



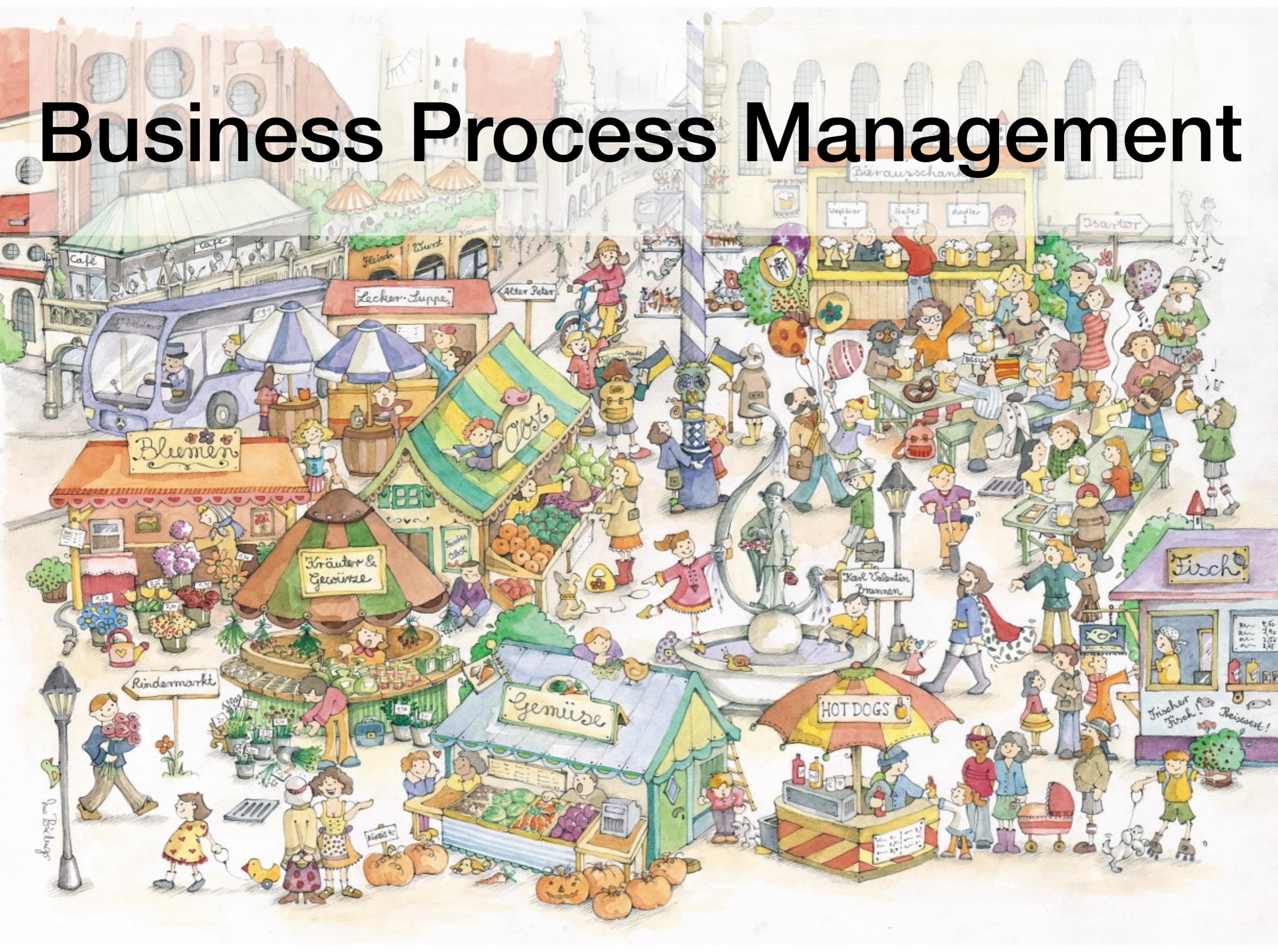
Processes and Organizations

A look behind the paper wall

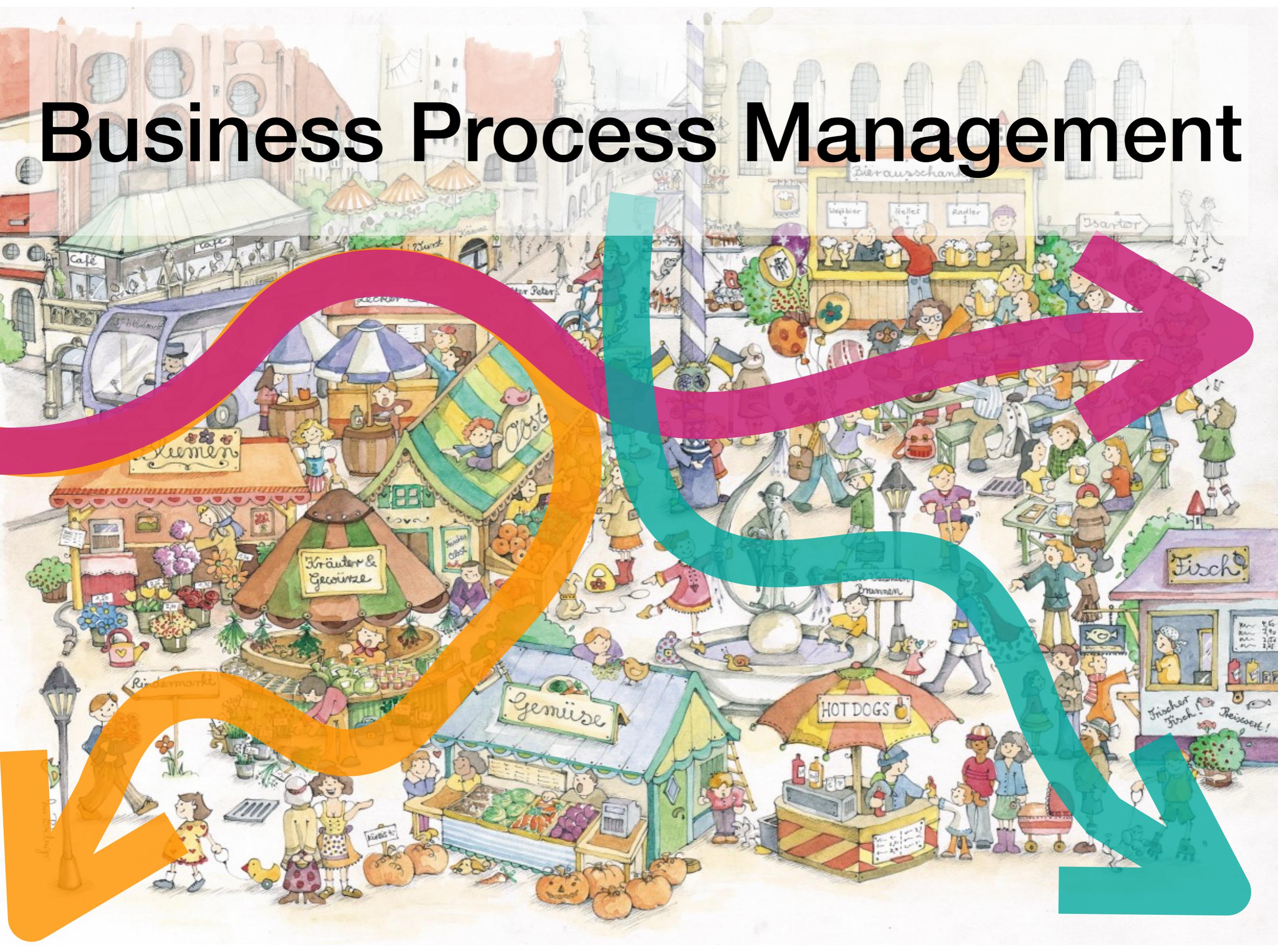
Marco Montali :: Free University of Bozen-Bolzano

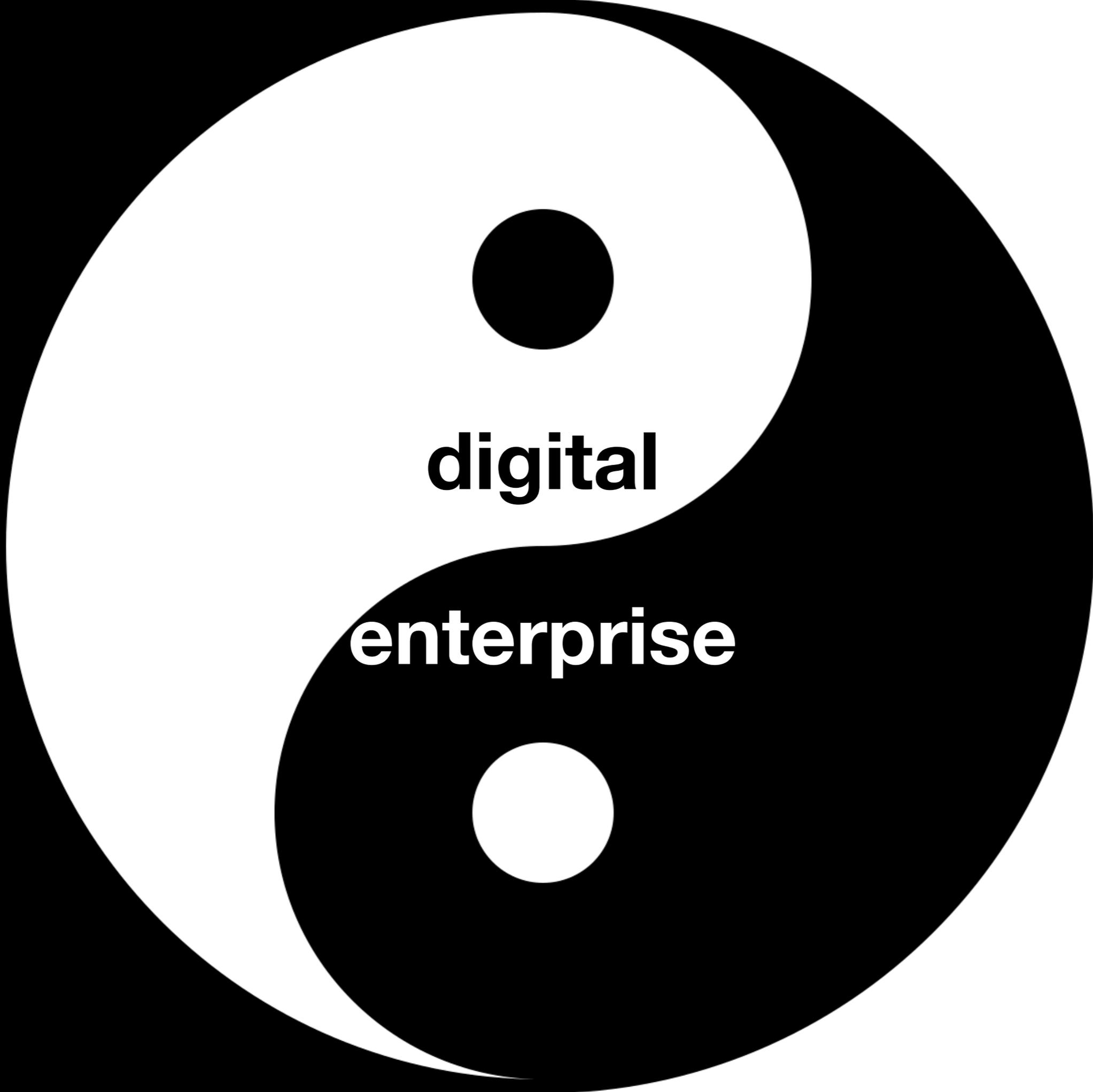
Fit for Digital, 23/10/2019

Business Process Management



Business Process Management

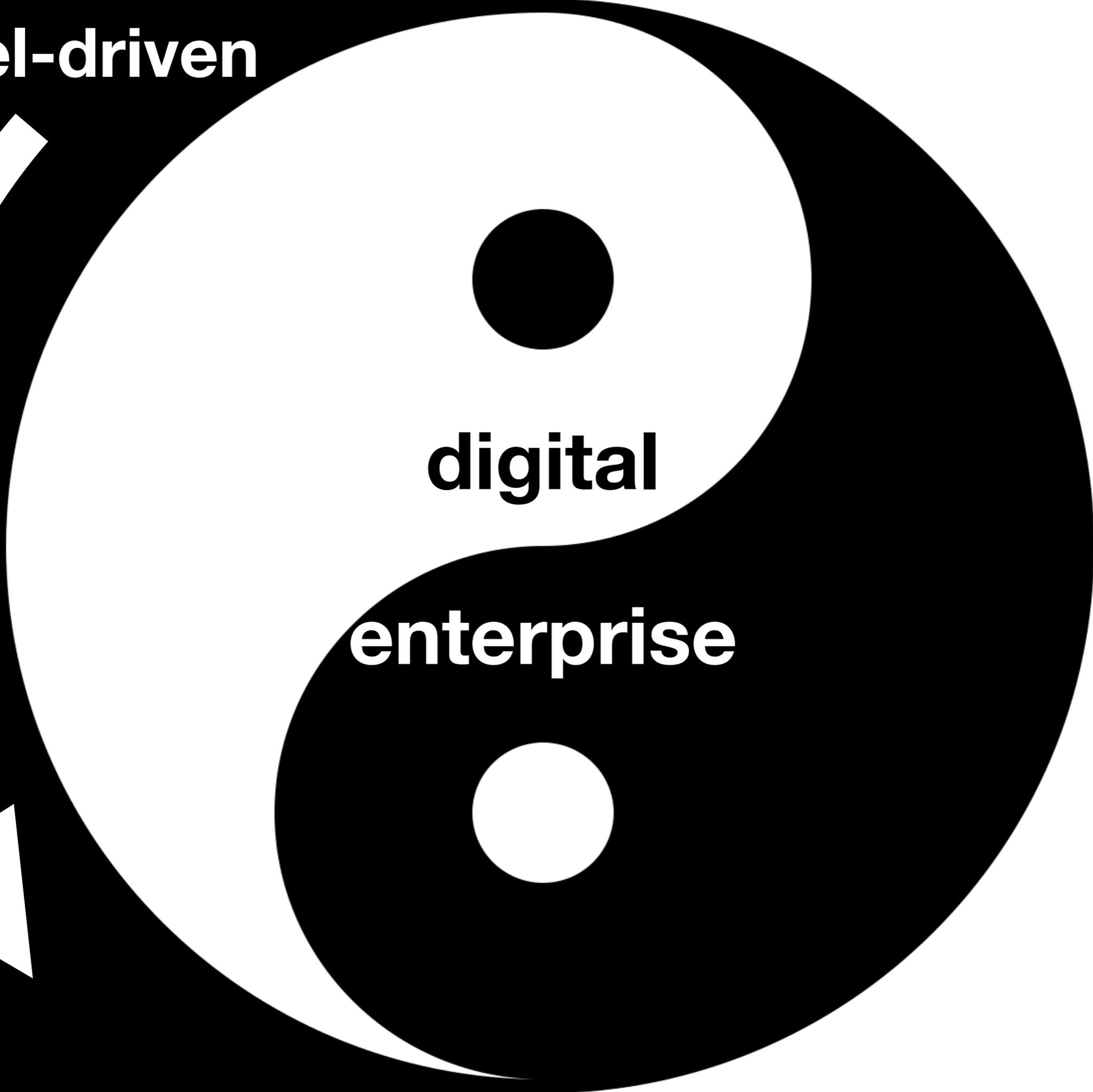




digital

enterprise

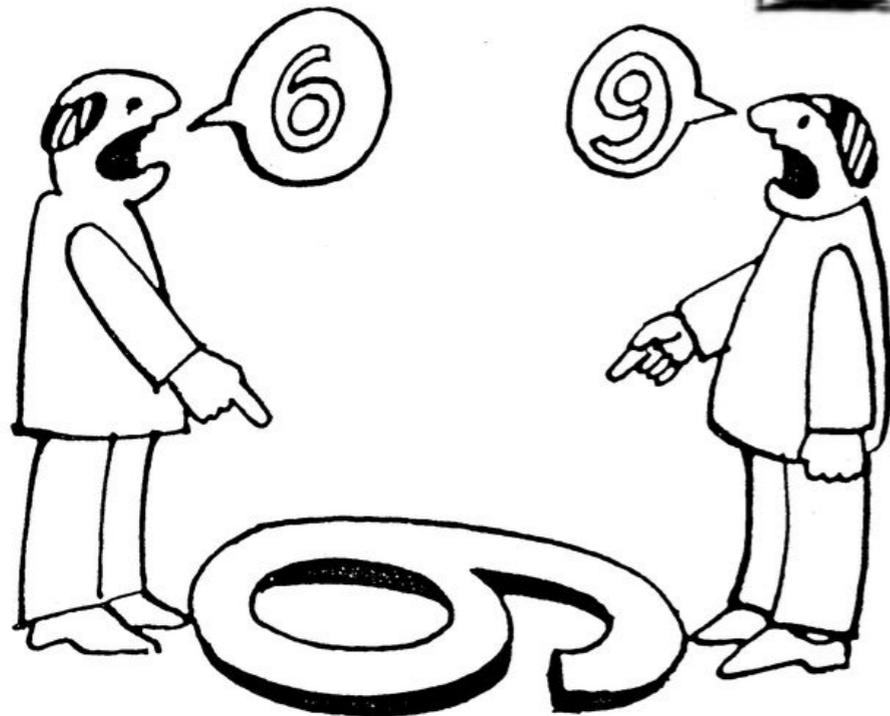
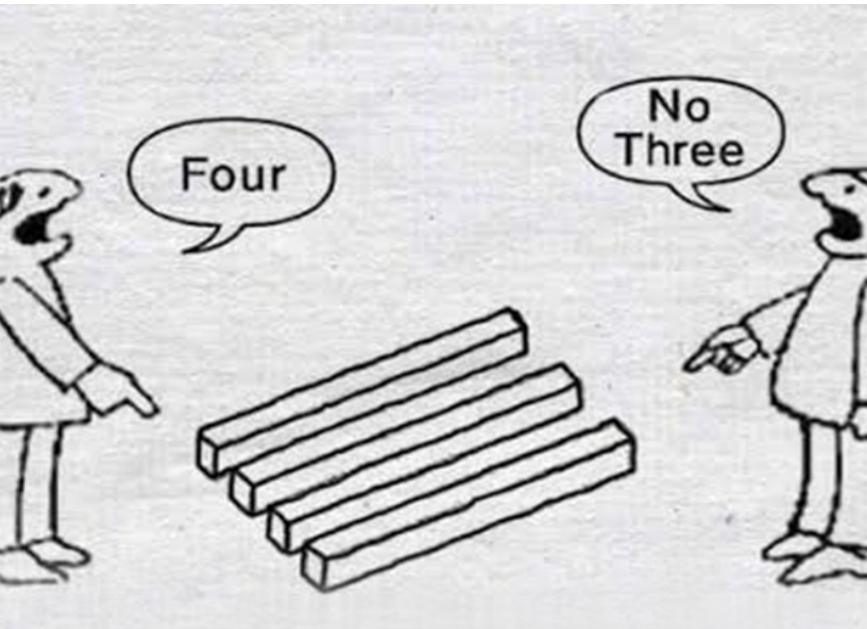
model-driven



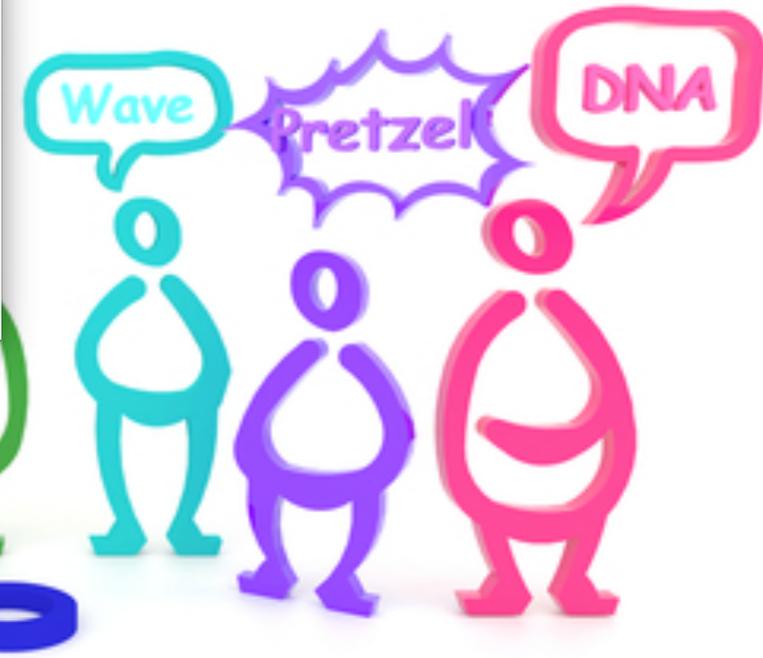
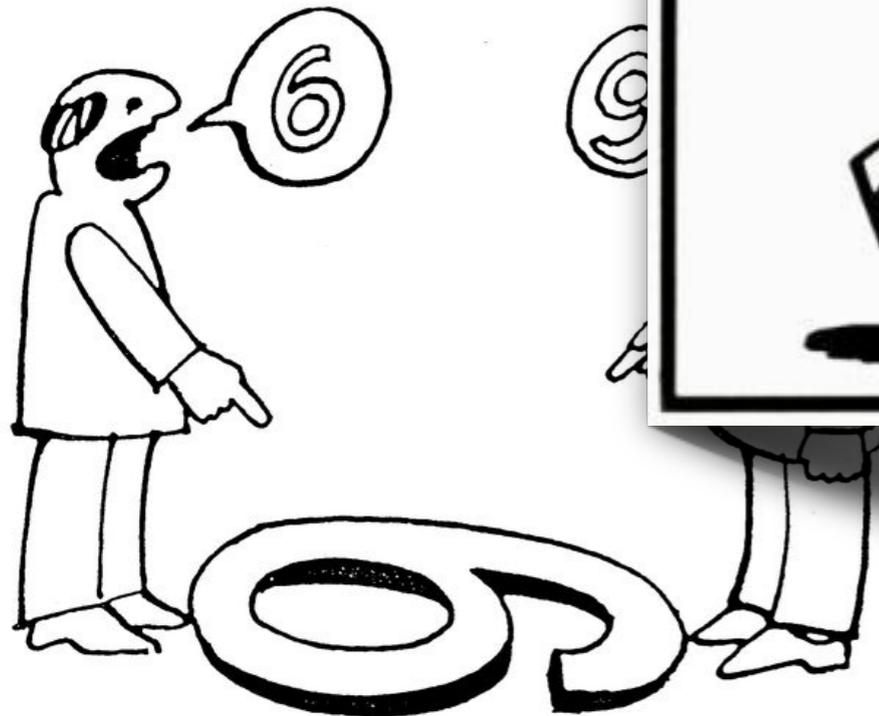
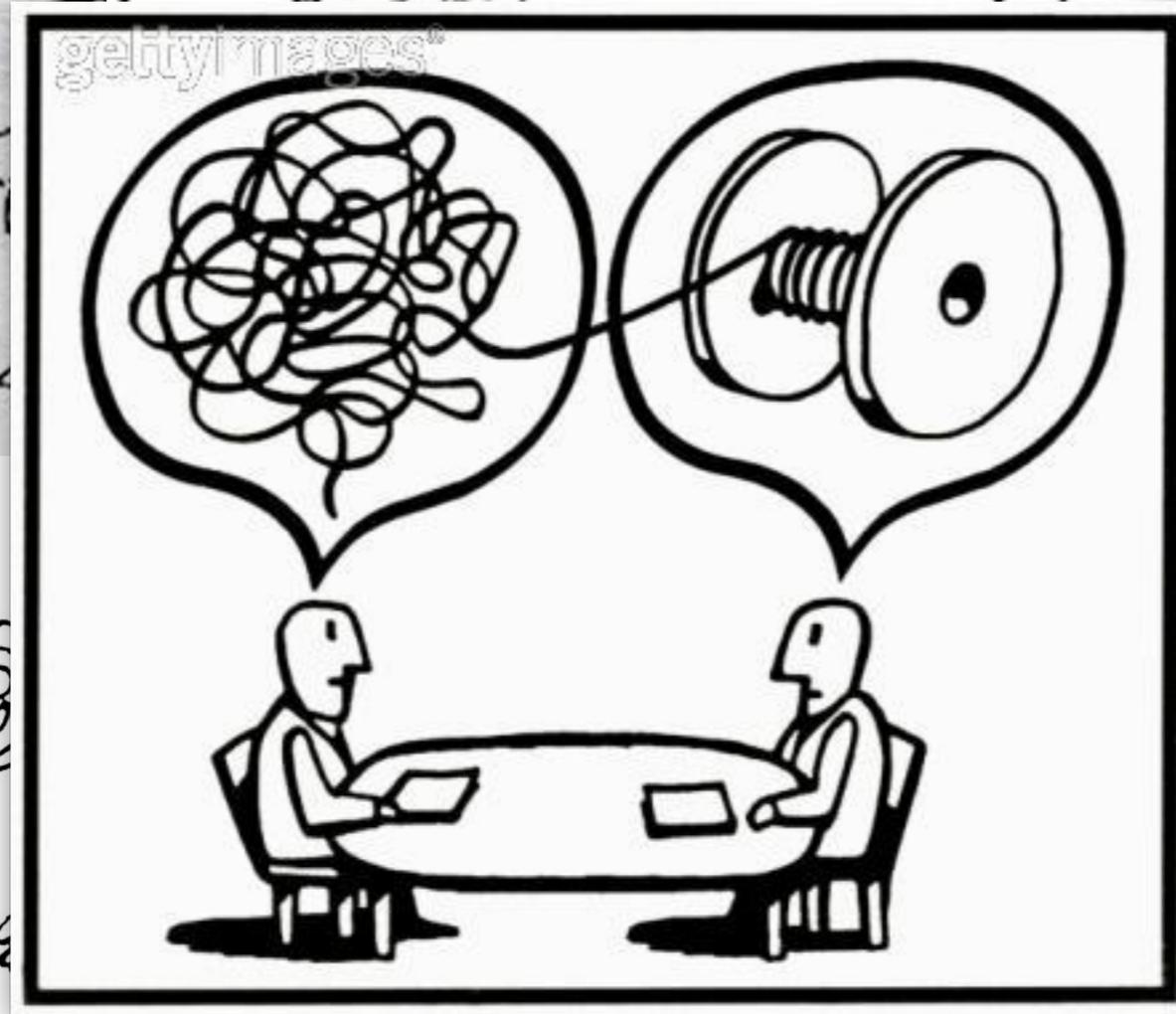
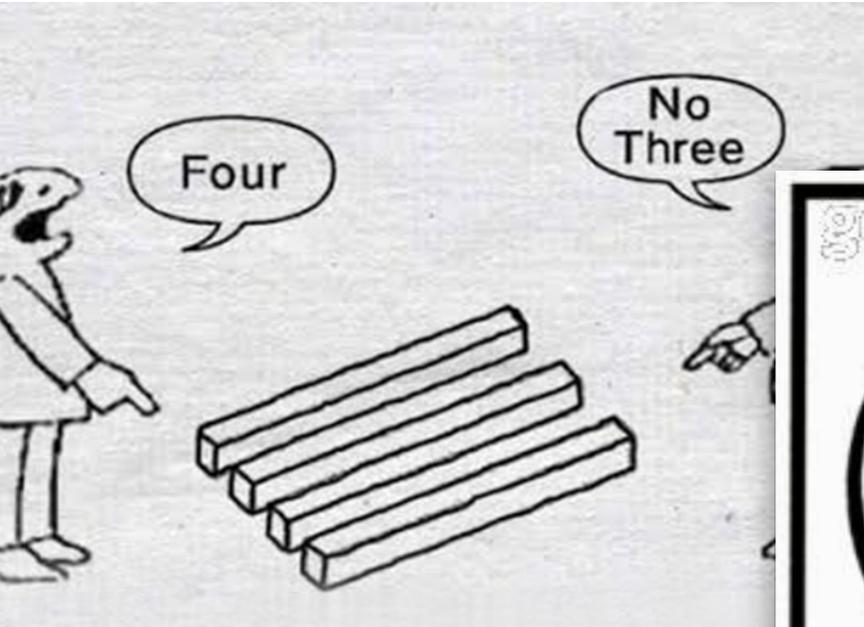
digital

enterprise

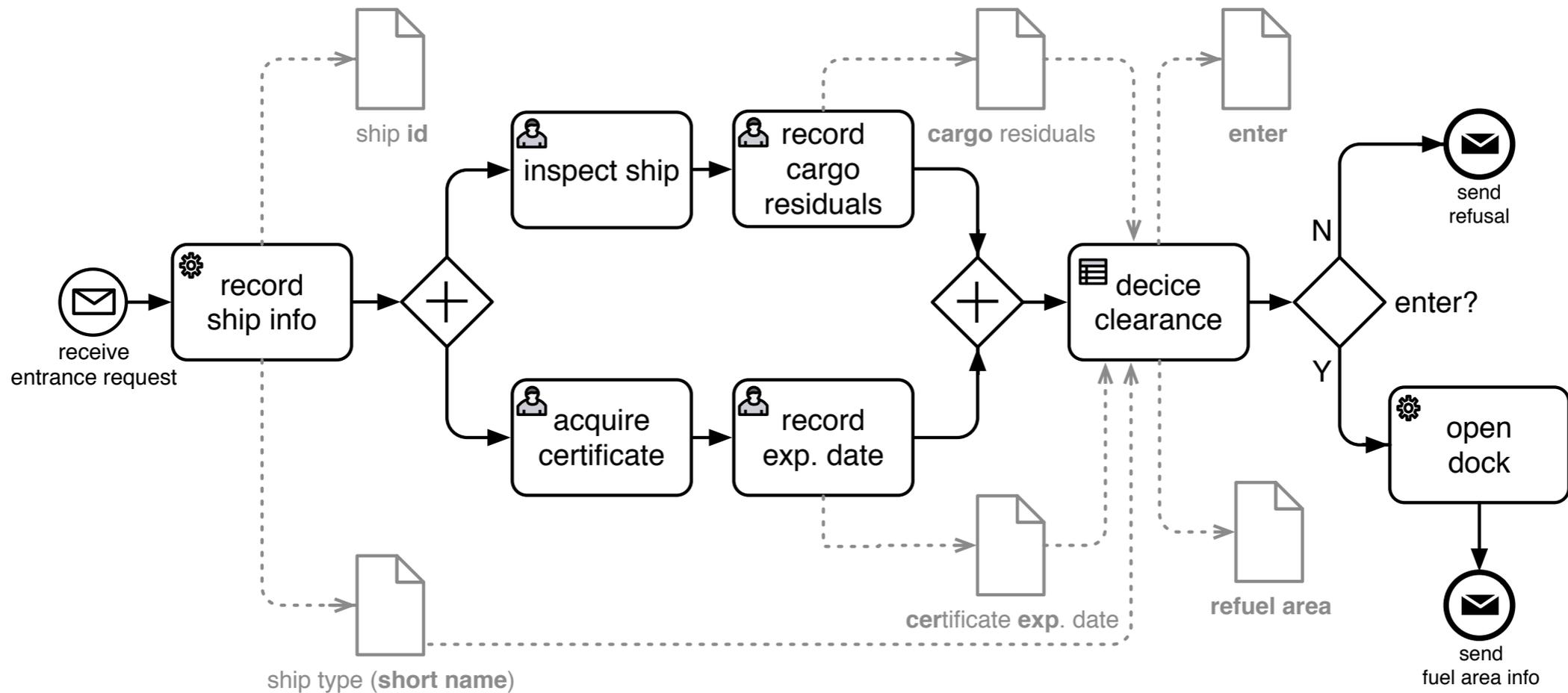
Conceptual modeling



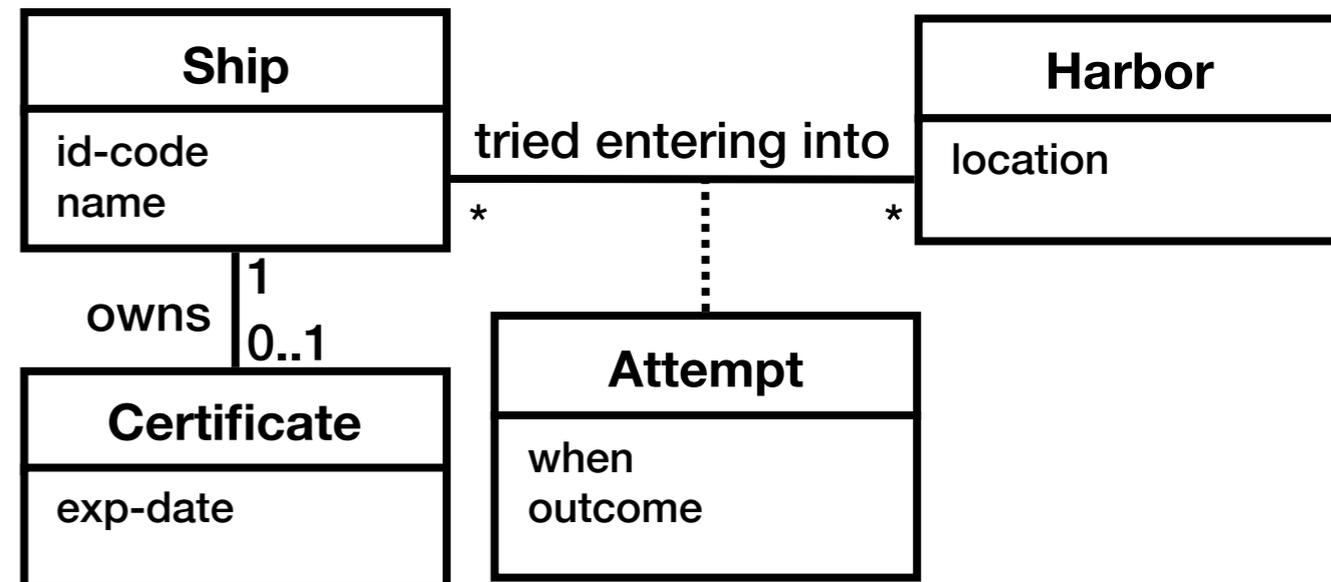
Conceptual modeling



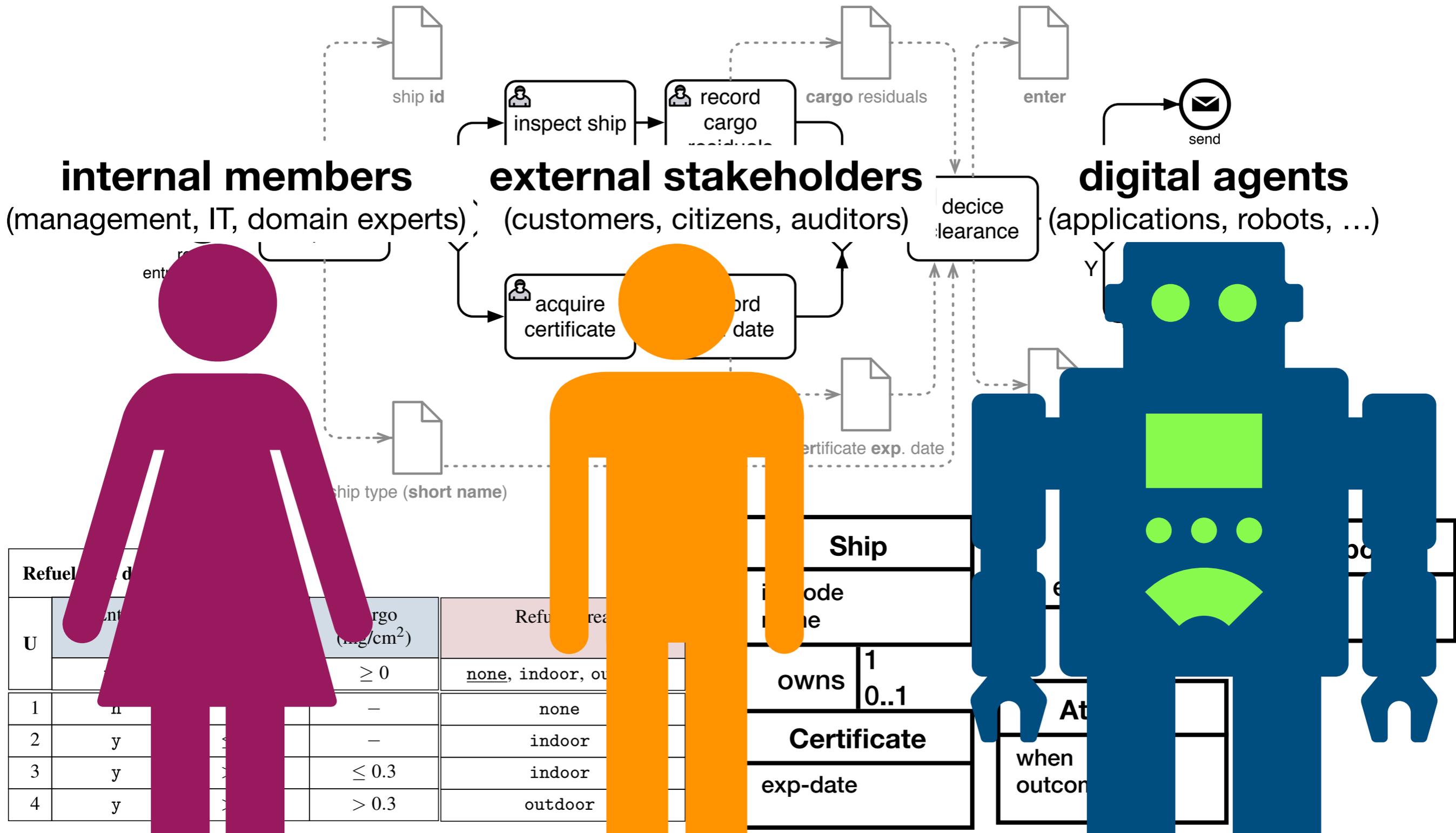
Understand, share, explain



Refuel area determination				
U	Enter	Length (m)	Cargo (mg/cm ²)	Refuel Area
	y,n	≥ 0	≥ 0	<u>none</u> , indoor, outdoor
1	n	—	—	none
2	y	≤ 350	—	indoor
3	y	> 350	≤ 0.3	indoor
4	y	> 350	> 0.3	outdoor

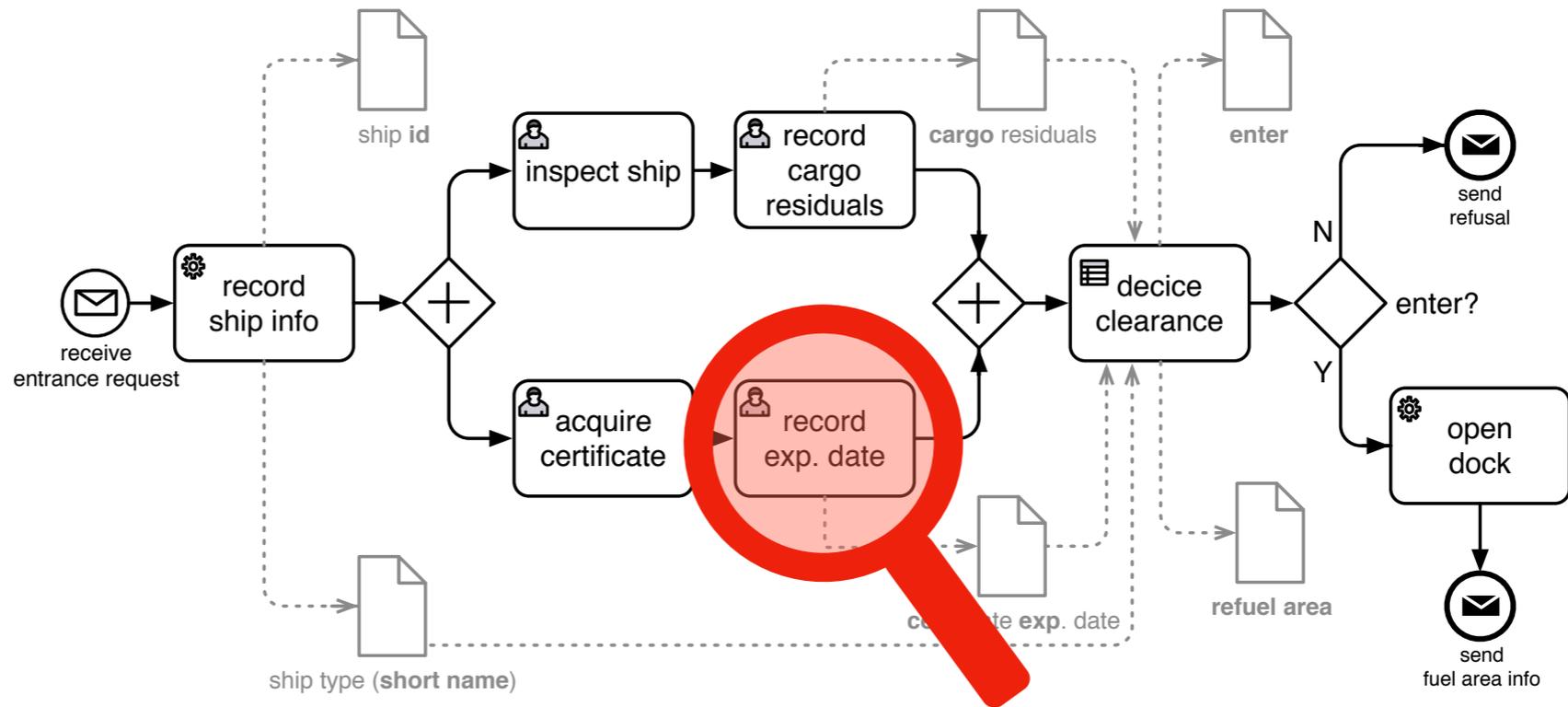


Understand, share, explain



Machines can use models...

for automated analysis



for execution support

-
-
-

The screenshot shows the Camunda Tasklist interface. On the left, there is a sidebar with task lists: 'My Tasks' (6 items), 'My Group Tasks', 'Accounting', 'John's Tasks', 'Mary's Tasks', and 'Peter's Tasks'. The main area displays a list of tasks, with the top one being 'Assign Approver' (Invoice Receipt) assigned to 'Demo Demo' 8 minutes ago, with a 3-day follow-up. The right panel shows the detailed view of this task, including a form to assign an approver. The form fields include: 'Who should approve this invoice?' (text input), 'Creditor' (Great Pizza for Everyone Inc.), 'Amount' (30€), 'Invoice Number' (GPFE-23232323), and 'Approver:' (text input).

Do models reflect reality?

(Does management understand what is going on?)



Do models reflect reality?

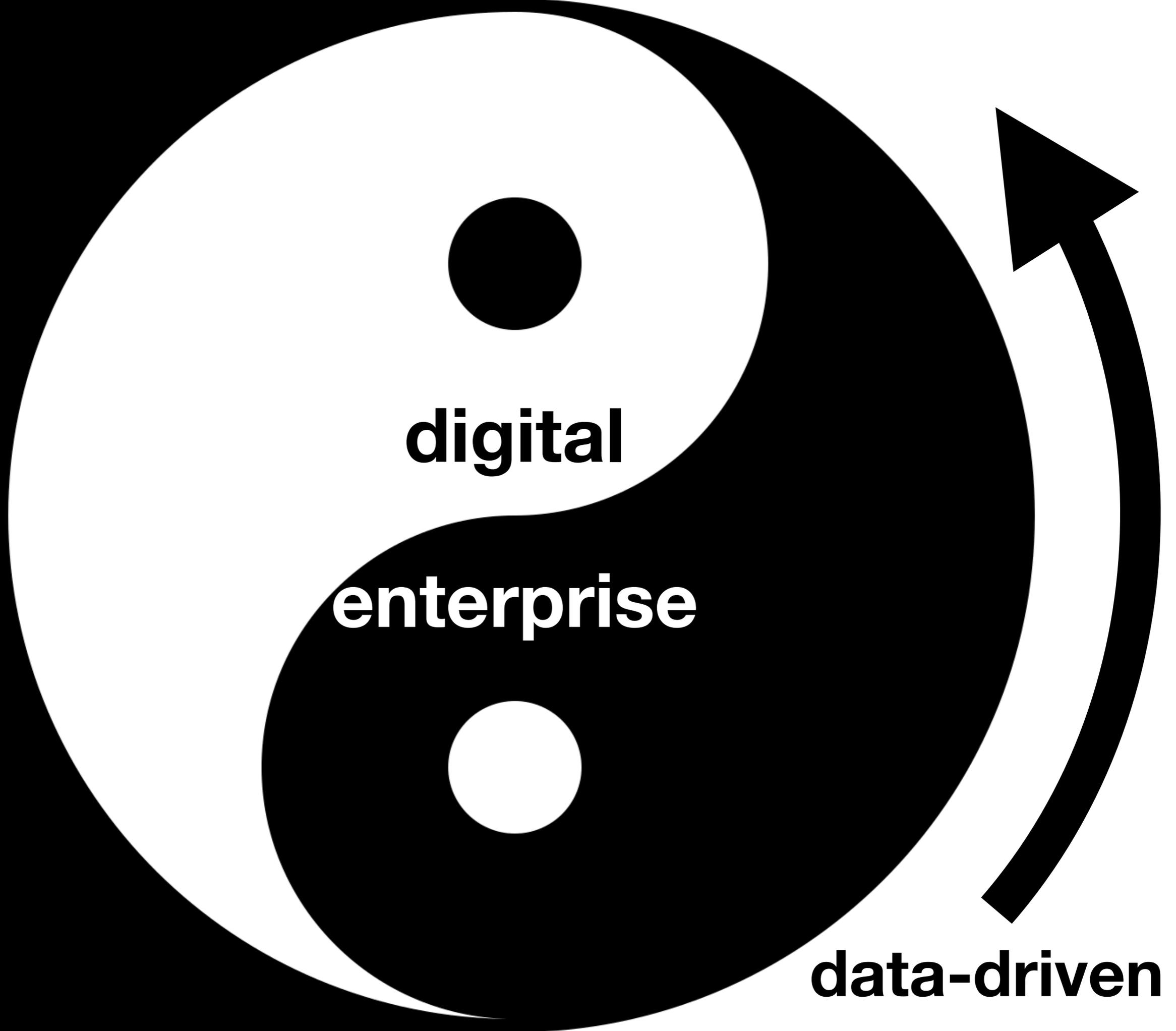
(Does management understand what is going on?)



Do models reflect reality?

(Does management understand what is going on?)





digital

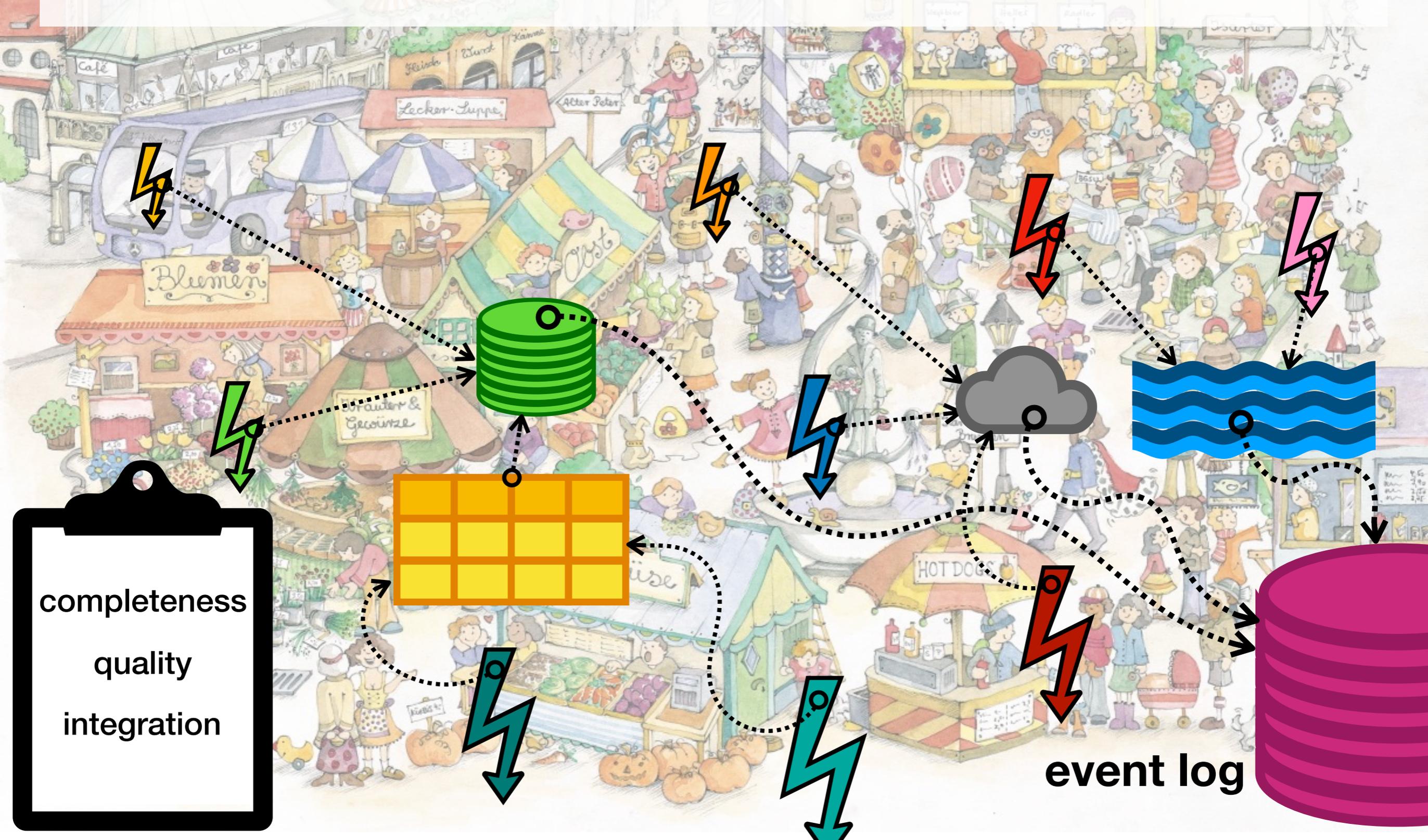
enterprise

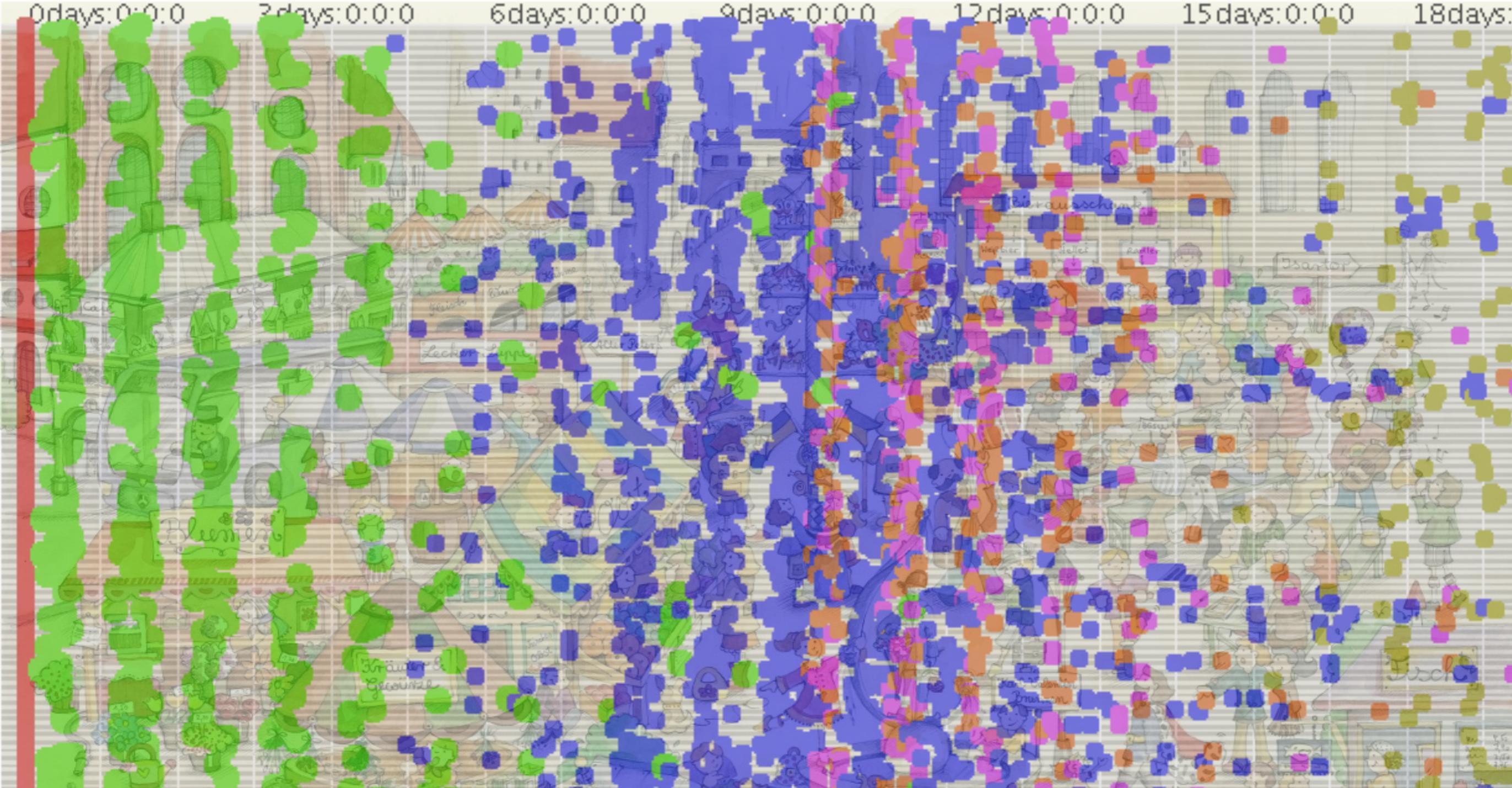
data-driven

Going digital



Going digital in reality





A sea of event data tracing the evolution of process instances...

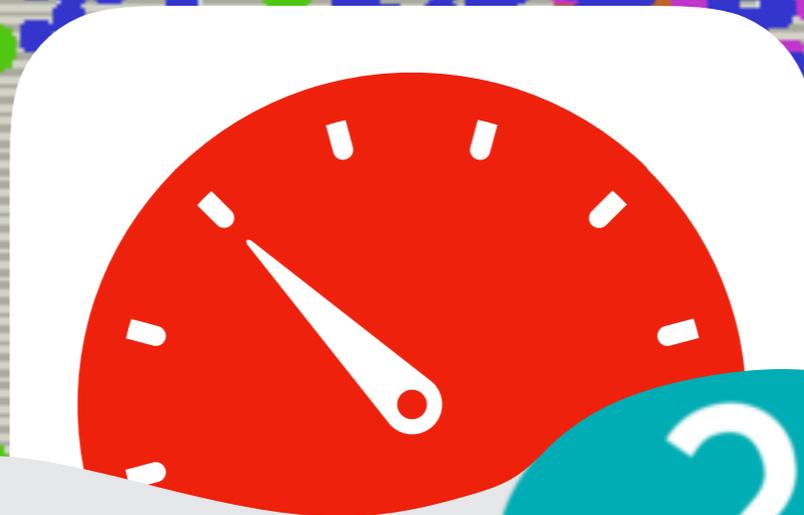
0days:0:0:0 3days:0:0:0 6days:0:0:0 9days:0:0:0 12days:0:0:0 15days:0:0:0 18days:0:0:0

... to compute indicators



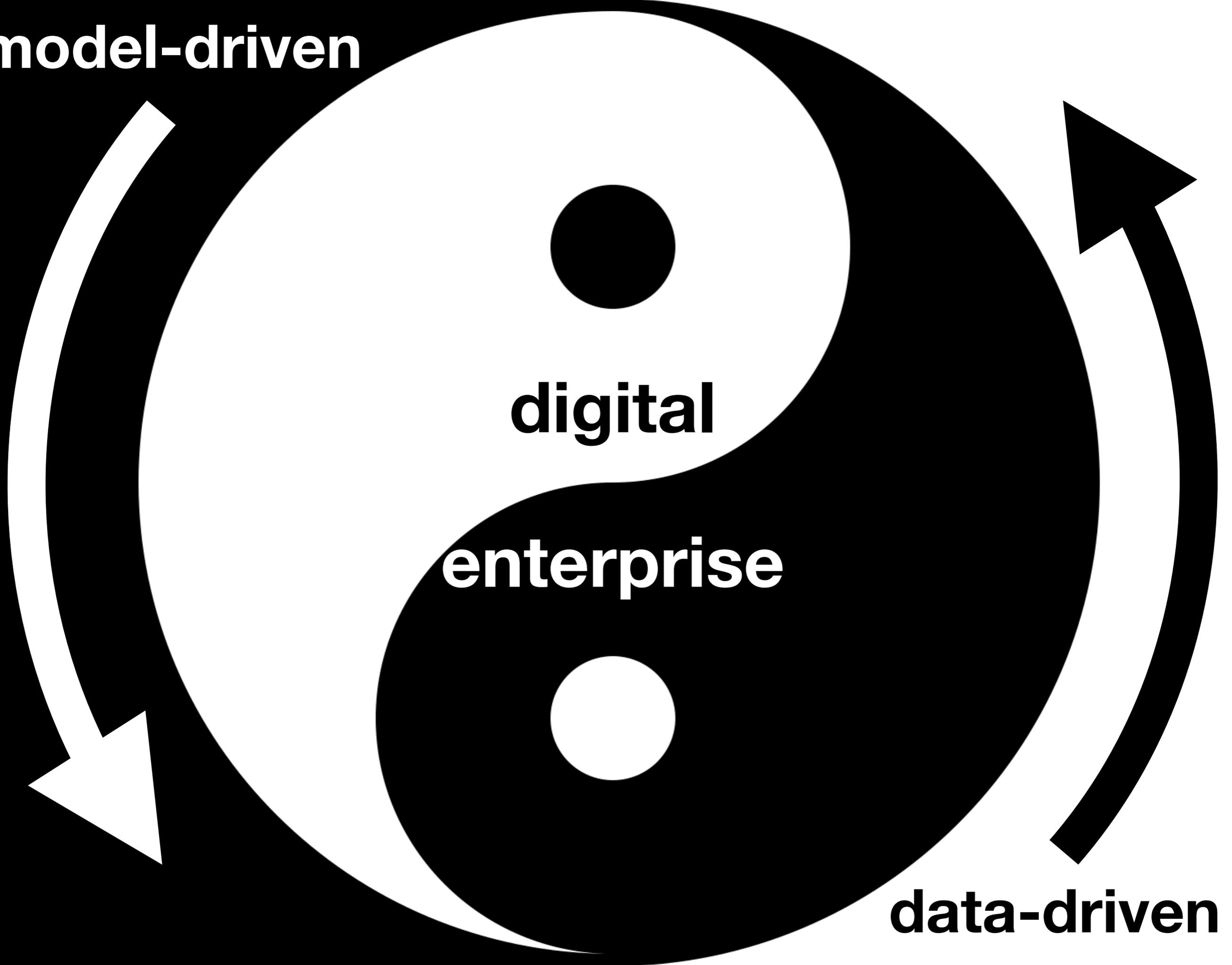
0days:0:0:0 3days:0:0:0 6days:0:0:0 9days:0:0:0 12days:0:0:0 15days:0:0:0 18days:0:0:0

... to compute indicators

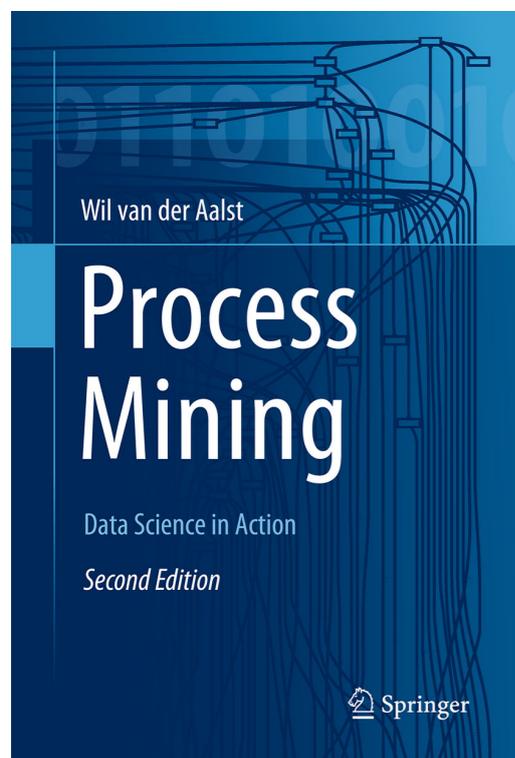


Why is reality so?

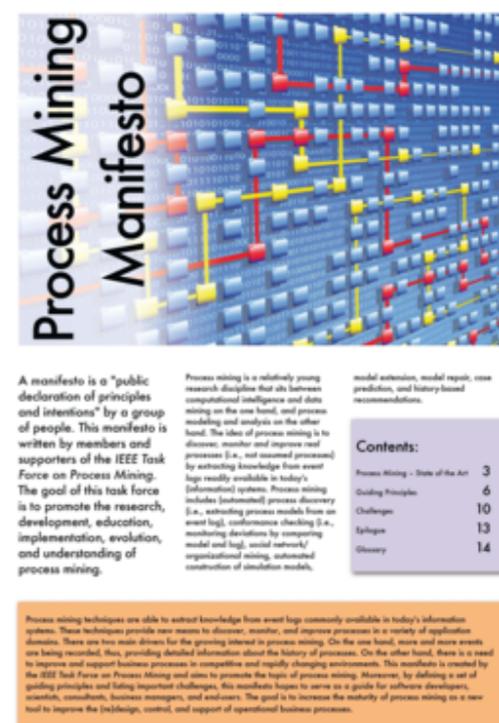
model-driven



data-driven



Process Mining



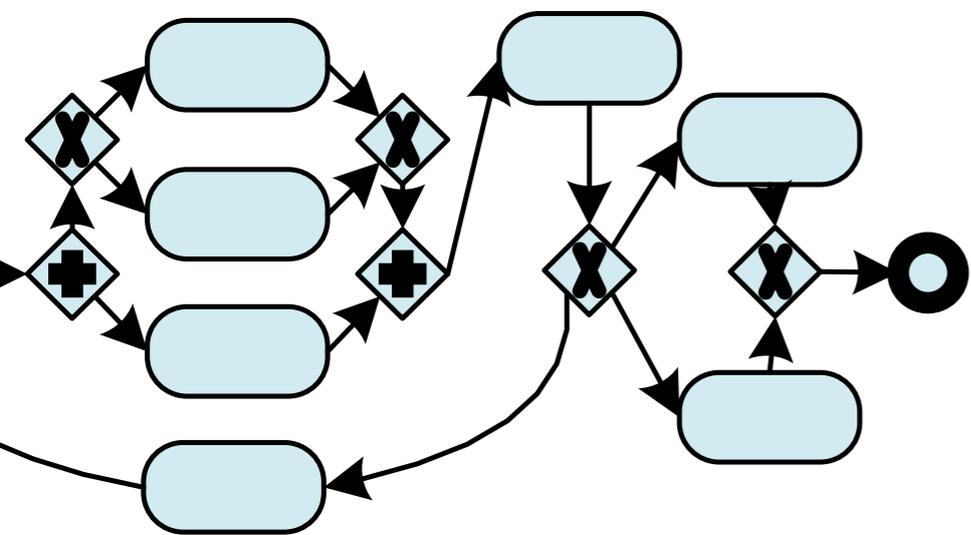
A manifesto is a "public declaration of principles and intentions" by a group of people. This manifesto is written by members and supporters of the IEEE Task Force on Process Mining. The goal of this task force is to promote the research, implementation, education, and understanding of process mining.

Process mining is a relatively young research discipline that sits between computational intelligence and data mining on the one hand, and process modeling and analysis on the other hand. 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. Process mining includes (automated) process discovery (i.e., extracting process models from an event log), conformance checking (i.e., monitoring deviations by comparing model and log), social network/organizational mining, automated construction of simulation models,

model extension, model repair, case prediction, and history-based recommendations.

Contents:	
Process Mining - State of the Art	3
Guiding Principles	6
Challenges	10
Epilogue	13
Glossary	14

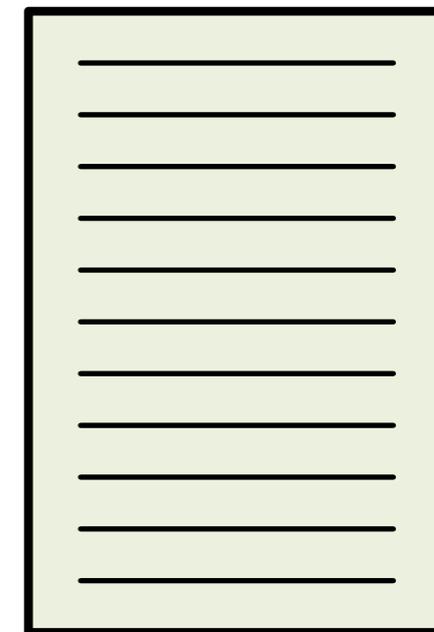
Process mining techniques are able to extract knowledge from event logs commonly available in today's information systems. These techniques provide new means to discover, monitor, and improve processes in a variety of application domains. There are two main drivers for the growing interest in process mining. On the one hand, more and more events are being recorded, thus providing detailed information about the history of processes. On the other hand, there is a need to improve and support business processes in competitive and rapidly changing environments. This manifesto is created by the IEEE Task Force on Process Mining and aims to promote the topics of process mining. Moreover, by defining a set of guiding principles and listing important challenges, this manifesto hopes to serve as a guide for software developers, scientists, consultants, business managers, and end-users. The goal is to increase the maturity of process mining as a new tool to improve the (re)design, control, and support of operational business processes.



process model



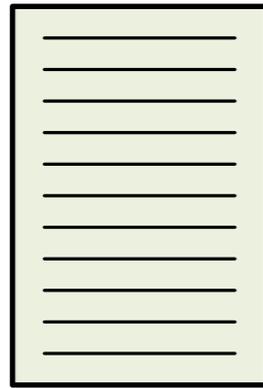
insights



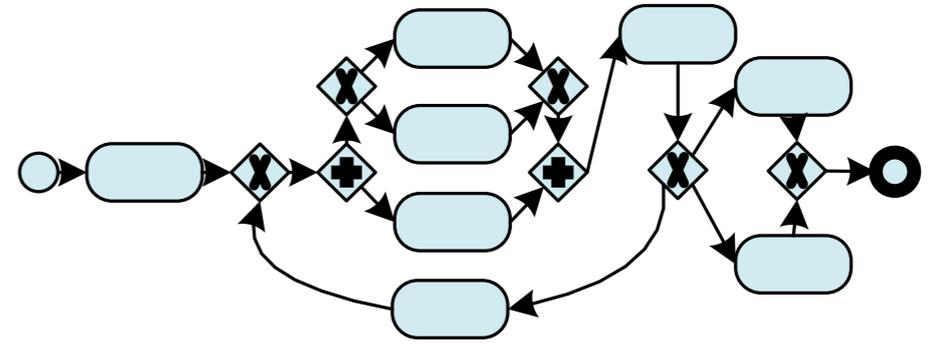
event log

Process Mining

Play in

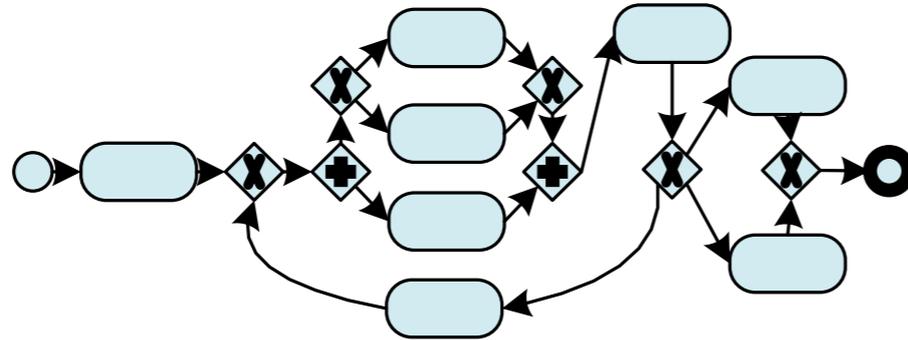


event log

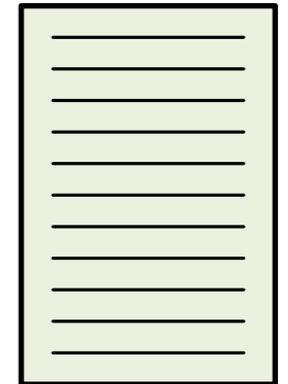


process model

Play out

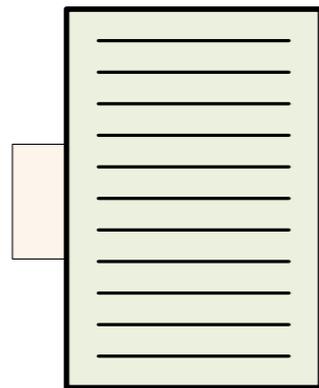


process model

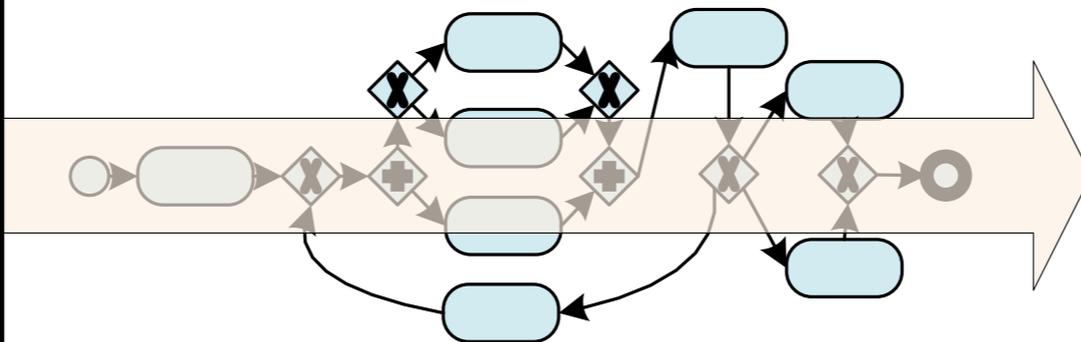


event log

Replay



event log

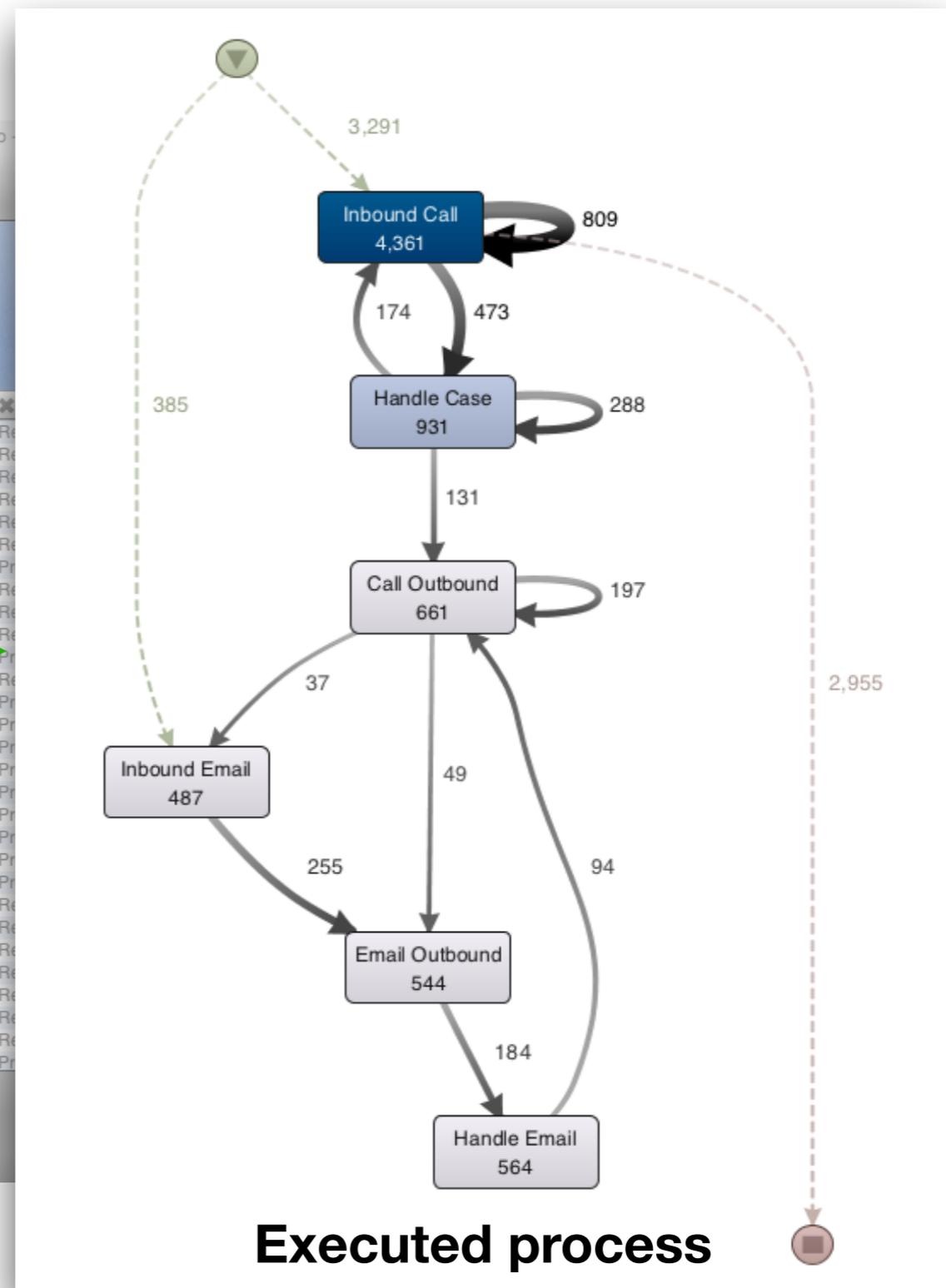


process model

- extended model showing times, frequencies, etc.
- diagnostics
- predictions
- recommendations

Play in: process discovery

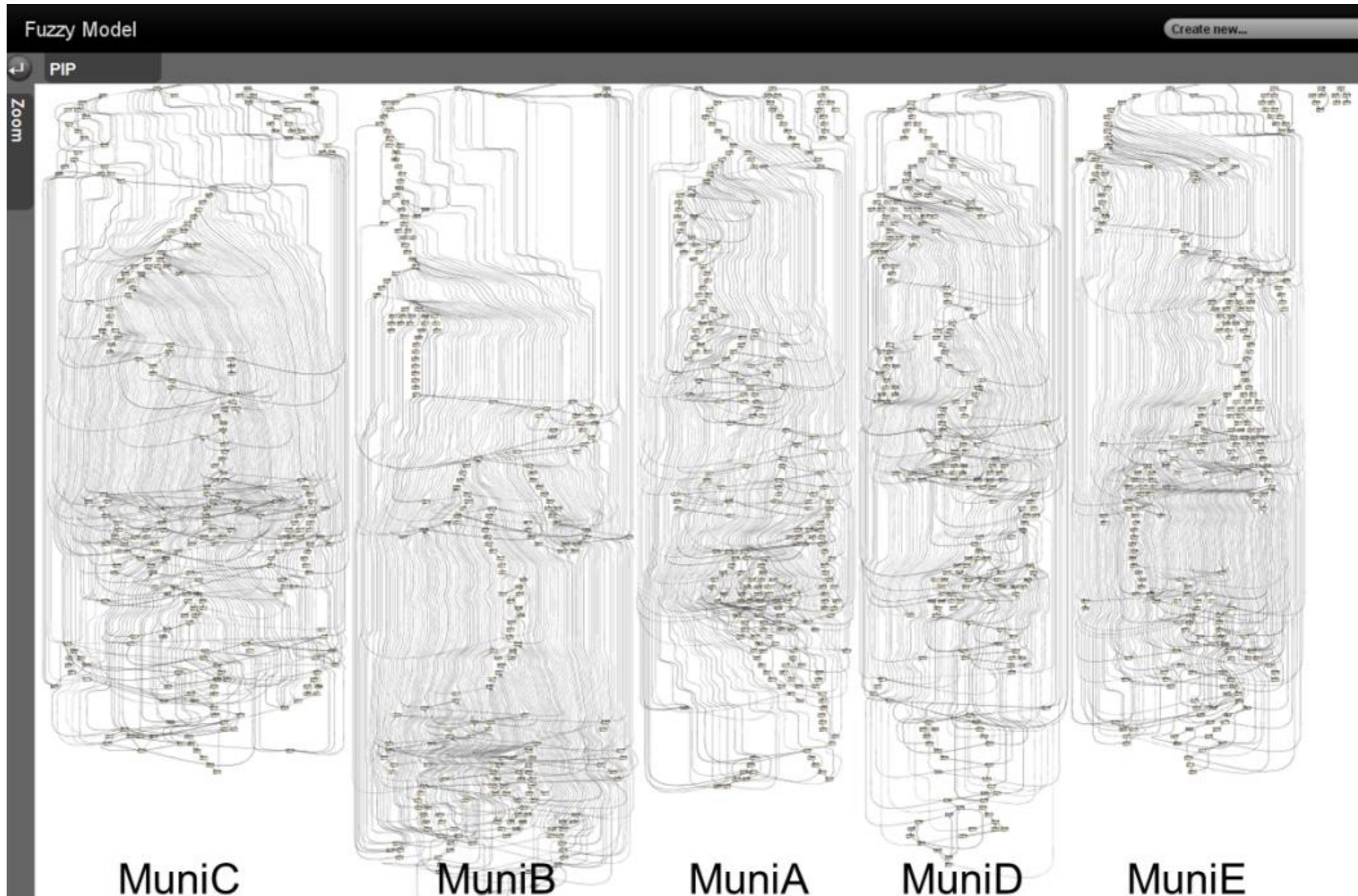
Case ID	Activity	Start Date	End Date	Agent Position	Customer ID	Product	
1	Case 1	Inbound Call	9.3.10 8:05	9.3.10 8:10	FL	Customer 1	MacBook Pro
2	Case 1	Handle Case	11.3.10 10:30	11.3.10 10:32	FL	Customer 1	MacBook Pro
3	Case 1	Call Outbound	11.3.10 11:45	11.3.10 11:52	FL	Customer 1	MacBook Pro
4	Case 2	Inbound Call	4.3.10 11:43	4.3.10 11:46	FL	Customer 2	MacBook Pro
5	Case 3	Inbound Call	25.3.10 9:32	25.3.10 9:33	FL	Customer 3	MacBook Pro
6	Case 4	Inbound Call	6.3.10 11:41	6.3.10 11:51	FL	Customer 4	iPhone
7	Case 5	Inbound Call	18.3.10 10:54	18.3.10 11:01	FL	Customer 5	MacBook Pro
8	Case 6	Inbound Call	25.3.10 17:09	25.3.10 17:13	FL	Customer 6	MacBook Pro
9	Case 6	Inbound Call	25.3.10 17:16	25.3.10 17:18	FL	Customer 6	MacBook Pro
10	Case 6	Inbound Call	26.3.10 8:36	26.3.10 8:40	FL	Customer 6	MacBook Pro
11	Case 7	Inbound Call	18.3.10 11:49	18.3.10 11:50	FL	Customer 7	MacBook Pro
12	Case 8	Inbound Call	11.3.10 9:20	11.3.10 9:23	FL	Customer 8	MacBook Pro
13	Case 9	Inbound Email	19.3.10 19:47	21.3.10 8:17	FL	Customer 9	MacBook Pro
14	Case 9	Call Outbound	21.3.10 8:32	21.3.10 8:33	FL	Customer 9	MacBook Pro
15	Case 9	Handle Email	21.3.10 8:33	21.3.10 8:33	FL	Customer 9	MacBook Pro
16	Case 10	Handle Email	27.3.10 11:29	27.3.10 11:30	FL	Customer 10	iPhone
17	Case 11	Inbound Call	27.3.10 8:09	27.3.10 8:11	FL	Customer 11	iPhone
18	Case 12	Inbound Call	29.3.10 9:28	29.3.10 9:29	FL	Customer 12	MacBook Pro
19	Case 13	Inbound Call	5.3.10 10:13	5.3.10 10:15	FL	Customer 12	MacBook Pro
20	Case 14	Inbound Call	4.3.10 7:49	4.3.10 7:50	FL	Customer 3	iPhone
21	Case 15	Inbound Call	7.3.10 8:06	7.3.10 8:13	FL	Customer 13	iPhone
22	Case 16	Inbound Call	25.3.10 10:26	25.3.10 10:34	FL	Customer 14	MacBook Pro
23	Case 17	Inbound Call	4.3.10 7:35	4.3.10 7:46	FL	Customer 15	MacBook Pro
24	Case 17	Handle Case	4.3.10 7:53	4.3.10 7:55	FL	Customer 15	MacBook Pro
25	Case 17	Handle Case	8.3.10 11:16	8.3.10 11:18	FL	Customer 15	MacBook Pro
26	Case 17	Handle Case	11.3.10 11:15	11.3.10 11:19	FL	Customer 15	MacBook Pro
27	Case 17	Inbound Call	14.3.10 17:53	14.3.10 17:56	FL	Customer 15	MacBook Pro
28	Case 18	Inbound Call	25.3.10 10:35	25.3.10 10:38	FL	Customer 16	iPhone
29	Case 19	Inbound Email	14.3.10 14:08	18.3.10 8:04	FL	Customer 17	MacBook Pro



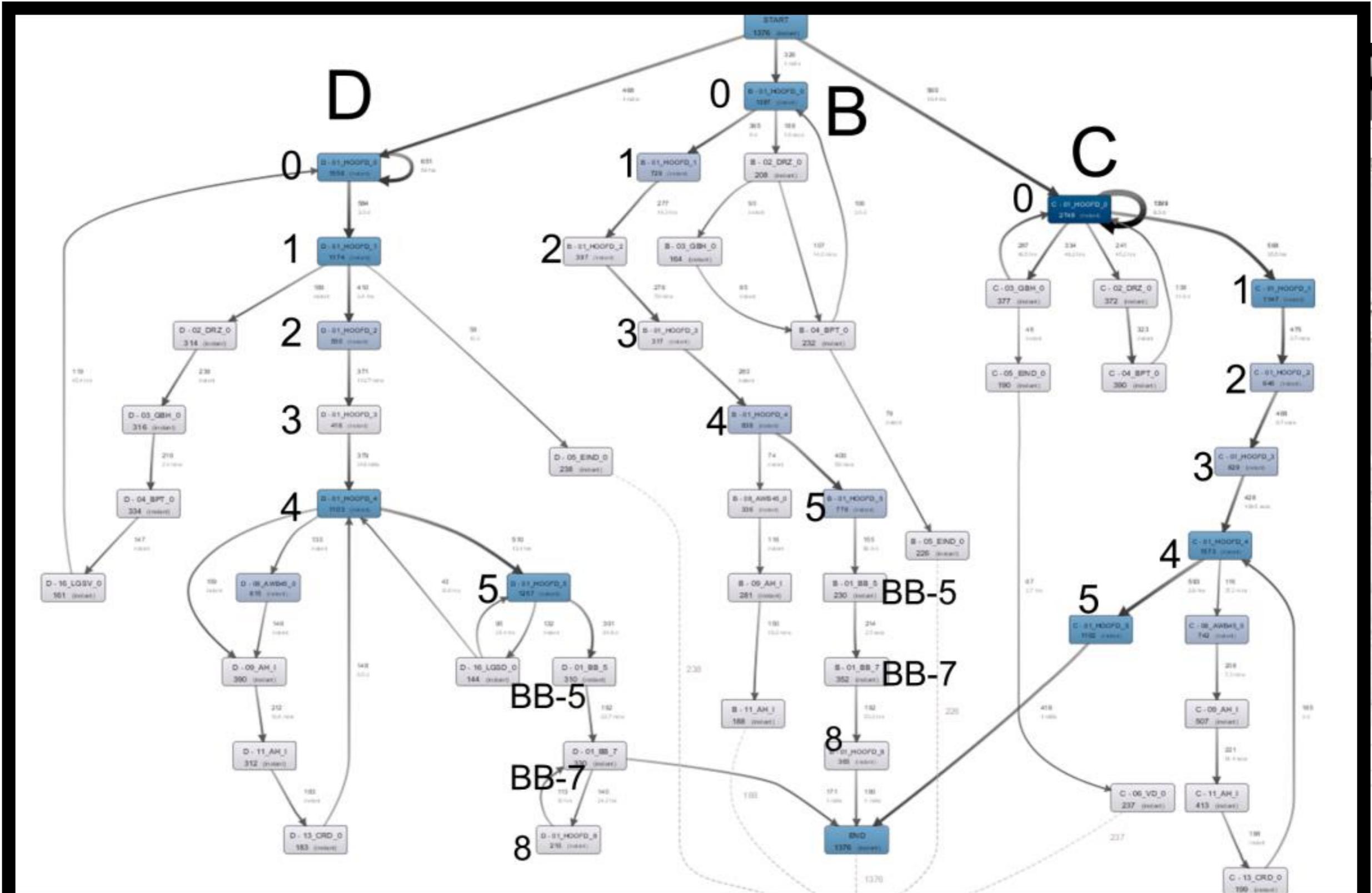
Executed process

[van der Ham, BPI Challenge 2015]

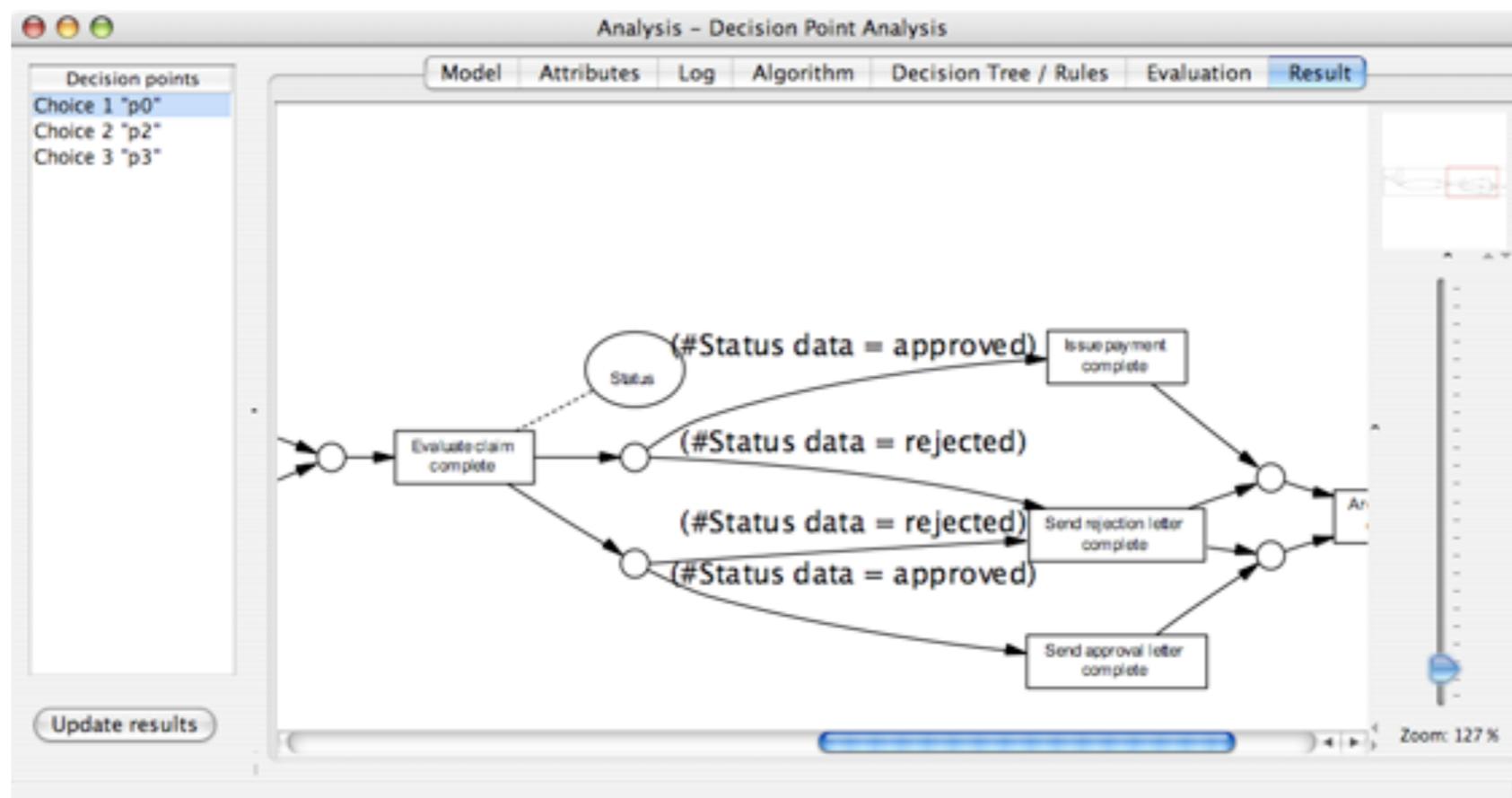
Dutch Municipalities



Dutch Municipalities

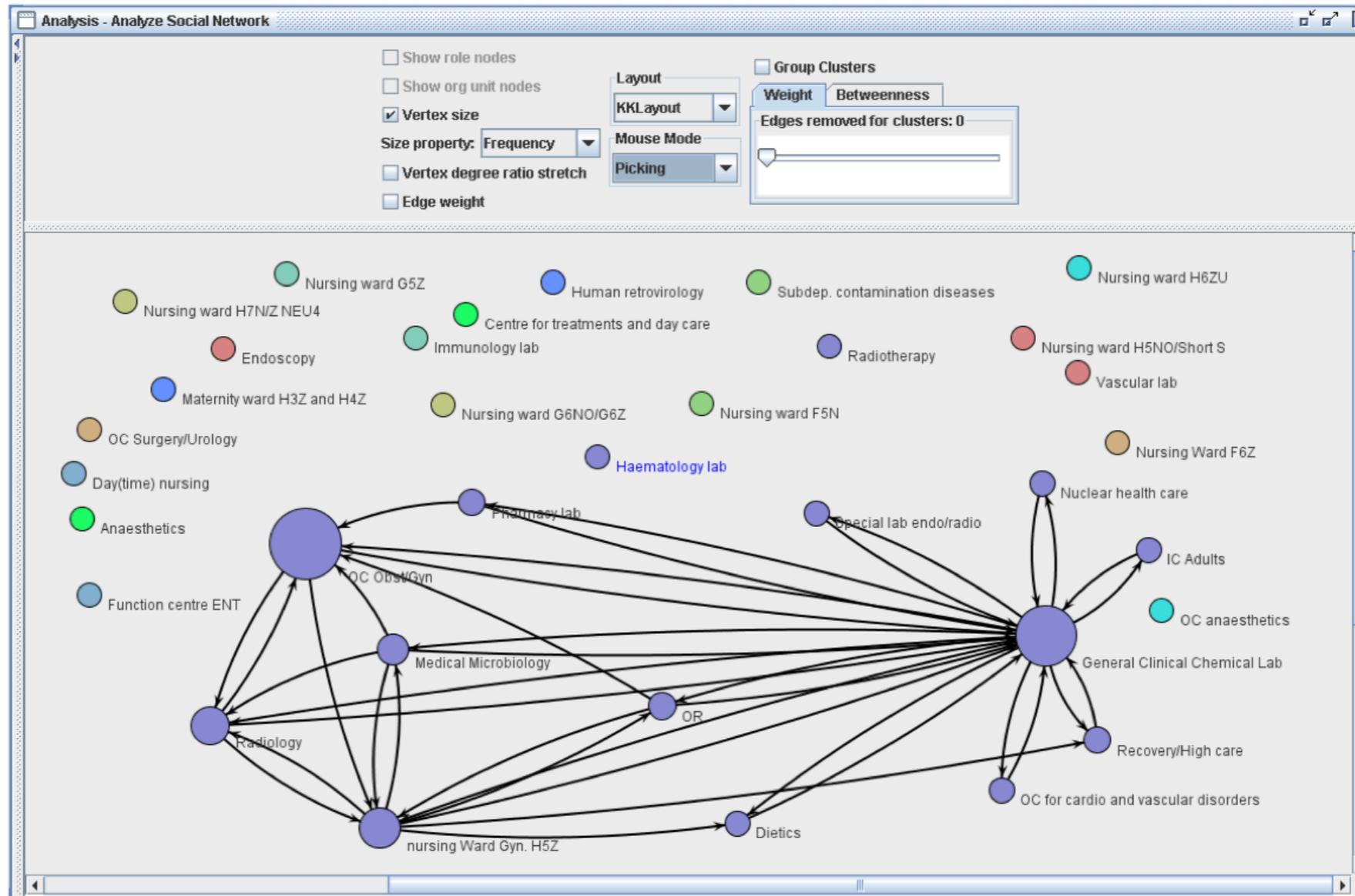


Play in: not just control-flow...



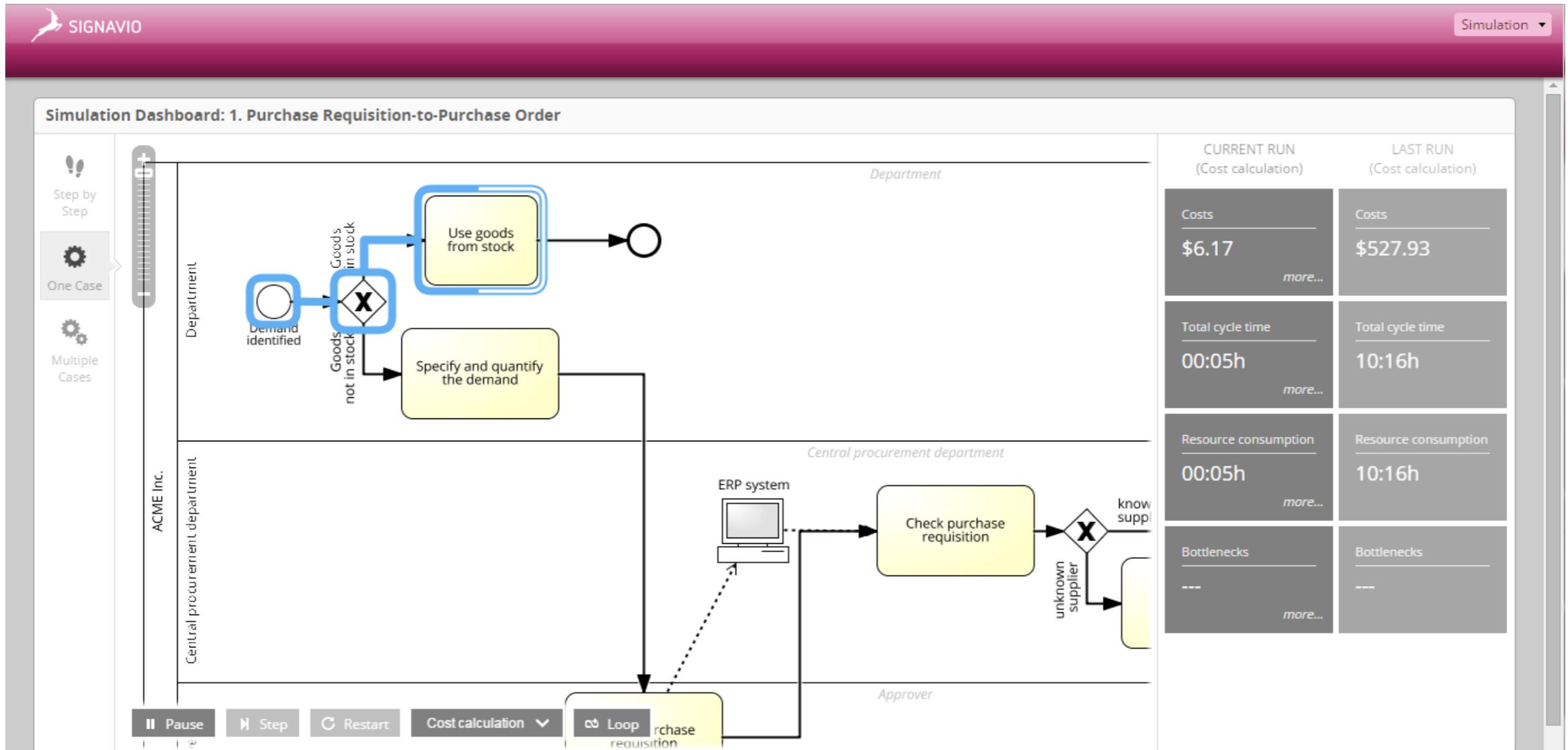
Decision mining: how do people route process instances?

Play in: not just control-flow...



Social network mining: “real” organizational structure (handover of work)

Play out: simulation



CURRENT RUN (Cost calculation)		LAST RUN (Cost calculation)	
Costs	\$6.17	Costs	\$527.93
more...		more...	
Total cycle time	00:05h	Total cycle time	10:16h
more...		more...	
Resource consumption	00:05h	Resource consumption	10:16h
more...		more...	
Bottlenecks	---	Bottlenecks	---
more...		more...	

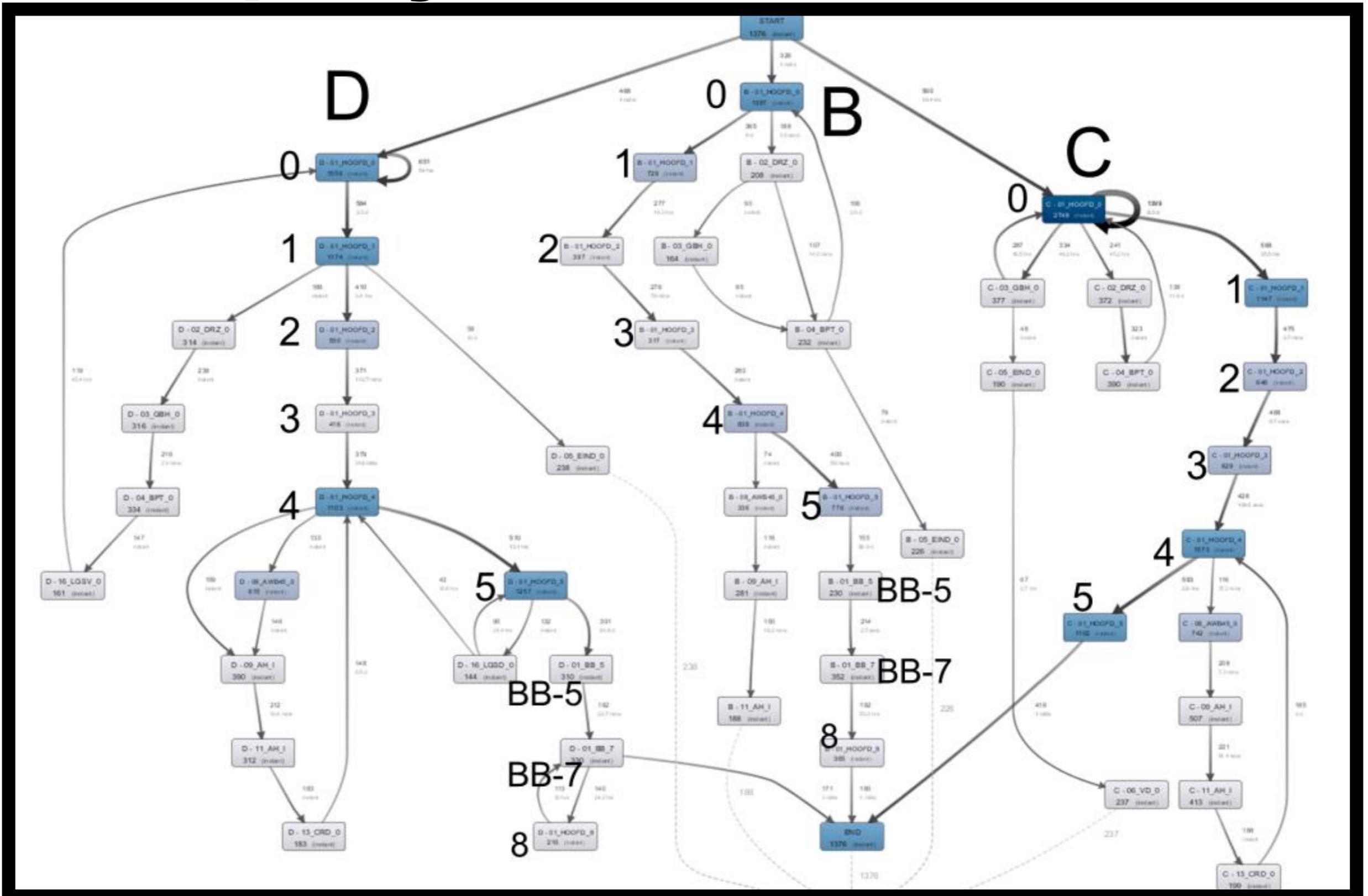
Scenarios

Remove scenario Save scenario

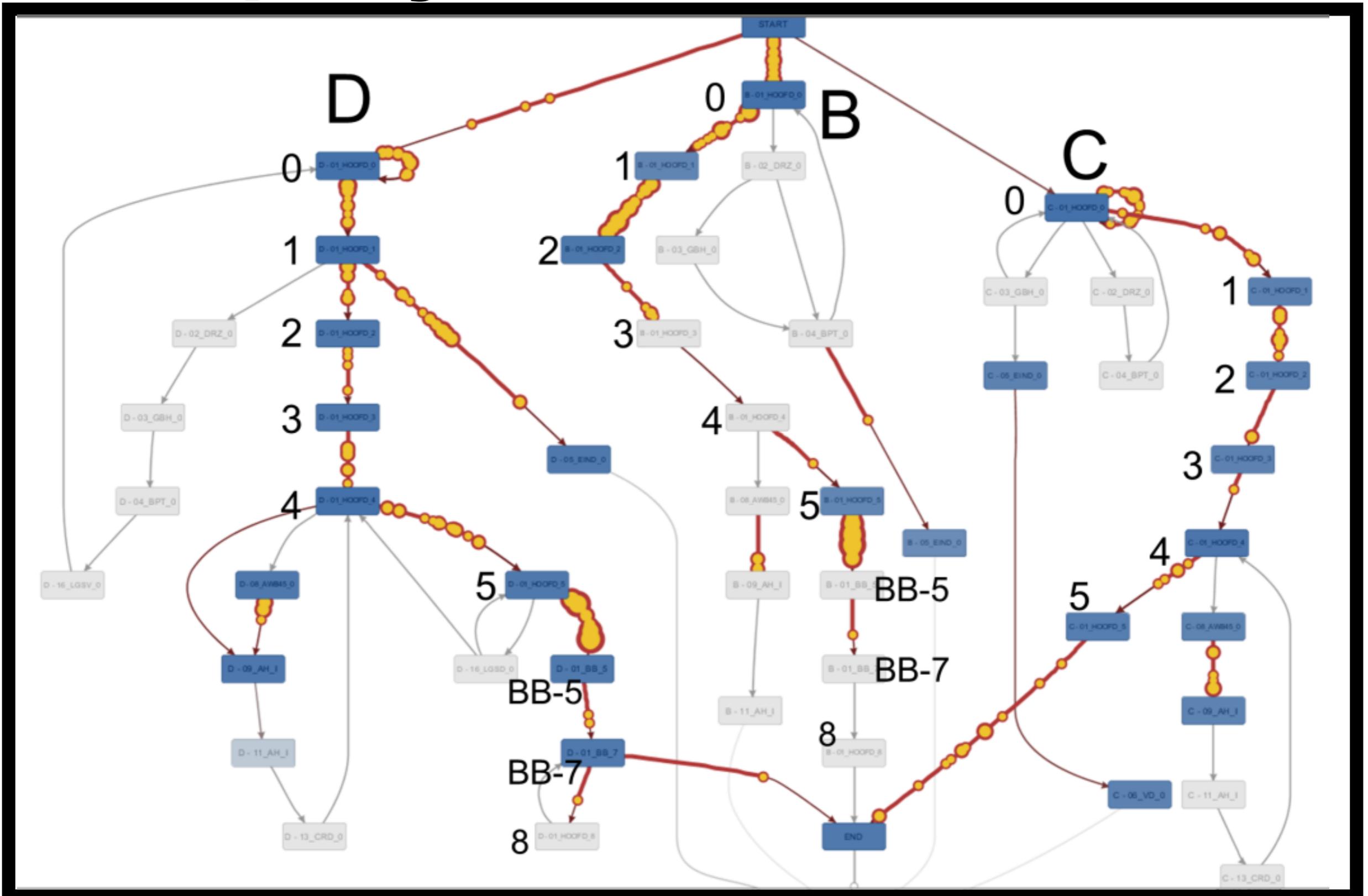
Cost calculation	Scenario 2	+
------------------	------------	---

Task	Execution costs
1. Specify and quantify the demand	\$5.00
2. Create purchase requisition	\$0.50

Replay: enhancement



Replay: enhancement



Replay: conformance checking

Tutorial

☰ ⏪ ⏩ ⏹

100% 10 cases 100% 124 events

Resolution ▬ Tokens

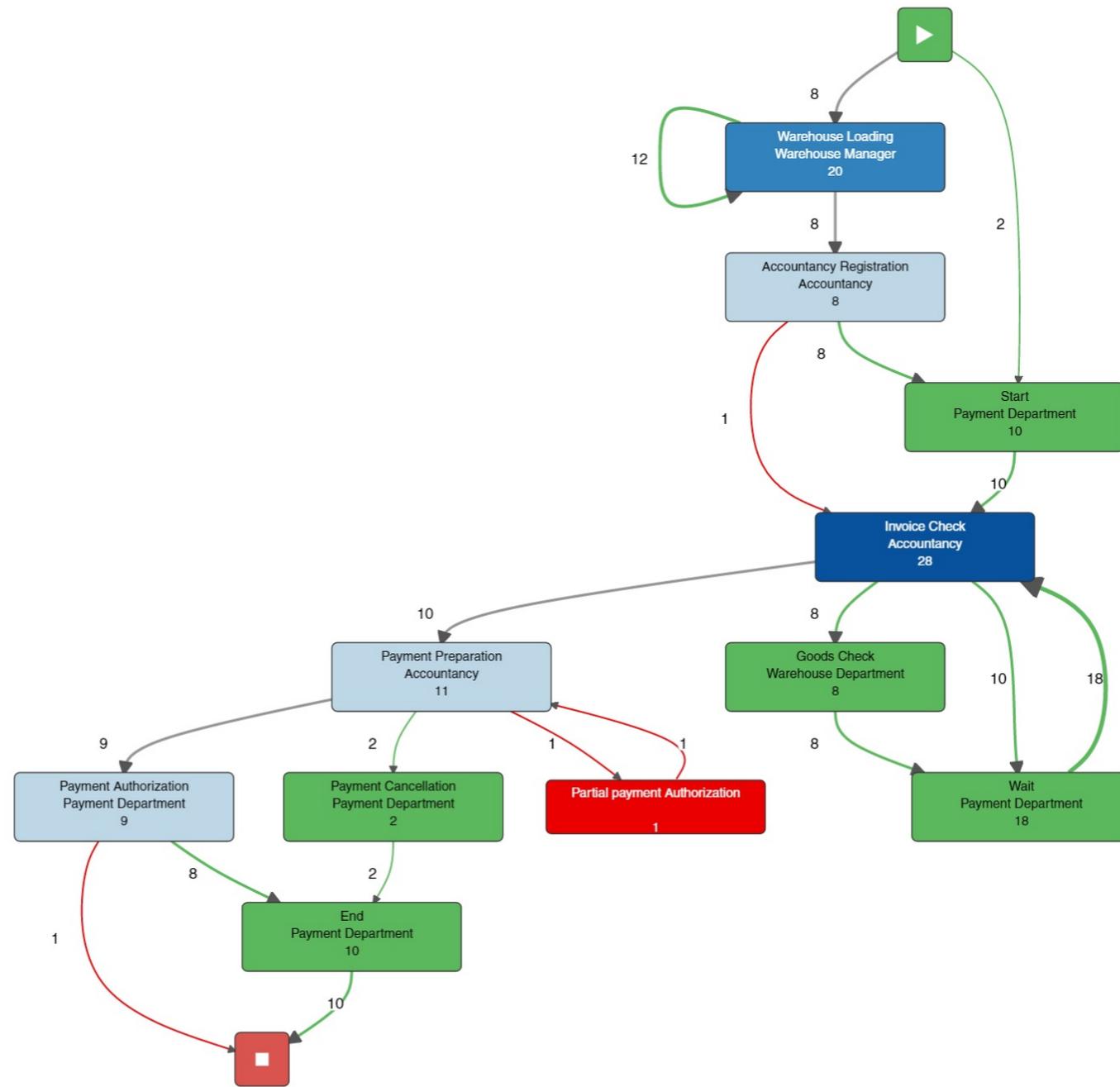
▶ Wed Jun 19, 2013 23:01:00

Activity

Model detail ▶

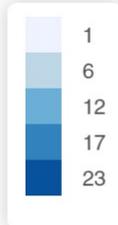
Resource focus ▶

🖼️ Portrait 🖼️ Landscape



Derived model

Reference model



Detect deviations and align the actual with the expected behaviors

Replay: conformance checking



Replay: conformance checking



Runtime operational support

NIRDIZATI Loan requests

RUNNING CASES **COMPLETED CASES** **COMPLETED EVENTS** **AVG CASE LENGTH** **AVG CASE DURATION**

208 **3** **1,568** **9.33** **21h 23m 40s**

Detail view | Outcomes | Case duration | Remaining time | Case length

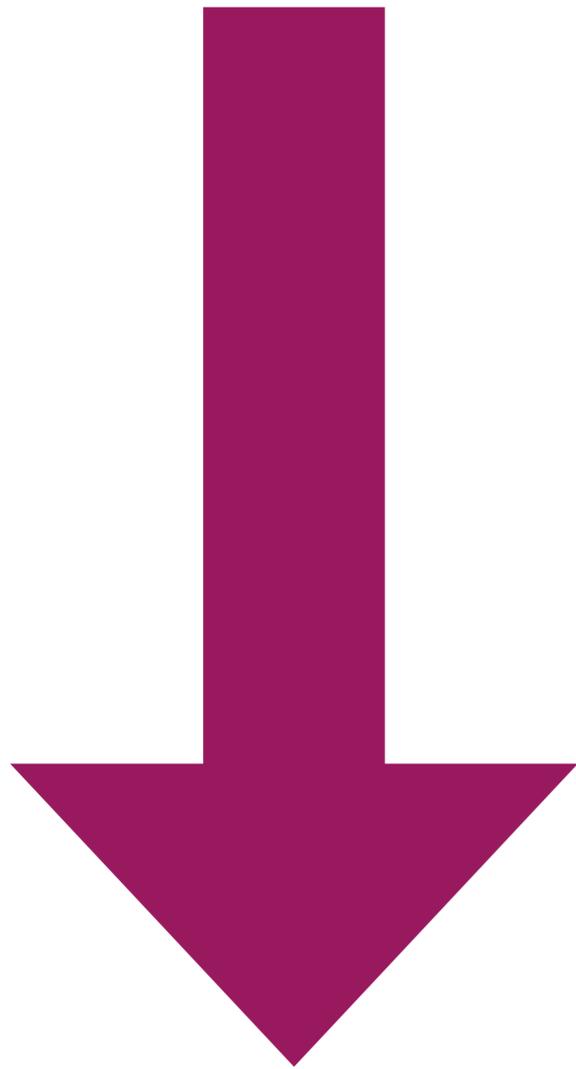
Search 🔍 📄 🔍 📄

case ID	Completed	Events elapsed	Start time	Latest event time	Predicted/Actual completion time	Predicted/Actual duration	Probability to be slow	Probability to be rejected
c_2026841022	false	9	Oct 05 2016 09:07:17	Oct 06 2016 08:05:44	Oct 29 2016 11:49:42	24d 2h 42m	0.57	0.804
c_1243522820	false	8	Oct 01 2016 10:12:27	Oct 01 2016 10:19:56	Oct 22 2016 07:26:47	20d 21h 14m	0.354	0.201
c_1811993938	true	9	Oct 01 2016 10:22:34	Oct 01 2016 10:46:14	Oct 01 2016 10:46:14	0h 23m 40s	-	-
c_1080763304	false	9	Oct 01 2016 10:59:16	Oct 01 2016 13:59:36	Oct 26 2016 00:09:03	24d 13h 9m	0.597	0.277
c_1460054354	false	11	Oct 01 2016 11:36:27	Oct 01 2016 11:46:11	Oct 27 2016 02:46:51	25d 15h 10m	0.662	0.227

Showing 1 to 5 of 210 rows 5 rows per page < **1** 2 3 4 5 ... 42 >

Predictive monitoring: what will likely happen to my process instance?

**This is for us to take, and
manage wisely**



Not to control...



...but to continuously improve!

An aerial photograph of a university campus, showing a complex network of roads, green spaces, and buildings. A semi-transparent white rectangular box is overlaid on the top portion of the image, containing the word "Thanks!" in a large, bold, black sans-serif font. The campus below features a mix of modern and traditional architecture, with several large, multi-story buildings and numerous parking lots. The roads are a mix of straight and curved paths, interspersed with lush green lawns and trees. The overall scene is a detailed view of a well-developed academic environment.

Thanks!