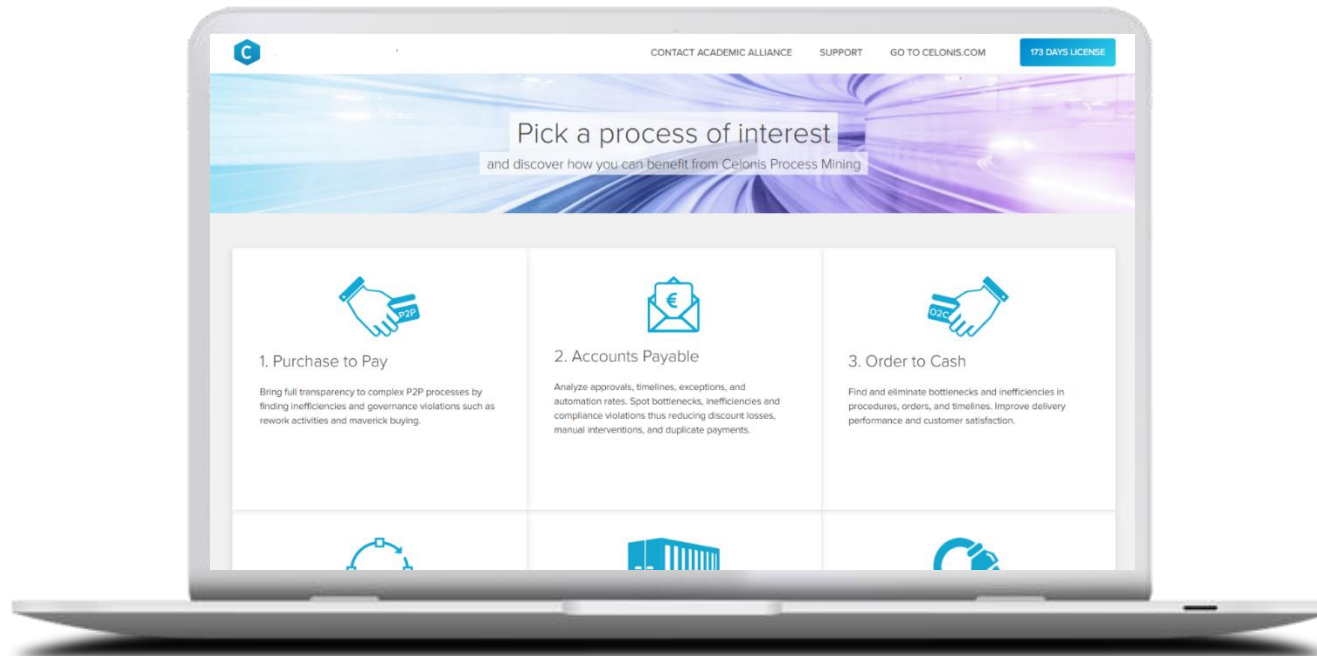


ACADEMIC CLOUD – START PROCESS MINING NOW



✓ **Free access**
Explore the full power of process mining.

✓ **Flexibility**
Six pre-loaded data sets and analyses.
Import of own log-files.

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No installation required. Top speed by latest cloud technology.

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Academic Cloud

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Generate Big Insights
with Big Data & Celonis
Process Mining

GUEST LECTURE | JUNE 19, 2018

JANINA NAKLADAL



UNIVERSITÄT
BAYREUTH

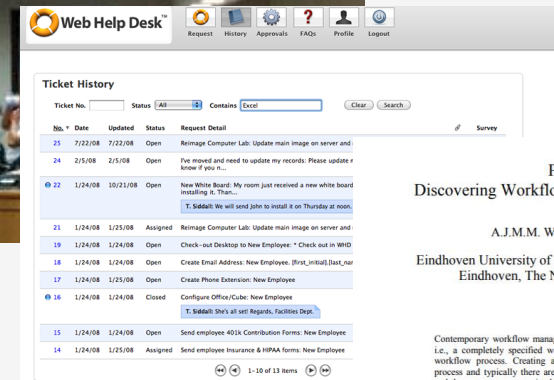
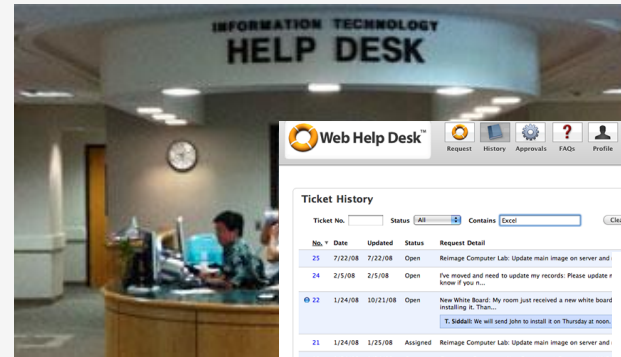
	About Celonis
	Process Mining technology
	Live demo and hands-on session
	Celonis PI – Process Mining becomes smart
	Celonis Use Cases
	A look into the future
	Become a Celonaut

Who we are

THE TEAM



THE PROJECT



Ticket No.	Date	Updated	Status	Request Detail
25	7/22/08	7/22/08	Open	Reimage Computer Lab. Update main image on server and...
24	2/5/08	2/5/08	Open	I've moved and need to update my records. Please update r...
22	1/24/08	10/21/08	Open	New White Board: My room just received a new white board installing it. Than... T. Siddall: We will send john to install it on Thursday at noon.
21	1/24/08	1/25/08	Assigned	Reimage Computer Lab. Update main image on server and...
19	1/24/08	1/24/08	Open	Check-out Desktop to New Employee. * Check out in WHD
18	1/24/08	1/24/08	Open	Create Email Address: New Employee. * First_name>Last_name
17	1/24/08	1/25/08	Open	Create Phone Extension: New Employee
16	1/24/08	1/24/08	Closed	Configure Office Cubes: New Employee T. Siddall: they all get Regard, Facilities Dept.
15	1/24/08	1/24/08	Open	Send employee 401k Contribution Forms: New Employee
14	1/24/08	1/25/08	Assigned	Send employee Insurance & HIPAA forms: New Employee

Process Mining Discovering Workflow Models from Event-Based Data

A.J.M.M. Weijters W.M.P. van der Aalst

Eindhoven University of Technology, P.O. Box 513, NL-5600 MB, Eindhoven, The Netherlands, +31 40 2473857/2290

Abstract

Contemporary workflow management systems are driven by explicit process models, i.e., a completely specified workflow design is required in order to enact a given workflow process. Creating a workflow design is a complicated time-consuming process and typically there are discrepancies between the actual workflow processes and the processes as perceived by the management. Therefore, we propose a technique for process mining. This technique uses workflow logs to discover the workflow process as it is actually being executed. The process mining technique proposed in this paper can deal with noise and can also be used to validate workflow processes by uncovering and measuring the discrepancies between prescriptive models and actual process executions.

1. Introduction

During the last decade workflow management concepts and technology [2, 9, 10] have been applied in many enterprise information systems. Workflow management systems such as Staffware, IBM MQSeries, COSSA, etc. offer generic modeling and enactment capabilities for structured business processes. By making graphical process definitions, i.e., models describing the life-cycle of a typical case (workflow instance) in isolation, one can configure these systems to support business processes. Besides pure workflow management systems many other software systems have adopted workflow technology. *Despite its economic merits, workflow are encountered when architect workflow.*



academy
consult



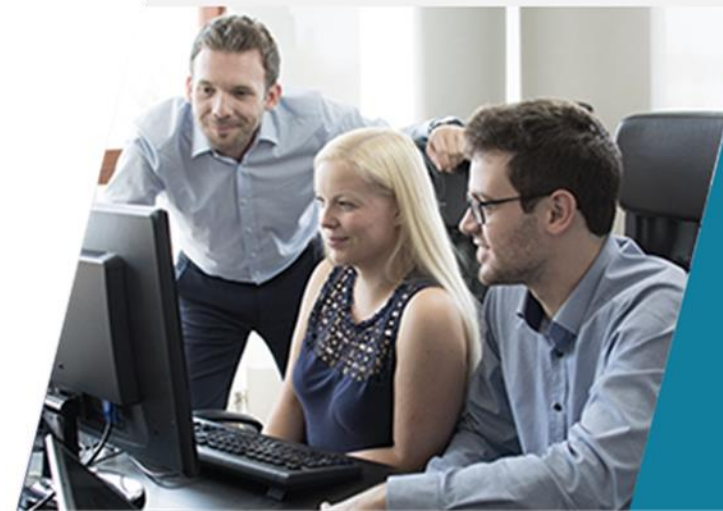
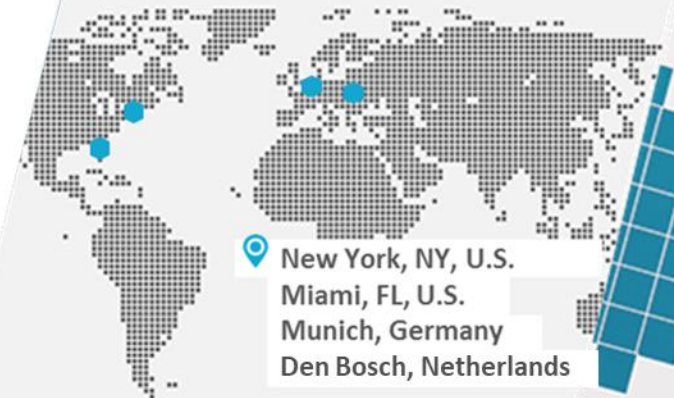
Technische Universität München



CELONIS TODAY

CELONIS IS AN INNOVATIVE, AWARD-WINNING SOFTWARE COMPANY AND THE MARKET LEADER FOR PROCESS MINING.

- **We make our customers more successful**
By improving every process throughout their organizations
- **We work with leading customers in the world**
More than 350 enterprises are already Celonis customers
- **Among fastest growing software companies in the world**
4.000% over the last 4 years, 300% yoy
- **Backed by world class investors Accel & 83 North/ Greylock**
(Facebook, Dropbox, Spotify, Slack, AirBnB, LinkedIn)



Deloitte
Technology Fast50

ERNST & YOUNG
ENTREPRENEUR
OF THE YEAR

SAP HANA
Innovation
Award

SAP
Demo Jam



INNOVATIONSPREIS IT
2016
mittelstand

SAP
Pinnacle
Awards
2016
Finalist

GERMAN
SILICON VALLEY
ACCELERATOR

TUM
Presidential
Entrepreneurship
Award 2015

OUR SUCCESS



USER & USAGE



100,000+
Users



350+
Enterprise
customers



15+
Industries



25
Countries



90+
Partners



70+
Standard
Connectors



68
Different
connected
processes



70+ ERPs
Biggest
customer
landscape



30+ TB
Largest
customer
Installation



Information is the oil of the 21st century,



and analytics is the combustion engine.

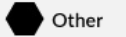
Peter Sondergaard, SVP Gartner

THE LARGEST COMPANIES BY MARKET CAP

The oil barons have been replaced by the whiz kids of Silicon Valley



Top 5 Publicly Traded Companies (by Market Cap)



DON'T NEED CHANGE?

Only **12%** of 1955s companies have remained Fortune 500 companies up to today.





BOSCH

logovaults



Mercedes-Benz

amazon.com



SIEMENS



What is driving companies today?



SAMSUNG
TESLA

Google

Coca-Cola



Customer centricity



Shorter product cycles



Robotization



Winner-takes-it-all markets

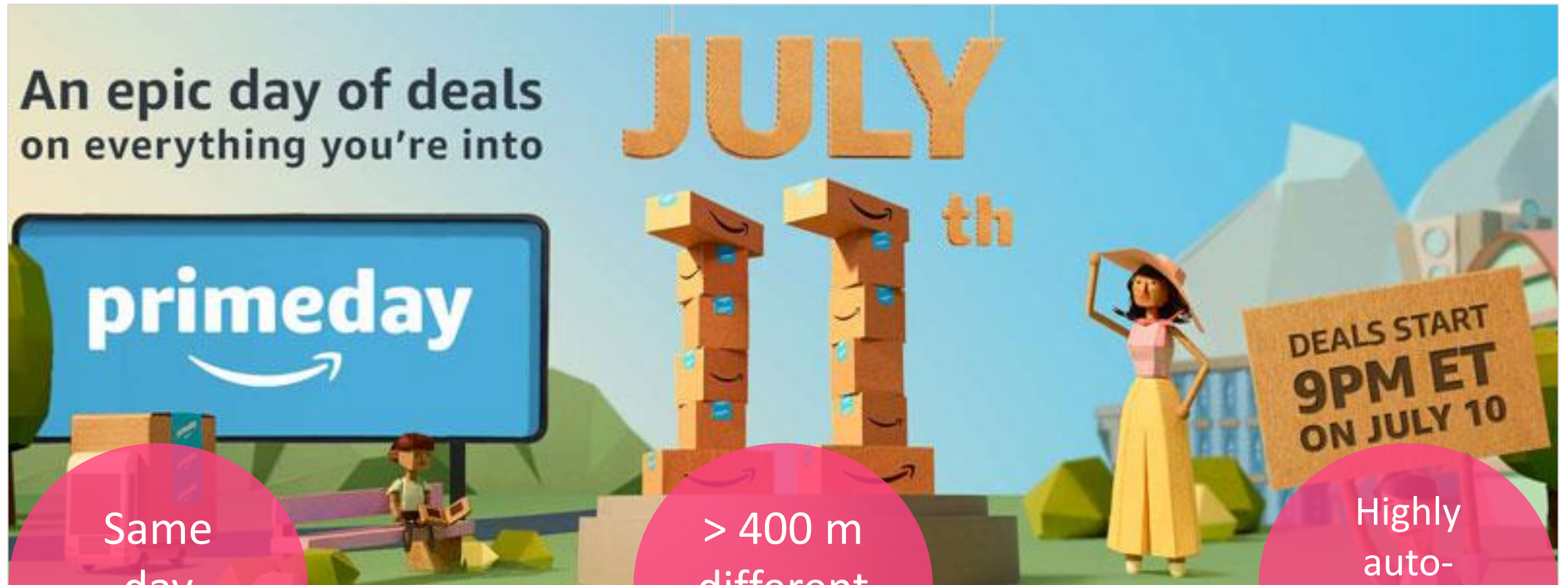


Global, complex and digital supply chains



Mass customization of products





Same
day
delivery

> 400 m
different
products

Highly
auto-
mated
fulfillment

ROBOTS

This is the first Adidas shoe made almost entirely by robots

Using robots to make shoes means moving factories closer to the people who buy them.

BY APRIL GLASER | @APRILASER | SEP 27, 2016, 10:13AM EDT

TWEET SHARE LINKEDIN



Customized designs

Adidas

The need for speed: Adidas and Siemens to build future digital factories

by John Kennedy

4 MAY 2017 414 SHARES



Adidas Stan Smith classic shoes. Image: 2p2play/Shutterstock

Robotic production

LATEST NEWS

X marks the spot as new name for iPhone leaks ahead of launch
2 HOURS AGO

These Irish sisters are on a roll with statement style for wheelchairs
3 HOURS AGO

Weekend takeaway: Inside the business of change
news cycle

Faking out fake news: How to news cycle
news cycle

Faster time-to-market

HOW CAN COMPANIES...

... TRANSFORM?



... ACCELERATE?

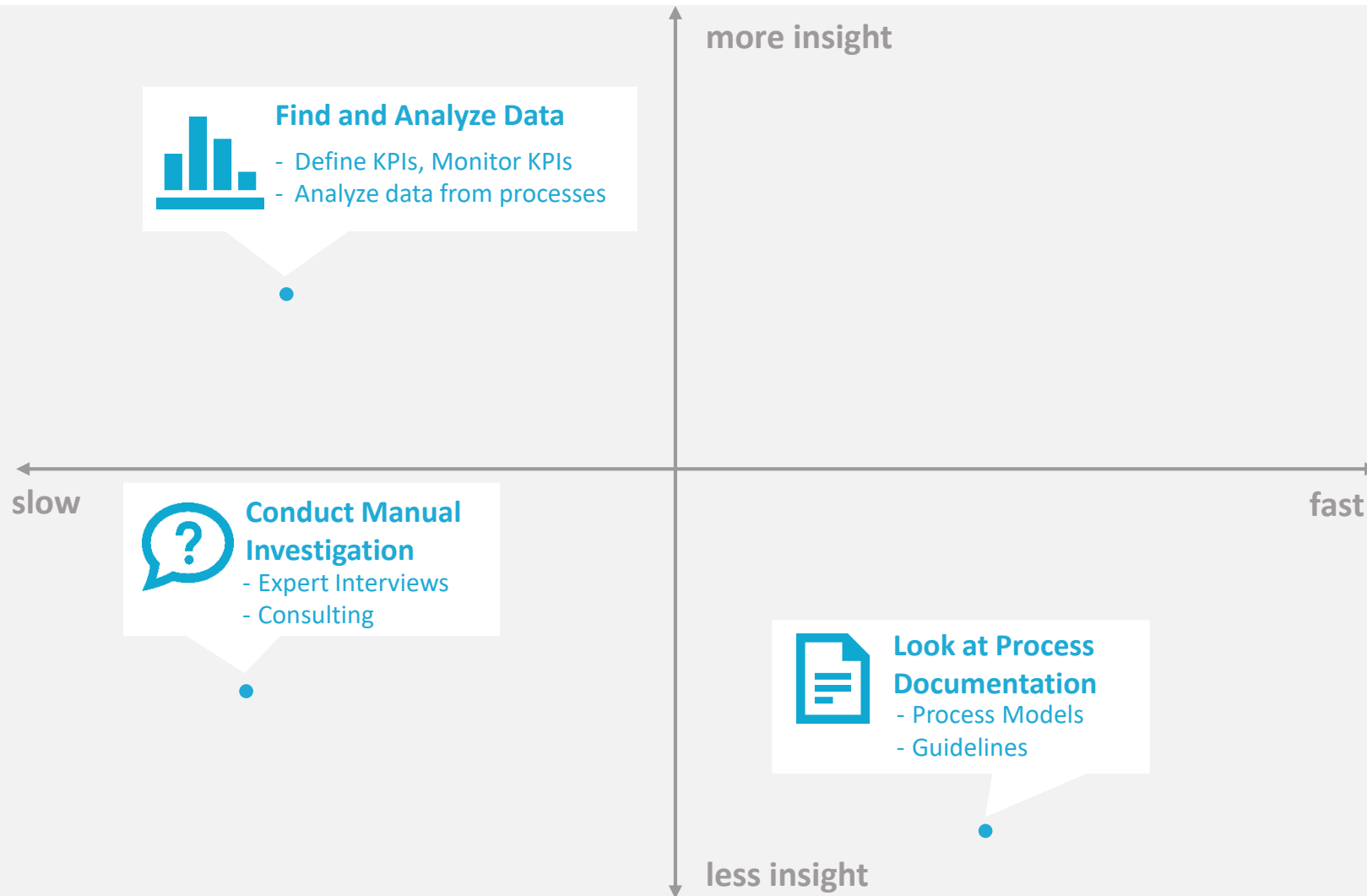


... IMPROVE?





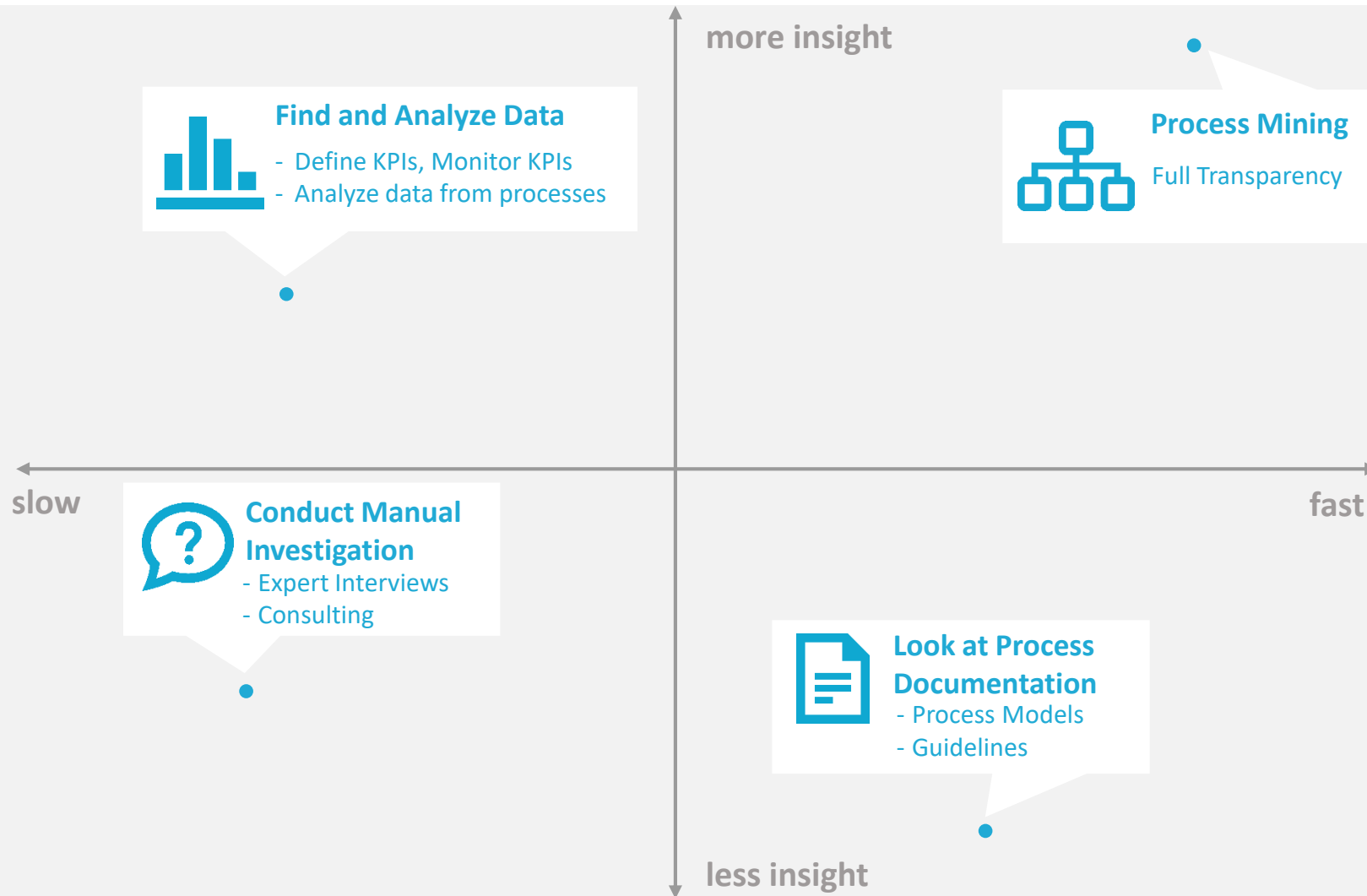
HOW DO YOU GET INSIGHTS INTO BUSINESS PROCESSES?



The methods currently available are not efficient or powerful enough.



HOW DO YOU GET INSIGHTS INTO BUSINESS PROCESSES?

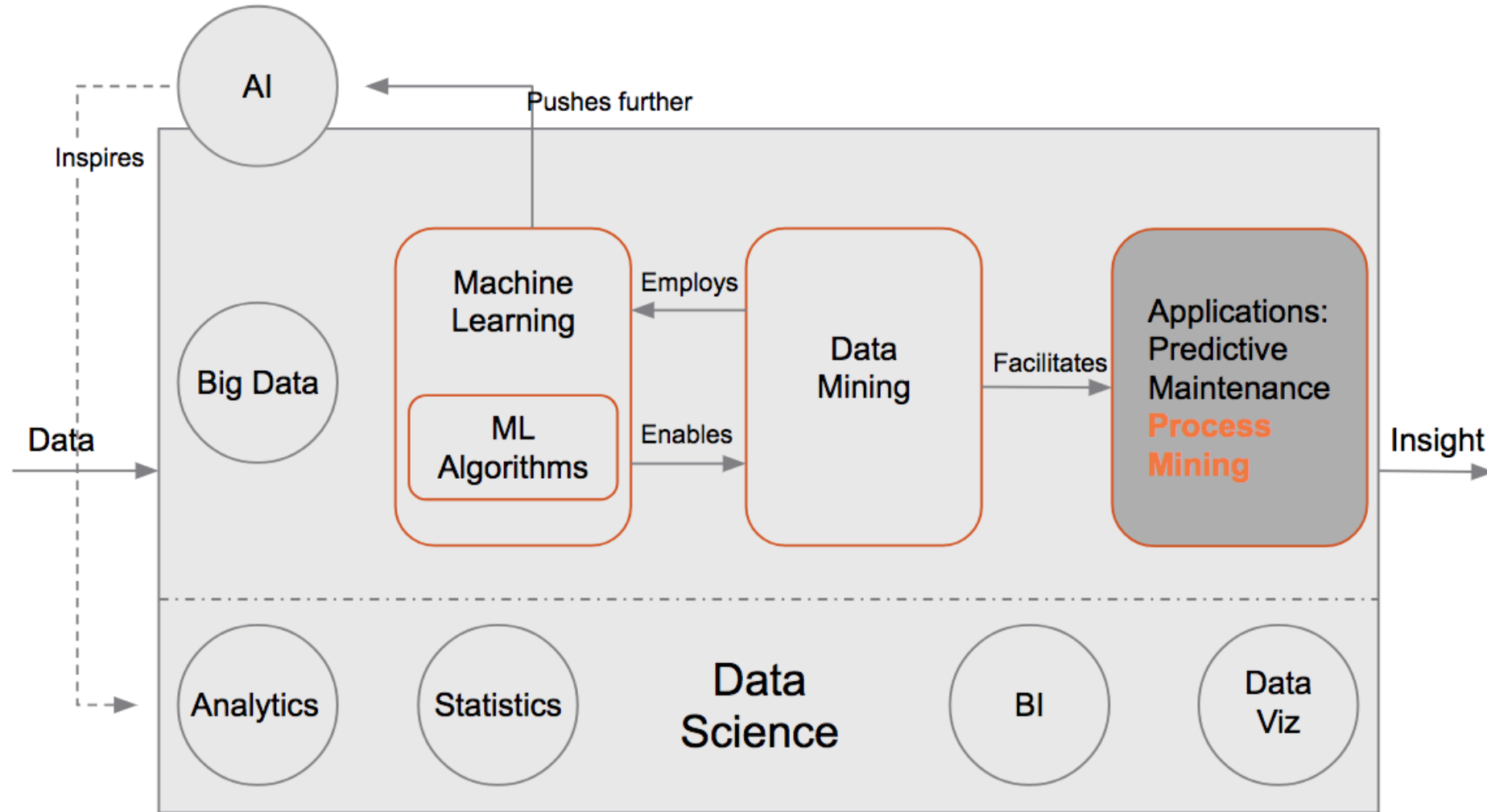


Time for a change:
Switch on the lights!





But... What is Process Mining?





(P.)

OFFICIAL LOG BOOK. No. 2.

INTEND WITH THE MERCHANTS KEEP'S LOG

OFFICIAL L

117

HOME TRADE SHIP.

Name of Ship	No. and Name of Register	Port of Registry	Tonnage	Name of Master	Particulars
<i>Galatia</i>		<i>Aberdeen 1842</i>		<i>George Nelson</i>	

Date of Commencement of the Voyage *Wednesday October 14th 1858*

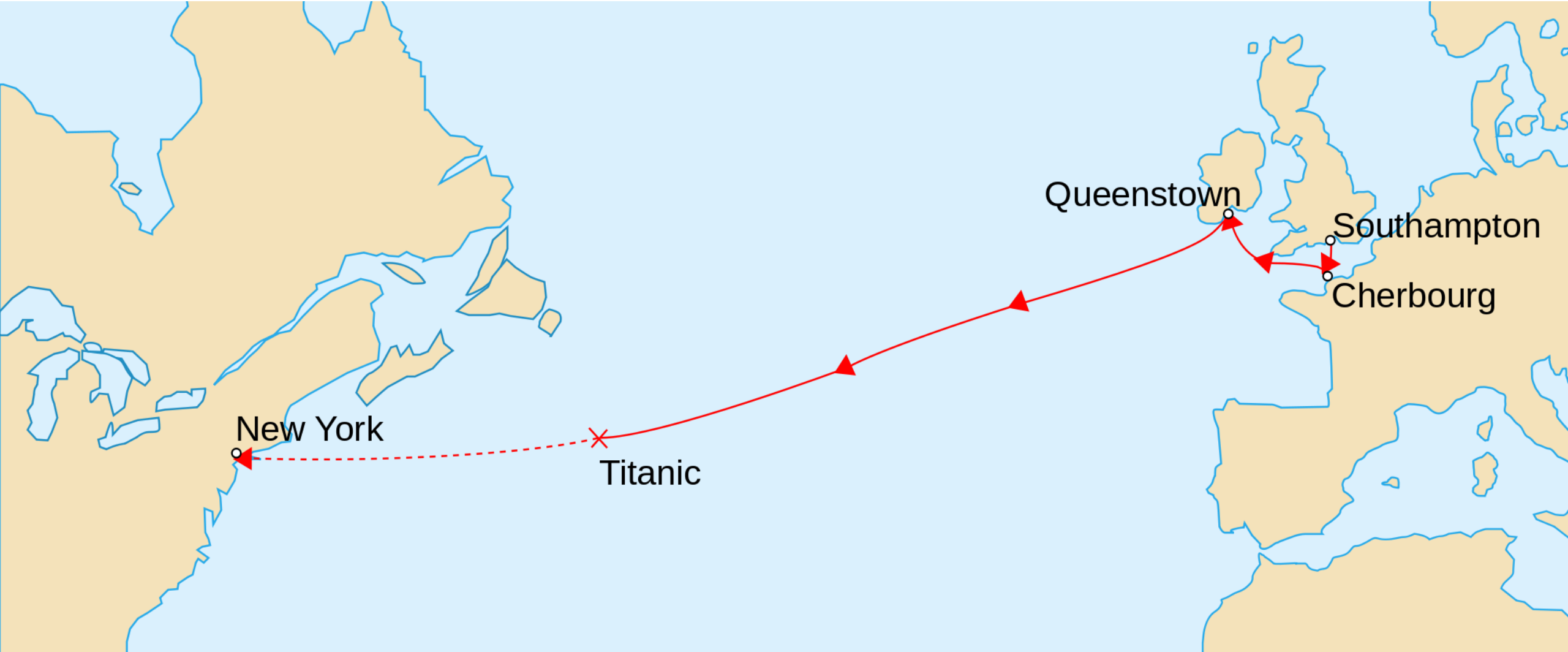
Name of the Voyage or Employment *from Cardiff to Callao for the
C. & A. Messrs. Smith and Co. Liverpool and from Callao to
London*

Delivered to the Shipping Master of the Port at *Callao by September 20th 1858*

Age of *34*
Signed *George Nelson*

Note.—The above entries are to be filled up by the Master before the log is delivered to the Shipping Master.

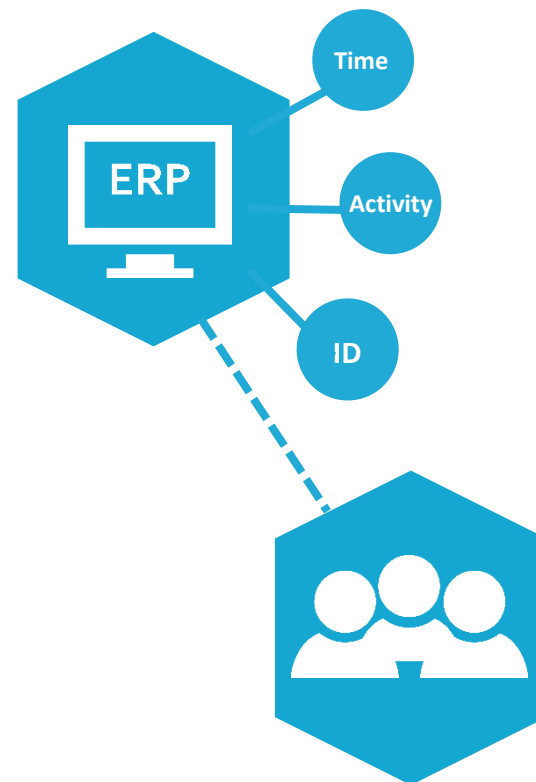
DATE.		Latitude.	Longitude	CURRENT.		WIND.		CLOUDS.				
Month & Day.	Hour.			N.	W.	Set.	Velocity in knots per h.	Direction.	Force.	Kinds.	Por- tion.	Motion from
Nov.	30	31 44	51 51		0.9	N. 4° W.	S. S. W.	Fresh.	Cirro Stratus.	10	S. W.	30.06
	4 P. M.	31 47	51 4				S. S. W.	Fresh.	Cir. Cum. Stratus and Nimbus.	10	S. W.	30.09
Dec.	1	31 52	50 51				N. N. W.	Light breeze.	Nimbus and Cum. Stratus.	10	S. W.	30.10
	8 A. M.	31 59	49 48				S. W.	Moderate.	Nimbus and Cirro Cum. Stratus.	10	S'd. & W'd.	30.12
	4 P. M.	32 00	49.13				S. S. E.	Light breezes.	Nimbus.	10	Southward.	30.12
"	2	32 00	48 50				S. S. E.	Light breezes.	Nimbus.	10	Southward.	30.12
	8 A. M.	32 24	48 26		0.5	N. 53° W.	S. E.	Moderate.	Cum. Stratus.	8	S'd. & E'd.	30.22
	4 P. M.	32 25 20	47 50		0.5	Westward.	South.	Moderate.	Cir. Cum. Strat.	5	Southward.	30.18





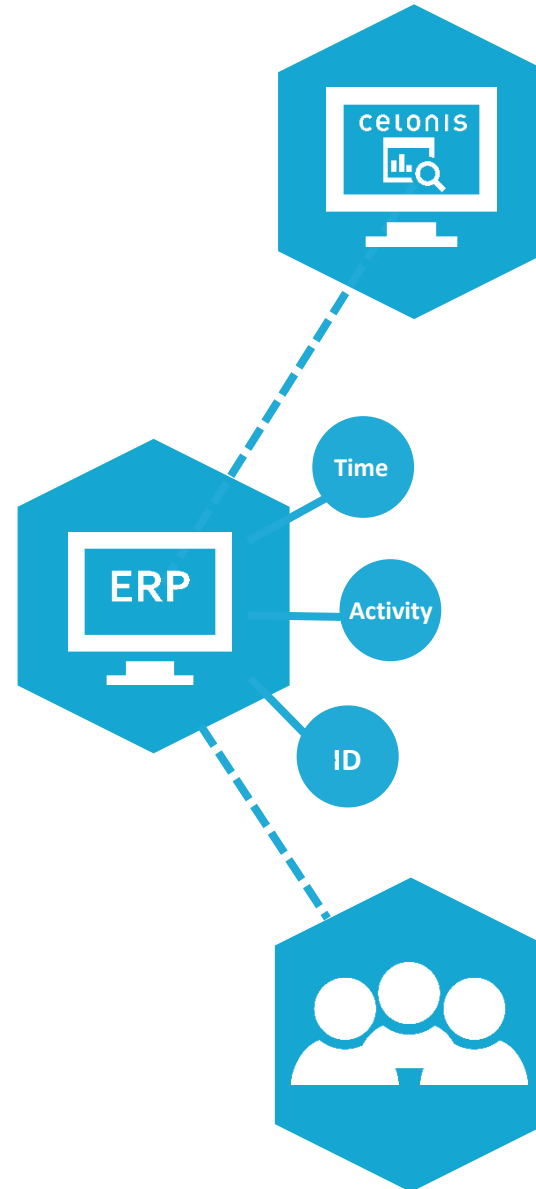
IT-based work
Every workflow is supported by IT systems like SAP.

Order No	Activity	Timestamp
1002	Enter order	2013-01-13 01:05:37
1002	Deliver goods	2013-01-20 01:04:41
1002	Create Invoice	2013-01-27 11:34:29
1002	Payment	2013-01-27 14:35:00
1003	Enter order	2013-01-13 01:05:54
1003	Deliver goods	2013-01-20 01:04:48
1003	Create Invoice	2013-01-27 11:34:38
1003	Payment	2013-01-27 14:35:04
1004	Enter order	2013-01-13 01:06:03
1004	Deliver goods	2013-01-20 01:04:52
1004	Create Invoice	2013-01-27 11:34:46
1004	Payment	2013-01-27 14:35:10
1005	Enter order	2013-01-13 01:06:03
1005	Deliver goods	2013-01-20 01:04:52
1005	Create Invoice	2013-01-27 11:34:46
1005	Payment	2013-01-27 14:35:10
1006	Enter order	2013-01-13 01:06:03
1006	Deliver goods	2013-01-20 01:04:52
1006	Create Invoice	2013-01-27 11:34:46
1006	Payment	2013-01-27 14:35:10
1007	Enter order	2013-01-13 01:06:03
1007	Deliver goods	2013-01-20 01:04:52
1007	Create Invoice	2013-01-27 11:34:46
1007	Payment	2013-01-27 14:35:10
1008	Enter order	2013-01-13 01:06:17
1008	Deliver goods	2013-01-20 01:04:57
1008	Create Invoice	2013-01-27 11:34:55
1008	Payment	2013-01-27 14:35:16
1009	Enter order	2013-01-13 01:06:24
1009	Deliver goods	2013-01-20 01:05:01
1009	Create Invoice	2013-01-27 11:35:03
1009		2013-01-27 14:35:22
1009		2013-01-13 01:06:25



Digital Footprints
Celonis Process Mining finds & reconstructs digital workflow traces.

IT-based work
Every workflow is supported by IT systems like SAP.



Full Transparency
Actual process flows are visualized in real time.

Digital Footprints
Celonis Process Mining finds & reconstructs digital workflow traces.

IT-based work
Every workflow is supported by IT systems like SAP.

CaseID	Activity	Timestamp
10001	Create purchase order	01-01-2009, 8:35 am
10001	Print and send purchase order	03-01-2009, 12:13 am
10001	Goods receipt	07-01-2009, 07:01 am
10001	Scan invoice	09-01-2009, 2:00 pm
10001	Book invoice	10-01-2009, 10:30 am
10002	Create purchase requisition	02-02-2009, 1:17 pm
10002	Create purchase order	04-02-2009, 9:15 am
10002	Print and send purchase order	07-02-2009, 4:41 pm
10002	Goods receipt	27-02-2009, 6:53 am
10002	Scan invoice	28-02-2009, 1:00 pm
10002	Book invoice	13-03-2009, 11:59 am
10003	Scan invoice	13-04-2009, 10:00 am
10003	Create purchase order	17-04-2009, 3:47 pm
10003	Print and send purchase order	17-04-2009, 5:30 pm
10003	Goods receipt	27-04-2009, 4:23 pm
10003	Book invoice	30-04-2009, 8:50 am

Event log

CaseID	Net order value	Vendor	Company code
10001	5337.98	Unisono SE	100
10002	250.30	Piccolo Ltd.	600
10003	12.17	Poly AG	100

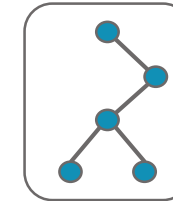
Case table

Case ID	Activity	Time
1	A1	10:12
1	A2	10:45
1	A3	11:34
1	A4	15:11
1	A5	18:33
2	A1	12:59
2	A2	14:34
2	A3	14:56
2	A4	18:32
3	A1	16:23
3	A2	17:04
3	A3	17:54
3	A4	19:23
3	A5	21:23

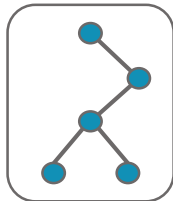
Event-Log



Discovery



Model



Model



Case ID	Activity	Time
1	A1	10:12
1	A2	10:45
1	A3	11:34
1	A4	15:11
1	A5	18:33
2	A1	12:59
2	A2	14:34
2	A3	14:56
2	A4	18:32
3	A1	16:23
3	A2	17:04
3	A3	17:54
3	A4	19:23
3	A5	21:23

Event-Log

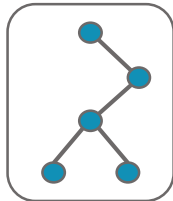


Conformance



Case ID	Activity	Time
1	A1	10:12
1	A2	10:45
1	A3	11:34
1	A4	15:11
1	A5	18:33
2	A1	12:59
2	A2	14:34
2	A3	14:56
2	A4	18:32
2	A5	19:23
3	A1	16:23
3	A2	17:04
3	A3	17:54
3	A4	19:23
3	A5	21:23

Diagnosis



Model

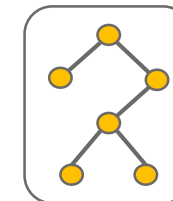


Case ID	Activity	Time
1	A1	10:12
1	A2	10:45
1	A3	11:34
1	A4	15:11
1	A5	18:33
2	A1	12:59
2	A2	14:34
2	A3	14:56
2	A4	18:32
3	A1	16:23
3	A2	17:04
3	A3	17:54
3	A4	19:23
3	A5	21:23

Event-Log

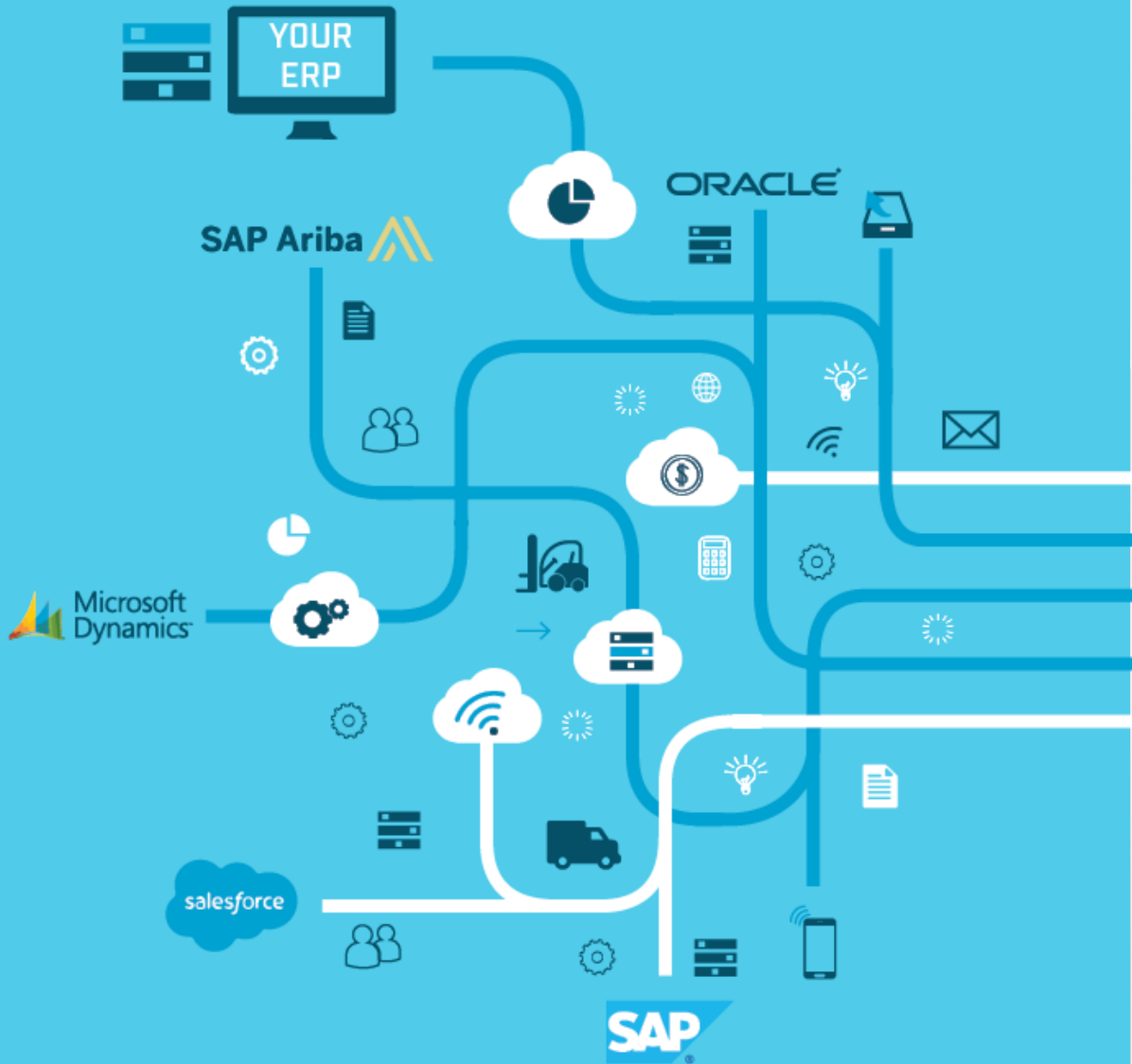


Enhancement



New Model

HOW DOES PROCESS MINING WORK?



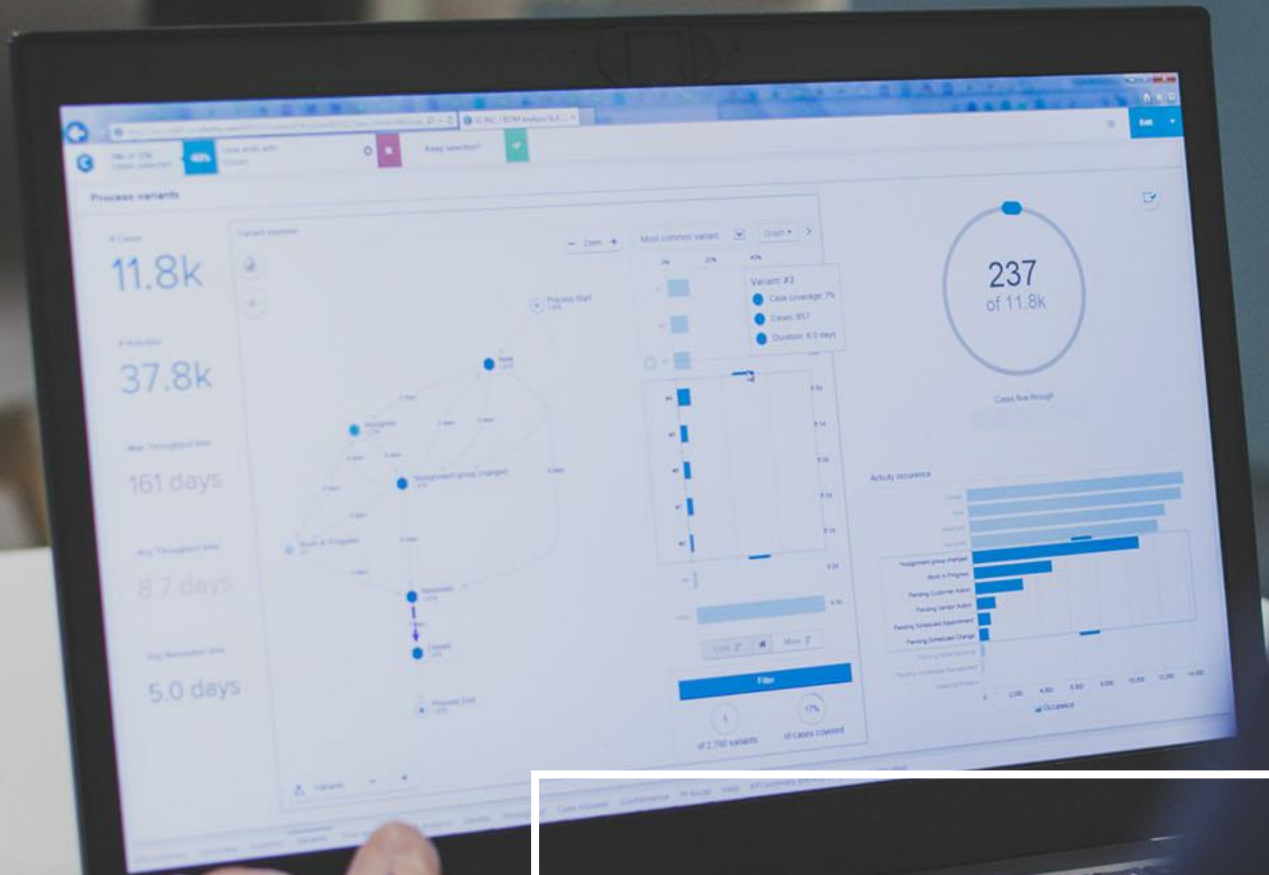
VISUALIZATION OF THE ACTUAL PROCESSES

AI-POWERED ROOT CAUSE ANALYSIS & IMPROVEMENT



EVENT LOG

2016-12-01	CREATE PURCHASE ORDER	#1234
2016-06-23	START PRODUCTION	#5678
2016-07-14	RECEIVE PAYMENT	#1234
2016-07-14	SEND EMAIL	#9012



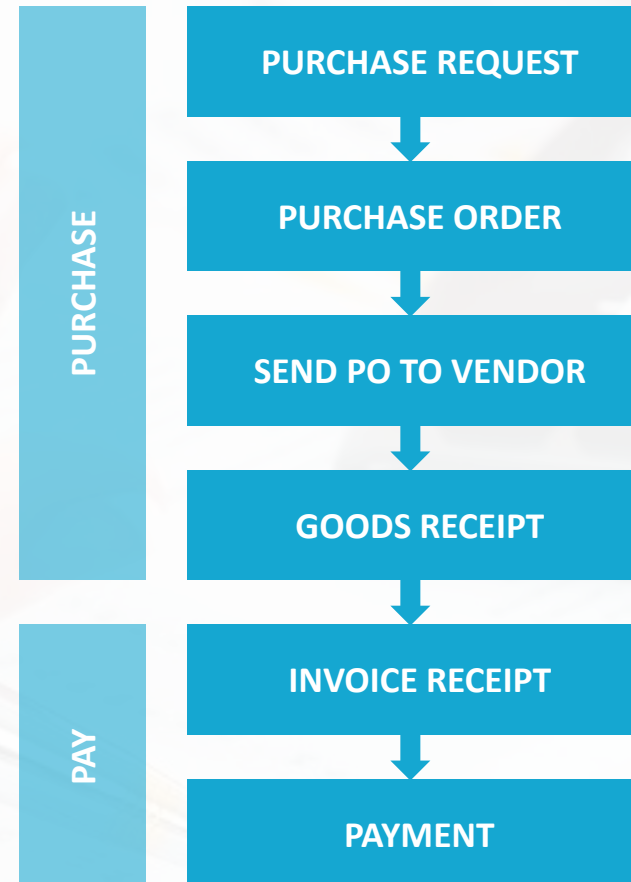
LIVE DEMO

Today's session

		Skills	Know how	Typical tasks
Viewer 	Departments	Business ★★★★★ Analytics ★★☆☆☆ Coding ☆☆☆☆☆	✓ Process knowledge ✓ No technical knowledge required	✓ Performance analysis ✓ Single case analysis ✓ Process improvement, e.g. customer relationship management
Analyst/Key User 	Departments or Center of Excellence	Business ★★★★★ Analytics ★★★★★ Coding ★☆☆☆☆	✓ Understand the requirements of the departments/viewers ✓ Analytical skills (e.g., reporting in Excel)	✓ Create new analyses ✓ Definition of KPIs ✓ Implementing the requirements of the departments/viewers ✓ Data validation
Data Scientist 	IT	Business ★☆☆☆☆ Analytics ★★★★★ Coding ★★★★★	✓ Knowledge about the data models ✓ SQL skills	✓ Connecting new processes ✓ Add further data sources

Purchase-to-Pay (P2P)

- Core business process
- High number of transactions
- Complexity:
Requests, approvals, timelines
- Various departments involved:
Procurement, Accounting, Warehousing,...



Please open the P2P process and navigate to the “**Variant Explorer**” sheet. In this step, you will learn how to interpret the process graph and how to identify inefficiencies and bottlenecks. Please note that one or multiple answers might be correct.

YOUR TASKS Please answer the following questions using the functionality of the variant explorer.

1. How many purchase order (PO) items follow the second process variant?

- a. 37,270
- b. 38,089
- c. 107,688
- d. 149,376

2. What's the overall average throughput time (in days) for the happy path from process start to end?

- a. 28
- b. 30
- c. 38
- d. 655

3. Display the first 17 variants in the variant explorer.

How does the 17th most common variant look like (use process animation)?

- a. The quantity is changed after the purchase requisition item is created
- b. The purchase order item is blocked after the order is print and sent
- c. Payment blocks are set and removed
- d. The currency is changed after the order is print and sent

Now you will learn to explore the power of filtering and how to get deeper insights into business processes. Please answer the following questions using filters within the “**Variant Explorer**” sheet.

YOUR TASKS

4. How many different variants exist for PO items with price change?
 - a. 1
 - b. 3
 - c. 68
 - d. 655

5. Let's look at PO items without purchase requisitions. How does the second most common variant look like for those?
 - a. The process starts with the scan of the invoice
 - b. The purchase order items are deleted
 - c. The purchase order items are refused
 - d. The price is changed after purchase order is sent out to vendor

6. Filter on purchase order items that are blocked (show the 10 most common variants), yet not reactivated. How does the main variant look like?
 - a. After blocking the purchase order item, the quantity is changed
 - b. The process ends with the purchase order items being blocked
 - c. After blocking the purchase order item, the goods receipt is cancelled

After learning the basic functions in Celonis, you continue with a more in-depth analysis of the process. For this task, go to the “**Analysis**” and the “**Details**” sheet.

YOUR TASKS

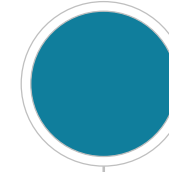
7. Look at purchase order items without purchase requisitions. Who is the dominant vendor for these positions in terms of net value?
 - a. IDES Consumer Products
 - b. C.E.B. Barcelona
 - c. Tiefland Glass AG

8. Have a look at Unisono AG (top 3 vendor in terms of number of PO items).
Observing the number of PO items and the net value over time, what attracts your attention?
 - a. There is an unusual peak in the net value in September 2016
 - b. The number of PO items is strongly decreasing over time with December 2016 being the month with the lowest net order value
 - c. There is a high accumulation of purchases towards the end of the year with a peak in net order value in November 2016

9. In the “Details” sheet, have a look at the PO item with the Purchasing Document Number 0000097360.
What is the material group of the goods being ordered?
 - a. Monitors
 - b. SMI Demo Scenarios
 - c. Bulbs

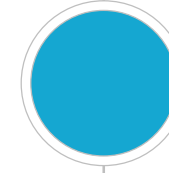


OVER 250 APPS – AND COUNTING!



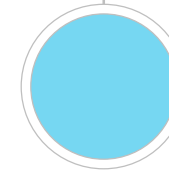
INDUSTRIES

APPS SUITABLE FOR 15 +
INDUSTRIES



LINES OF BUSINESS

OVER 10 DIFFERENT LINES OF
BUSINESS COVERED



USE CASES

APPLICABLE FOR A VARIETY OF USE
CASES

CELONIS IS CONTINUOUSLY DEVELOPING
NEW APPS FOR CUSTOMER NEEDS

A NETWORK OF CUSTOMERS AND
PARTNERS IS DEVELOPING APPS IN
SPECIALIZED AREAS

Celonis **PI**

Process Mining becomes smart

PI FEATURES



Celonis PI (Proactive Insights Engine) combines Process Mining with machine learning and A.I. to achieve highly intelligent and fully automated insights.



PI Conformance

Compares actual operations to designed processes (conformance checking) and automatically identifies the highest priority issues and their root causes, so you can take immediate action.



PI Machine Learning

PI Machine Learning integrates the most sophisticated machine learning and statistical algorithms natively into all Celonis analyses. The possibility to integrate any R-Library or statement into Celonis will allow every user to apply advanced prediction techniques.



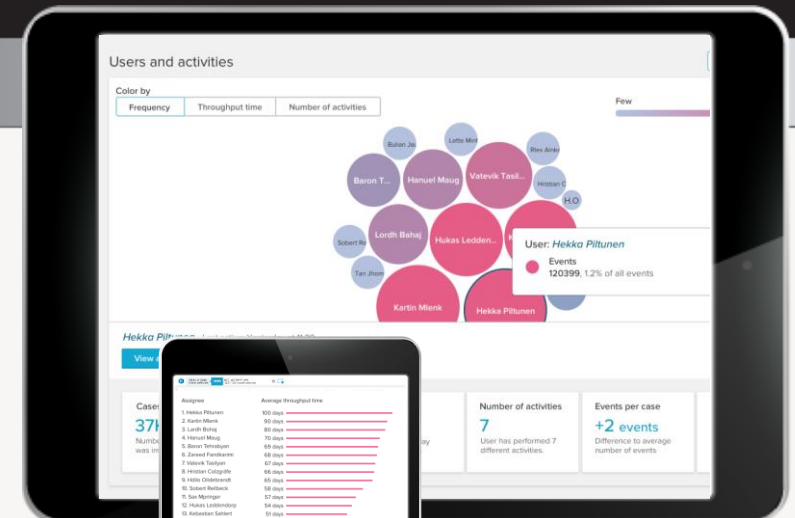
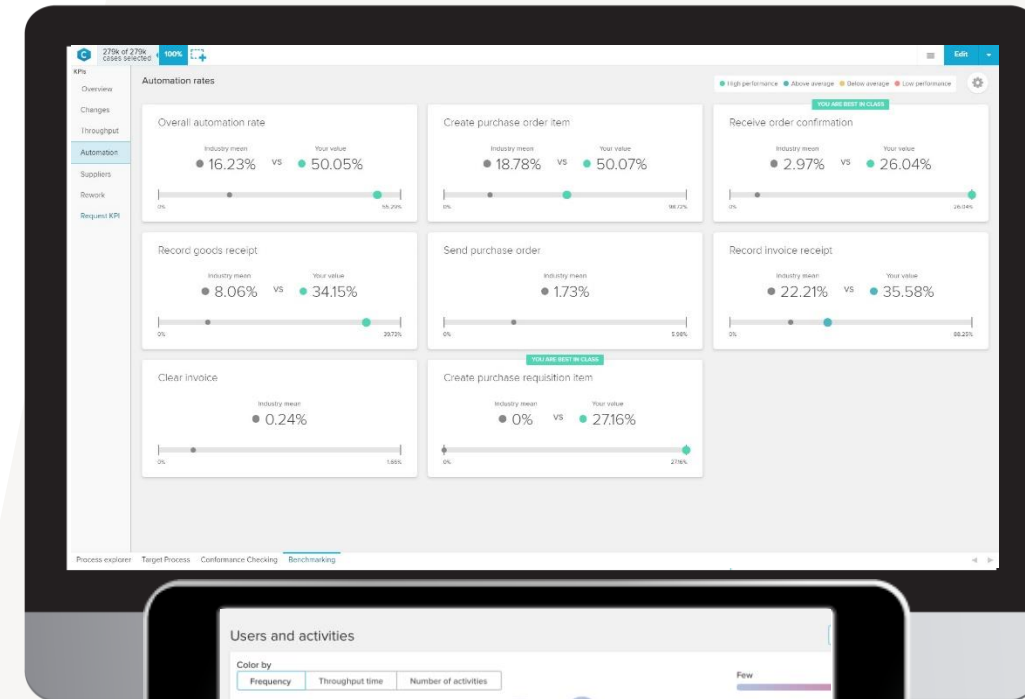
PI Social

Use PI to gain a deep understanding of the human aspect of your processes. Identify which teams have the best outcomes, which interactions result in lost time or bottlenecks, or discover where inefficiencies in organization structure call for improvement.



PI Companion

Identifies potential issues before they even happen and allows users to make the right decisions during process execution rather than after a problem arises.



Celonis Use Cases



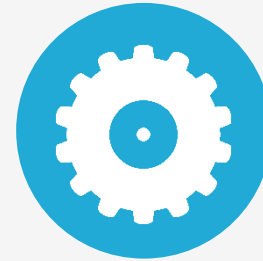
IT Service Mgmt



Procurement



Human Resources



Production



Sales



Accounting



Logistics



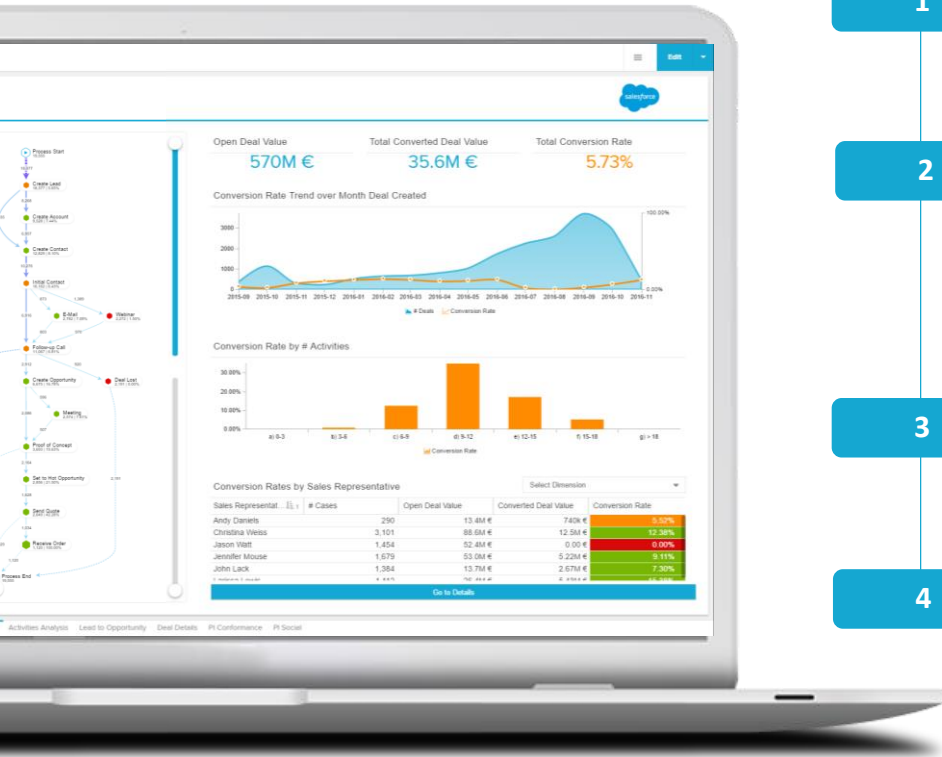
Audit



Webanalytics



...and many more



HOW IT WORKS

1

How can the sales process become more efficient?

2

Which activities and measures have the highest likelihood to lead to conversion?

3

How can aging of promising opportunities be prevented?

4




How does the process flow look for lost vs. won opportunities?

EXAMPLE

PROCESS DISCOVERY & KPIs

-  TIME TO CONVERSION
-  SALES ACTIVITIES
-  REVENUE STREAMS
-  CONVERSION RATES

INTELLIGENT ROOT CAUSE ANALYSES

-  LOST DEALS
-  UNNECESSARY EFFORT
-  SALES PERFORMANCE



HOW IT WORKS

1

How often do tickets ping-pong back and forth between two ITSM groups?

2

How many tickets pass through multiple departments?

3




How many ticket openings could we avoid in general?

4




How much can we reduce the overall throughput time?

EXAMPLE

PROCESS DISCOVERY & KPIs

-  CYCLE TIMES
-  AUTOMATION RATES
-  BENCHMARK

INTELLIGENT ROOT CAUSE ANALYSES

-  MULTI HOP
-  MANUAL REWORK
-  THROUGHPUT TIME

DACH

EMEA

AMERICAS

Production



Processing



Financial



Consumer & Logistics



Virtual



Public & Services



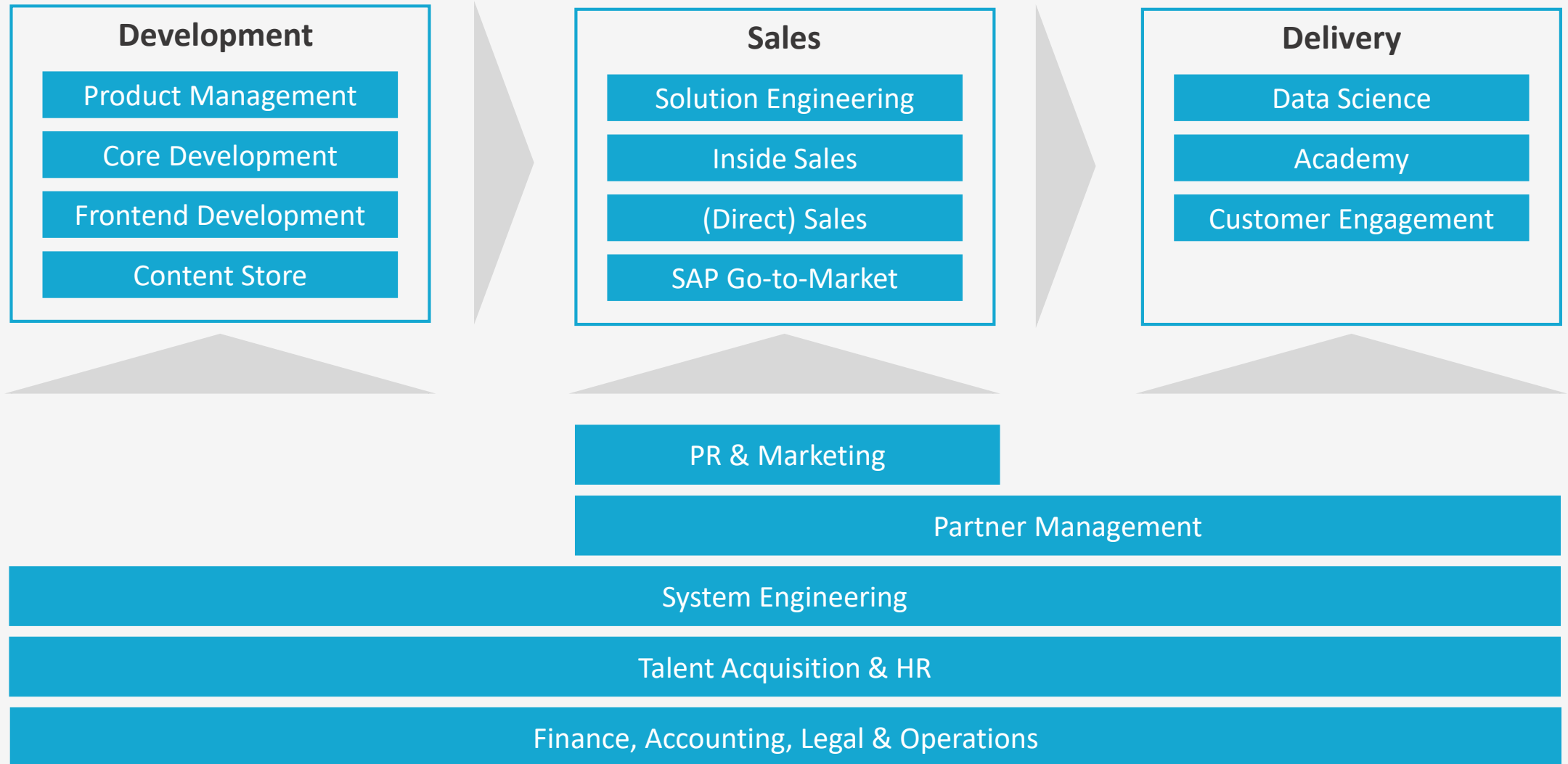


THE FUTURE

of the business world

By 2020, Celonis' Process Mining technology for Big Data Analytics will be deeply embedded in every large company as a business critical application in the race for the fastest, most efficient and most transparent processes.

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BECOME A PROCESS MINING SPECIALIST

BPI Challenge 2018

- Celonis sponsors the Business Process Intelligence (BPI) challenge 2018.
- Analyze a real-life event log .
- The best submissions will be awarded at the 14th BPI Workshop in Sydney (September 9-10, 2018).

To participate in the challenge, download the data set at the [BPI website](#).

MOOCs / Videos / Readings

- Coursera online course “Process Mining – Data Science in Action” by Professor Wil van der Aalst. Go to <https://www.coursera.org/learn/process-mining>
- Celonis YouTube Channel. Go to <https://www.youtube.com/user/CelonisPM>
- IEEE Task Force on Process Mining. *Process Mining Manifesto*. Download [here](#).
- Van der Aalst, W.M.P. (2016). *Process Mining – Data Science in Action*, 2. edition.

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