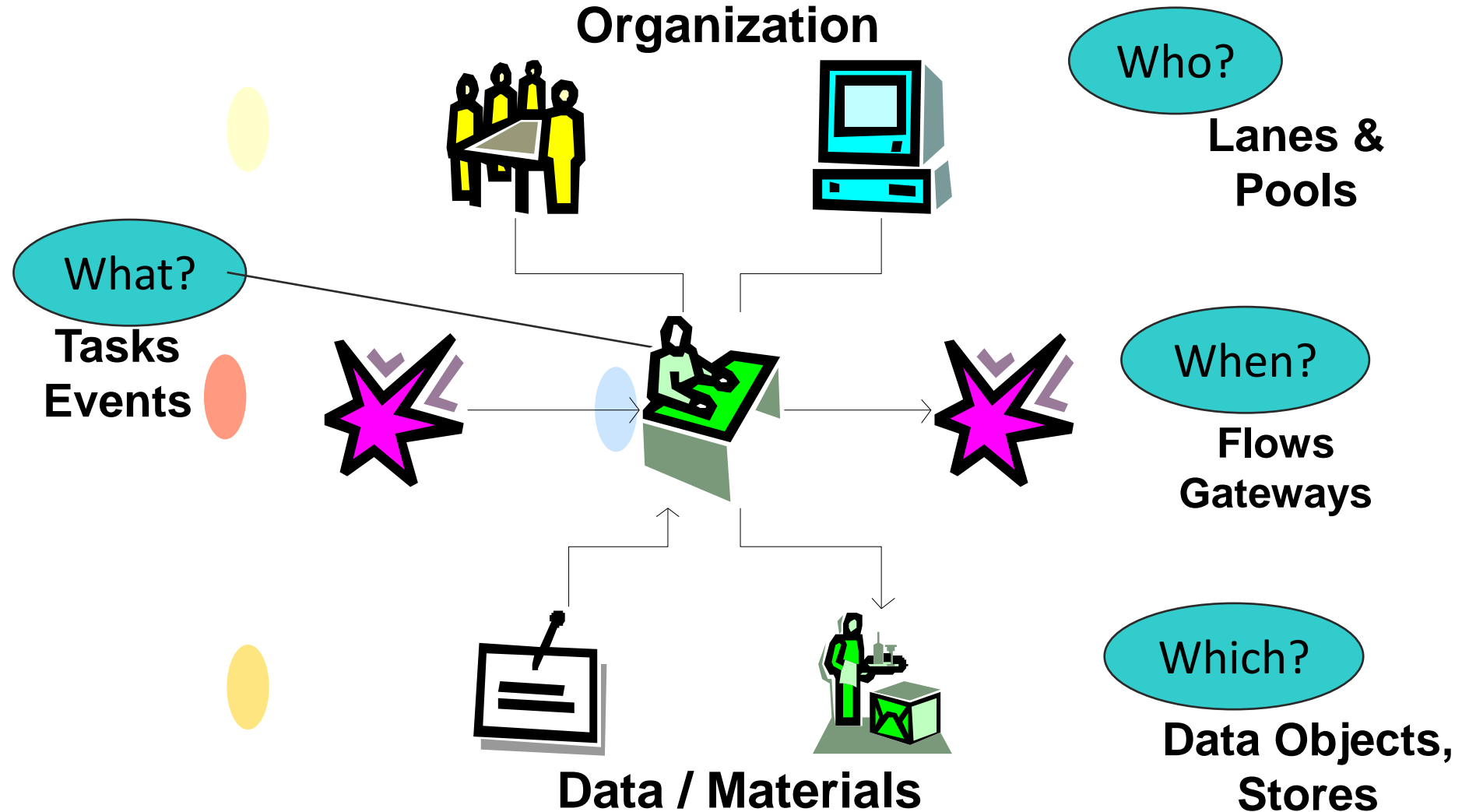
Now we can ask questions about this process to an LLM...



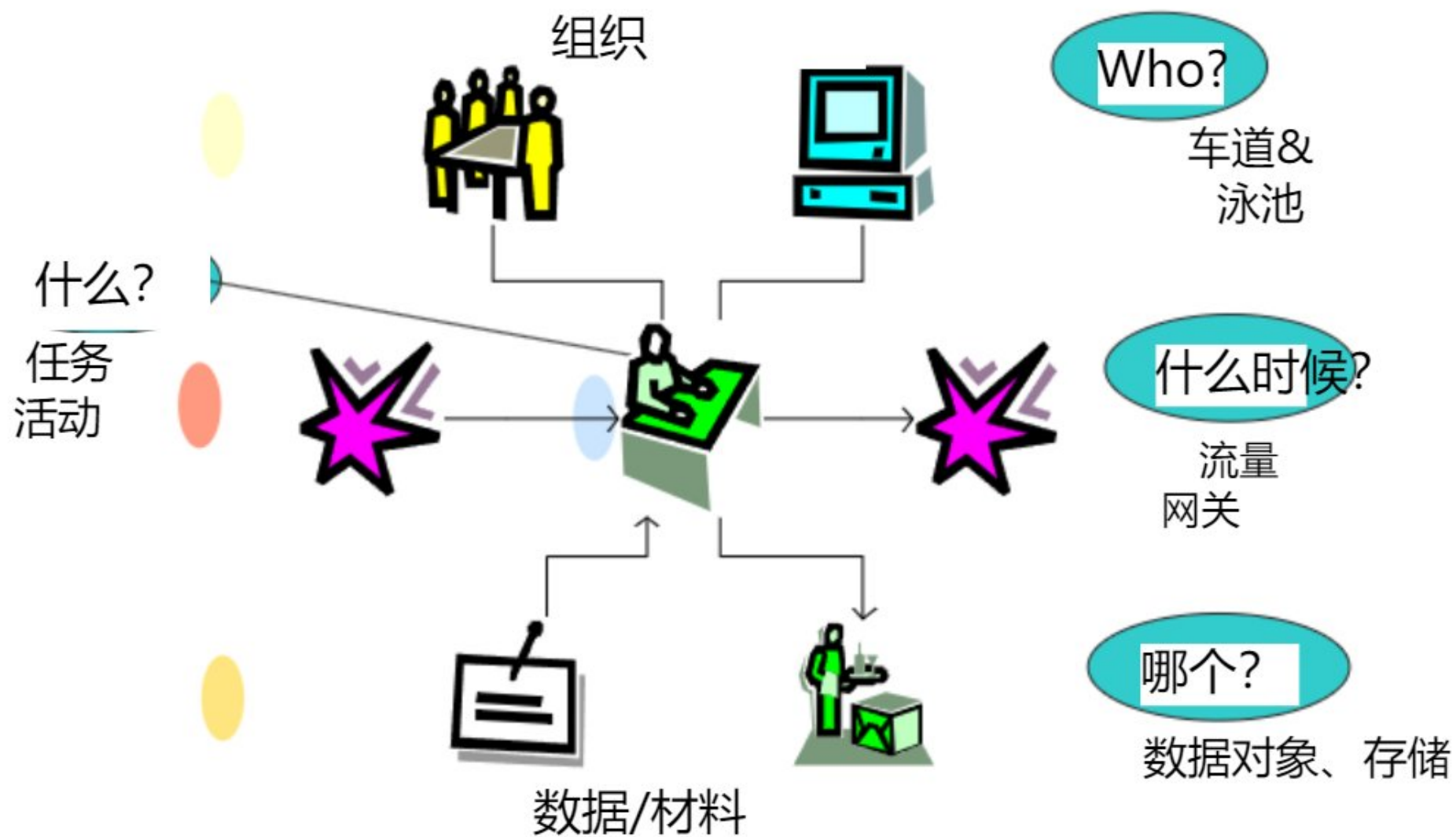
现在我们可以向法学硕士询问有关此过程的问题.....



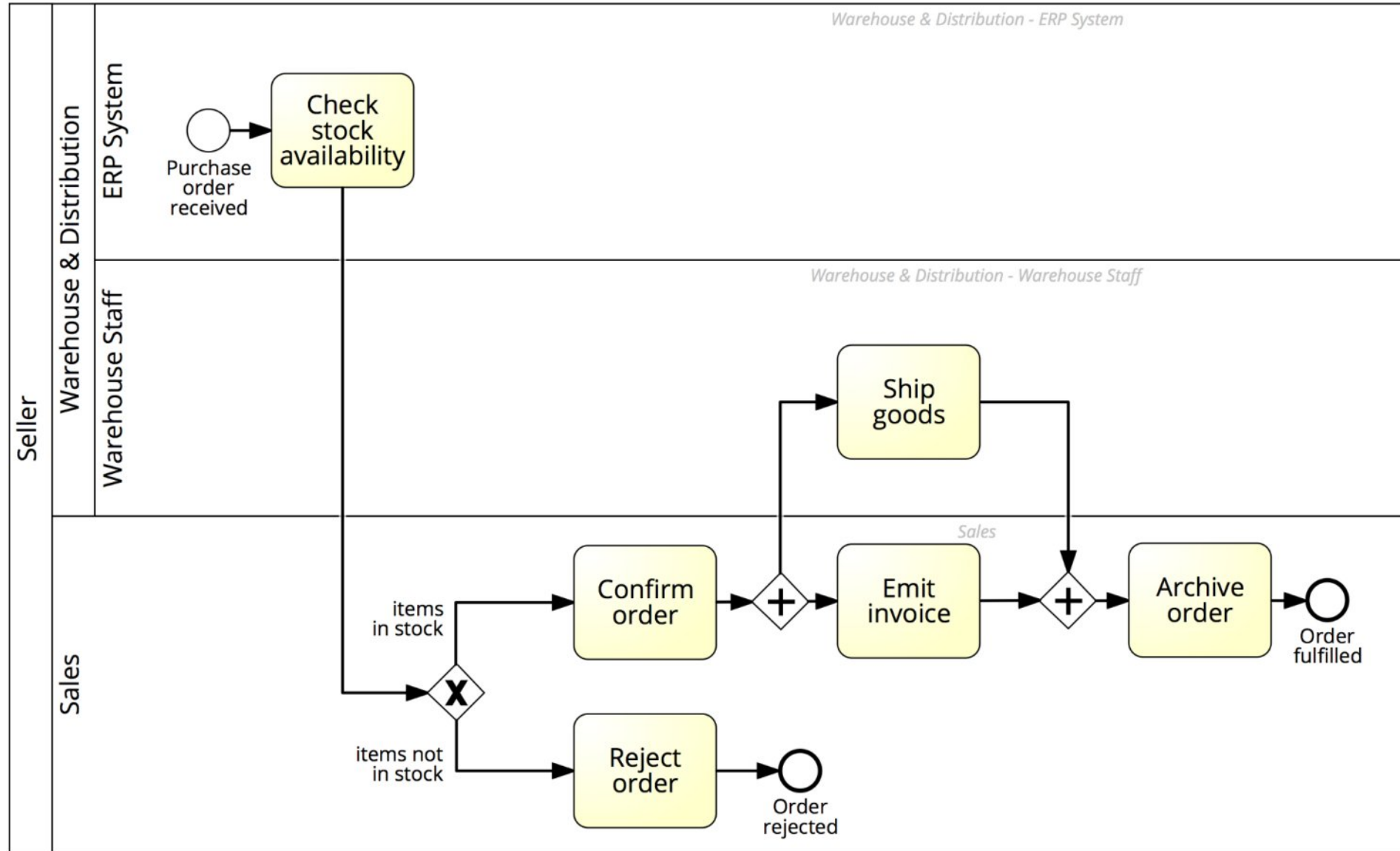
Process Modelling Viewpoints



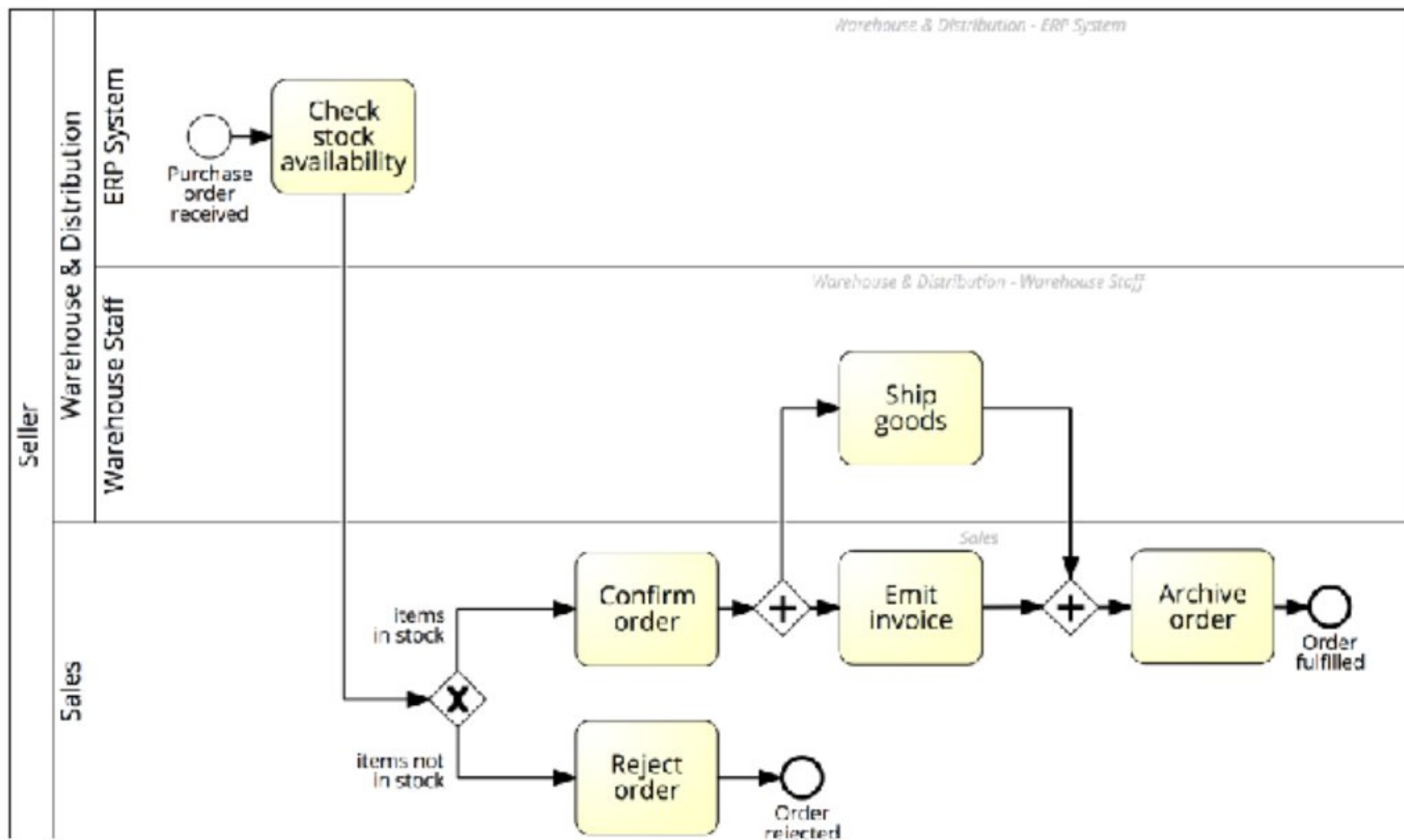
流程建模观点



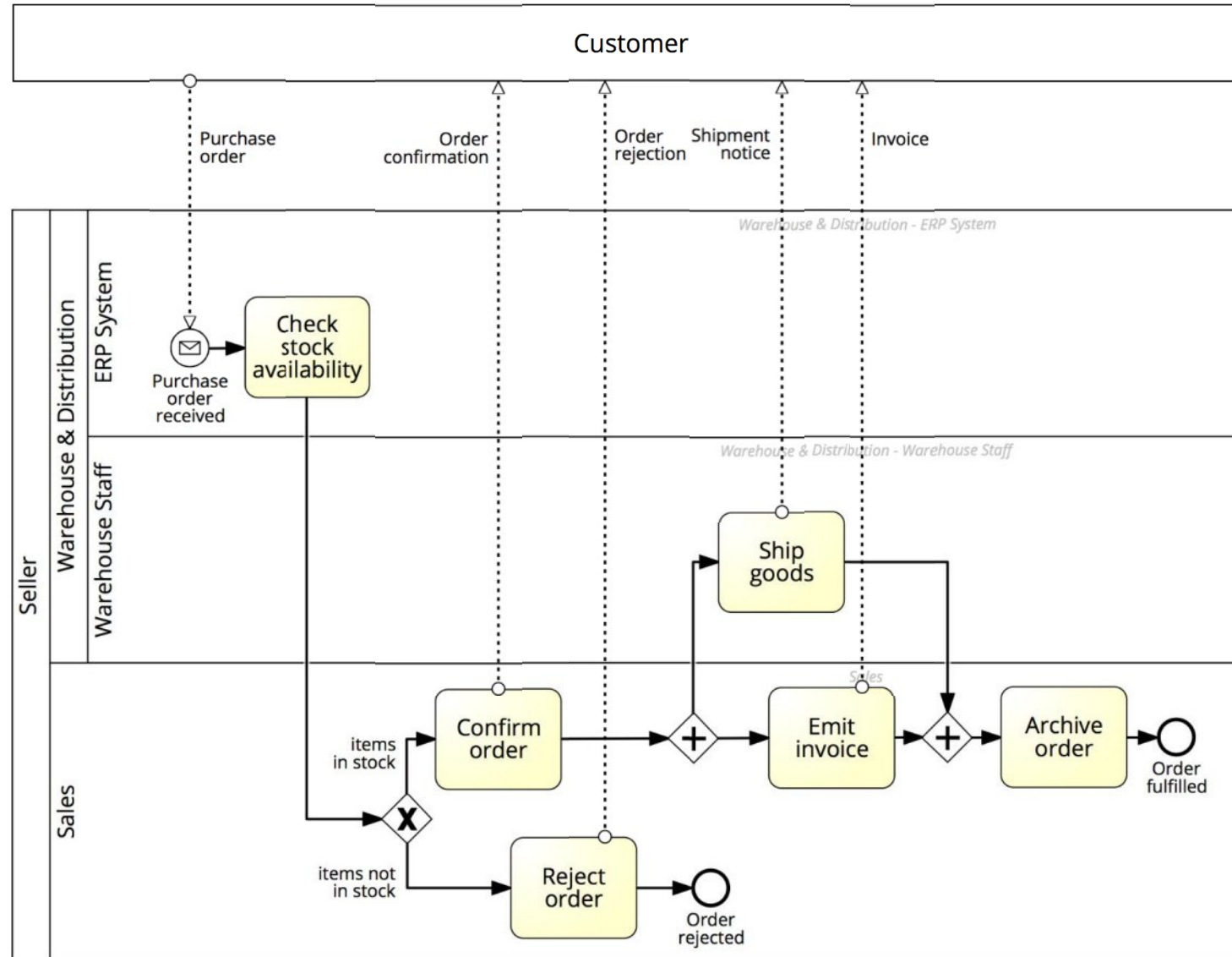
Order-to-cash process with lanes



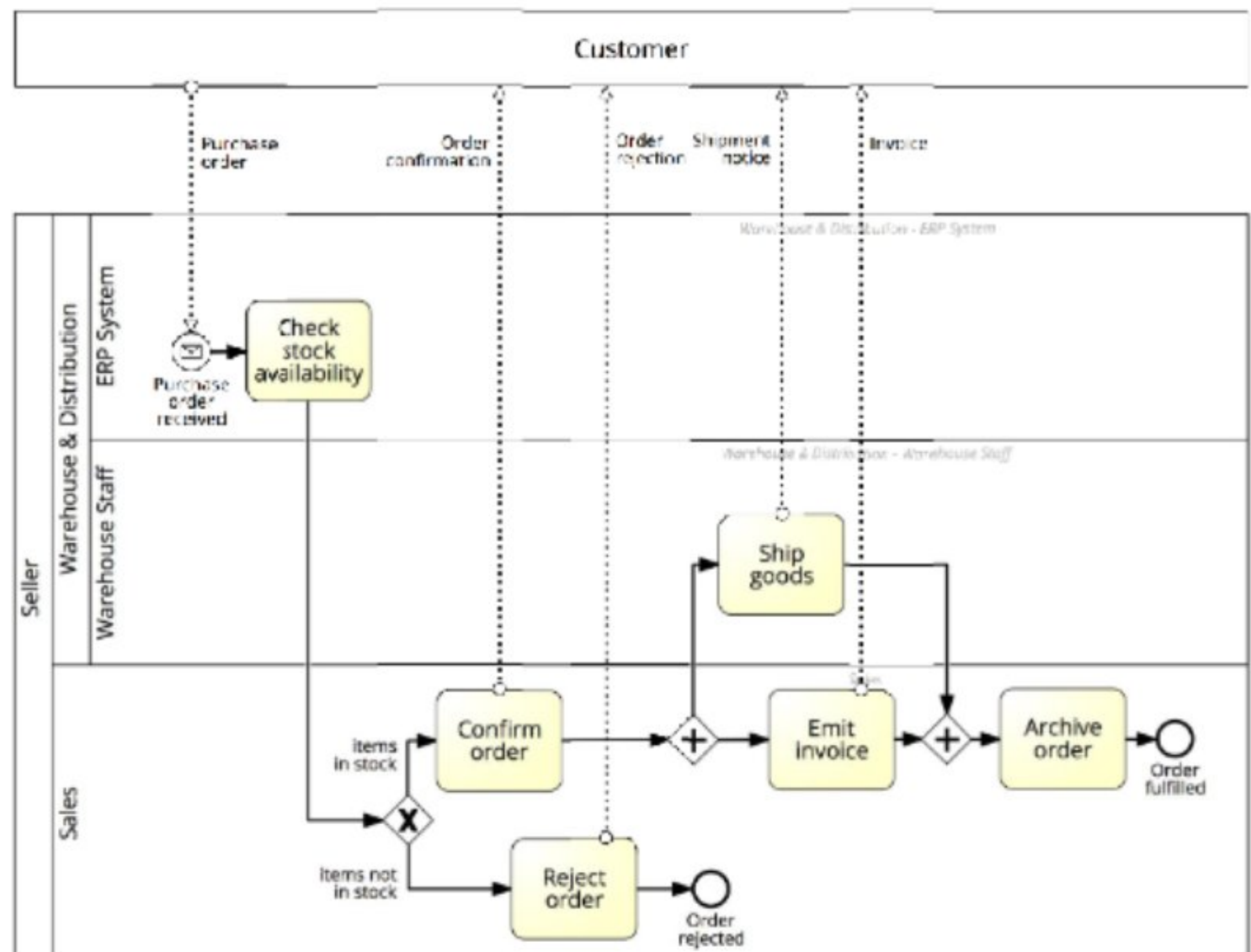
具有通道的订单到现流程



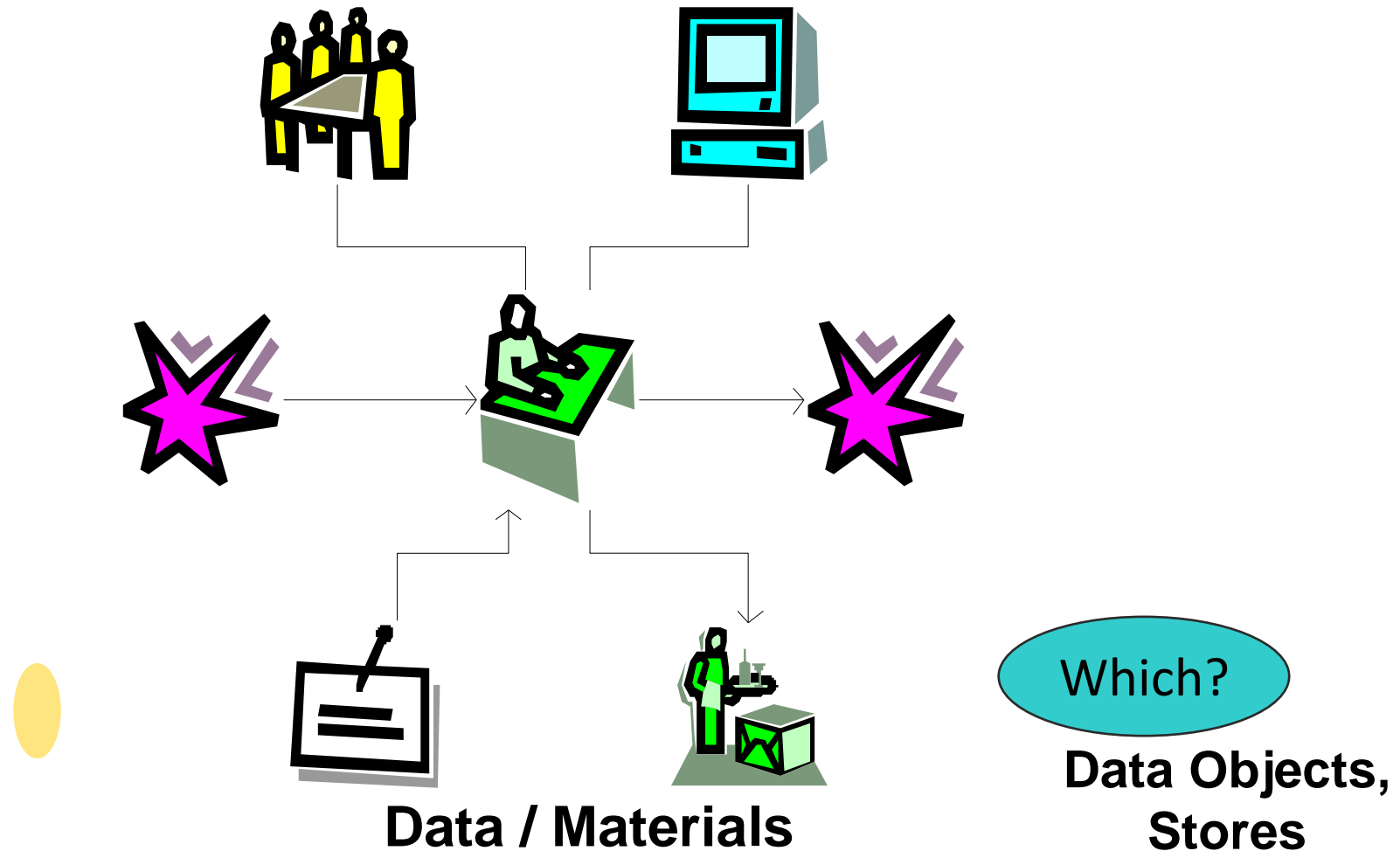
Order-to-cash process with a black-box customer pool



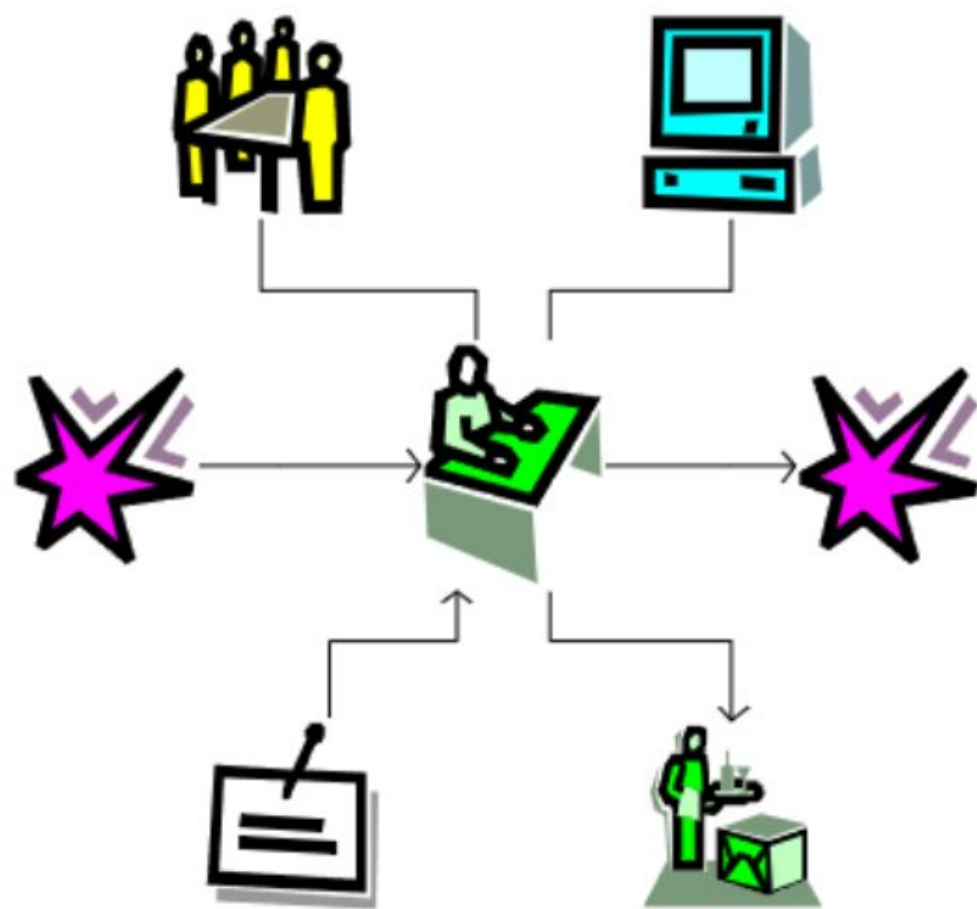
具有黑盒客户池的订单到现金流程



Process Modelling Viewpoints



流程建模观点

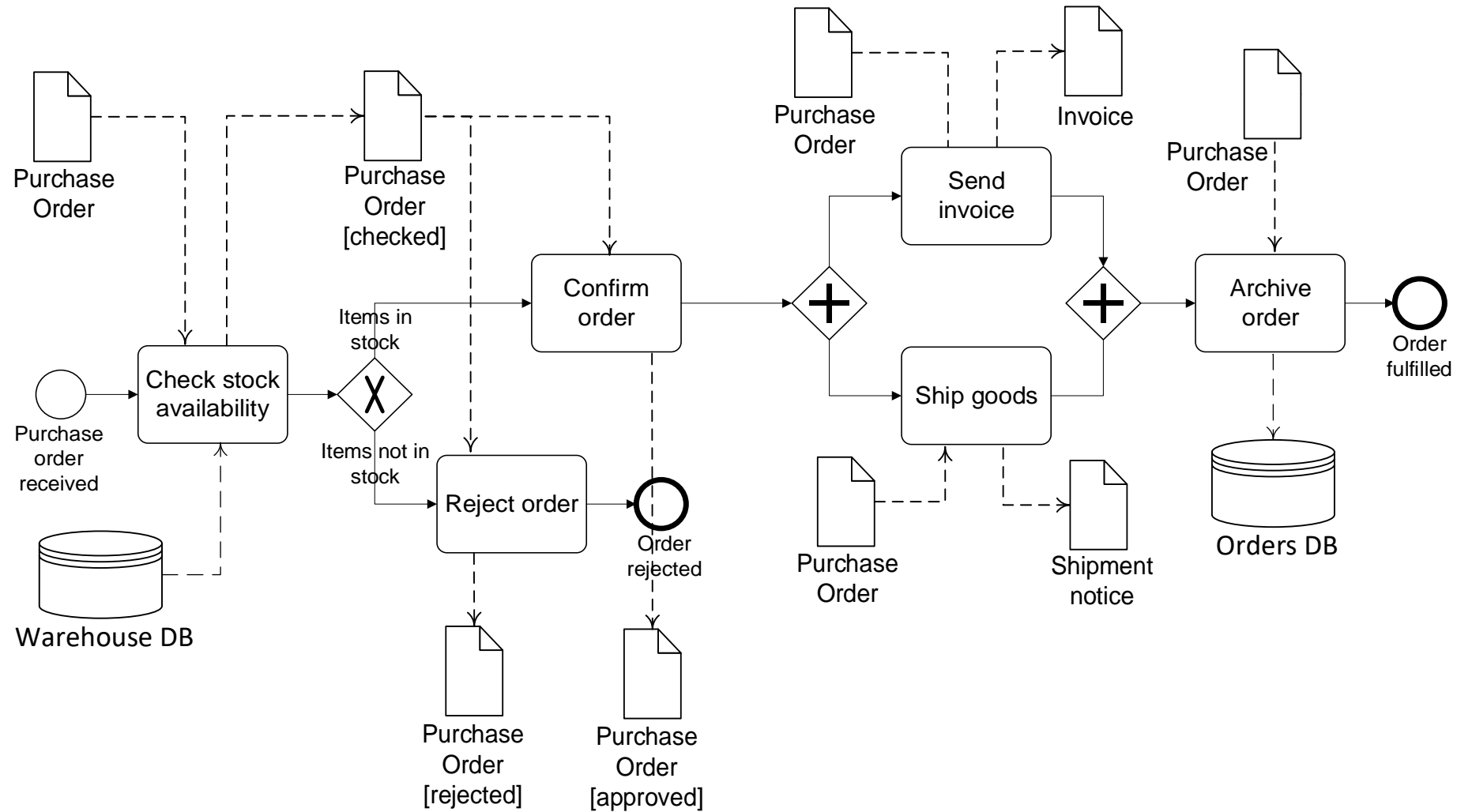


数据/材料

哪个?

数据对象、存储

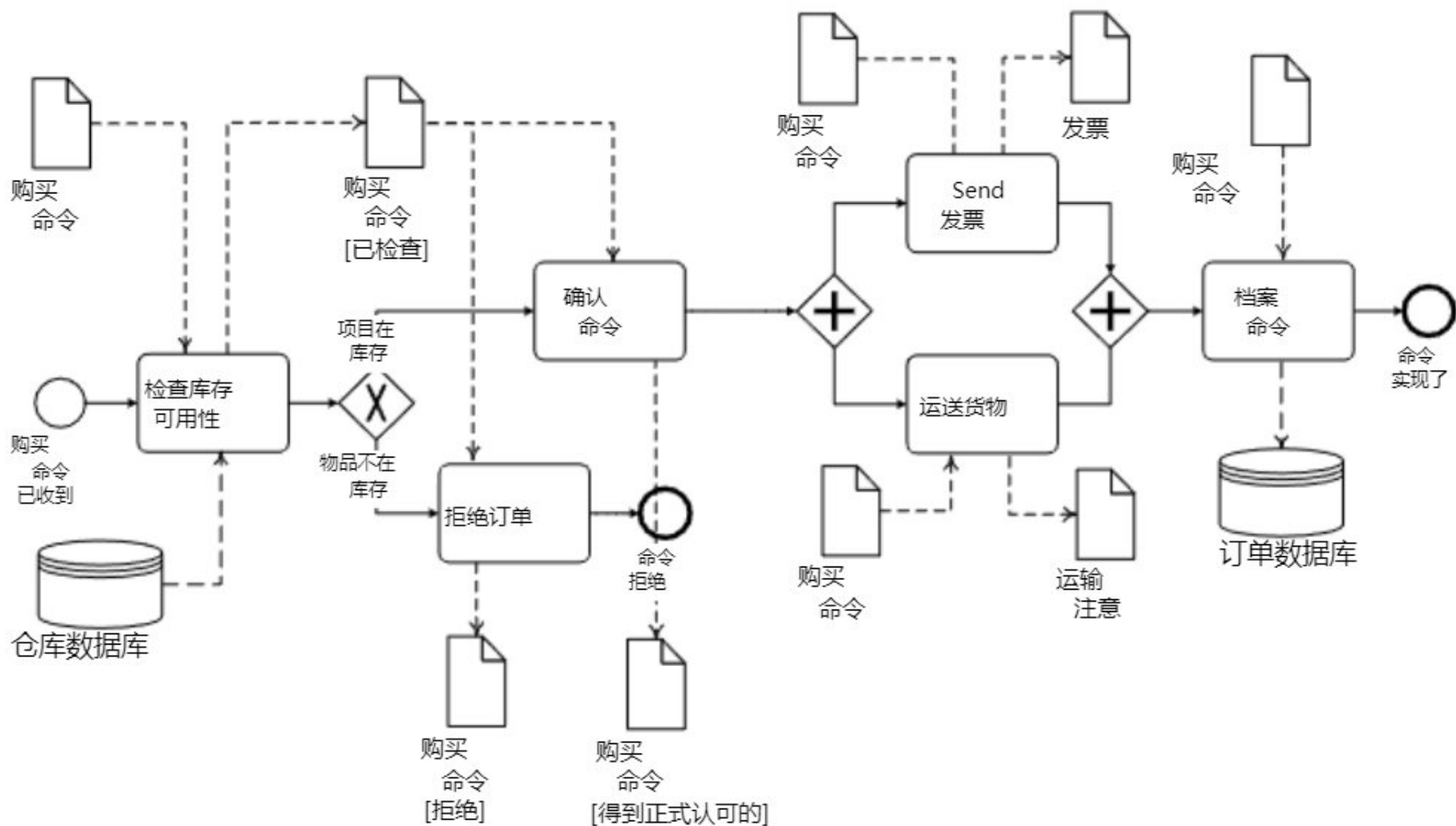
Process model with information artifacts



Beware: This diagram is a too detailed. It is for illustration purposes.

In practice, try to only model the most important data objects and associations. Keep the model readable.

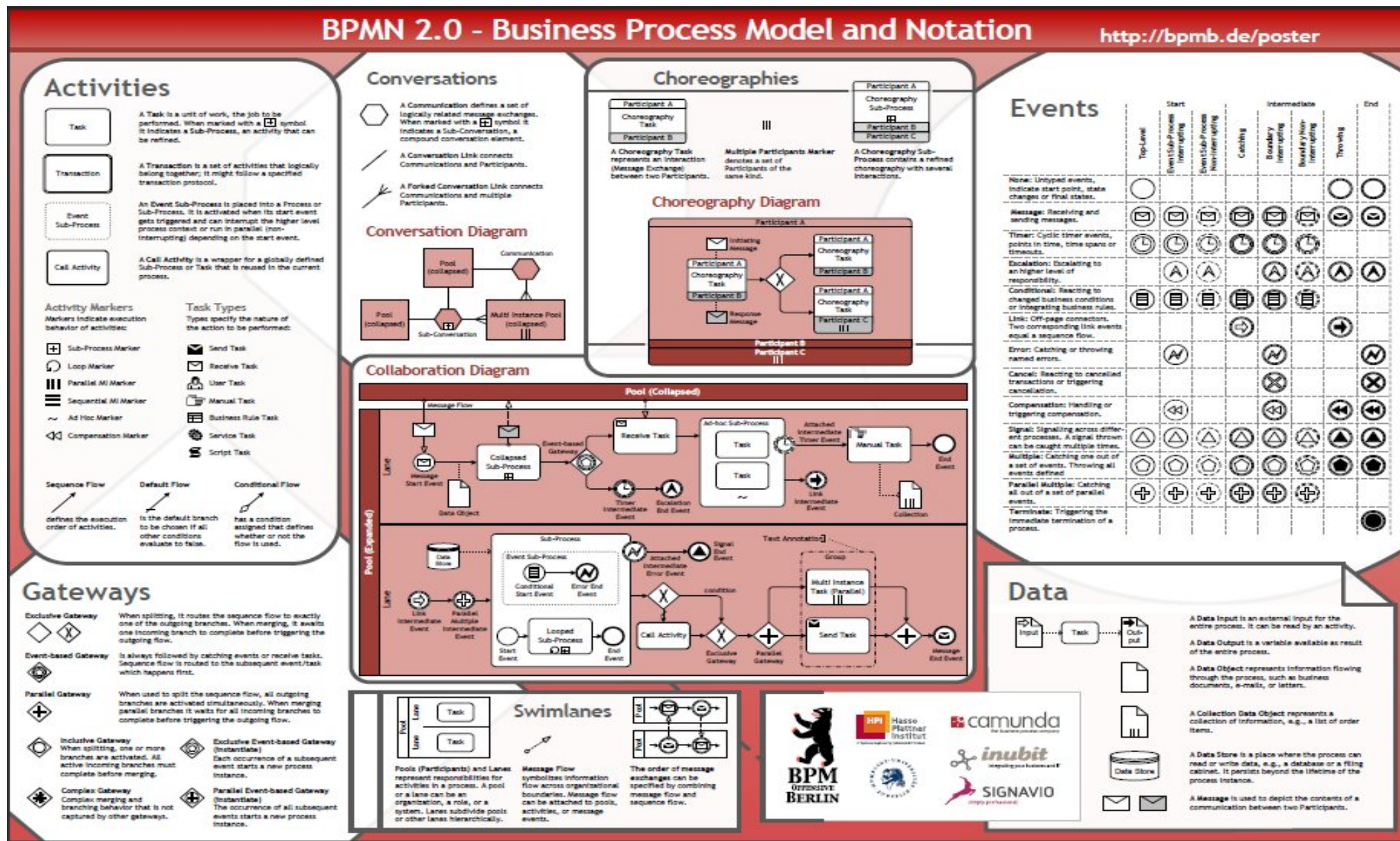
具有信息工件的流程模型



注意：此图过于详细。这是为了说明目的。

在实践中，尝试仅对最重要的数据对象和关联进行建模。保持模型的可读性。

BPMN Poster



BPMN 海报

