



# SAP Intelligent Technologies for Chemicals, Mill Products and Mining

Muriel Rakotomalala, Andreas Forster - SAP

September 28, 2022

**“AI should be embedded in every product,  
natively. It should not be separate; it needs  
to be embedded”**

Thomas Saueressig in [Product Engineering 2022 Kick-Off](#)

# From embedded AI to bring-your-own models

## AI integrated into business processes and solutions

Intercompany reconciliation   Sales order automation   SAP Cash Application   Workflow Intelligence   SAP Litmos personalized learning recommendations   Returnable packaging   Product & Pricing Recommendations   Intelligent expense scanning   Automatic invoice processing   SAP Analytics Cloud

### Ready-to-use AI

### Chatbot

### Process Automation

Service Ticket Intelligence   Data Attribute Recommendation   Document Information Extraction   Business Entity Recognition

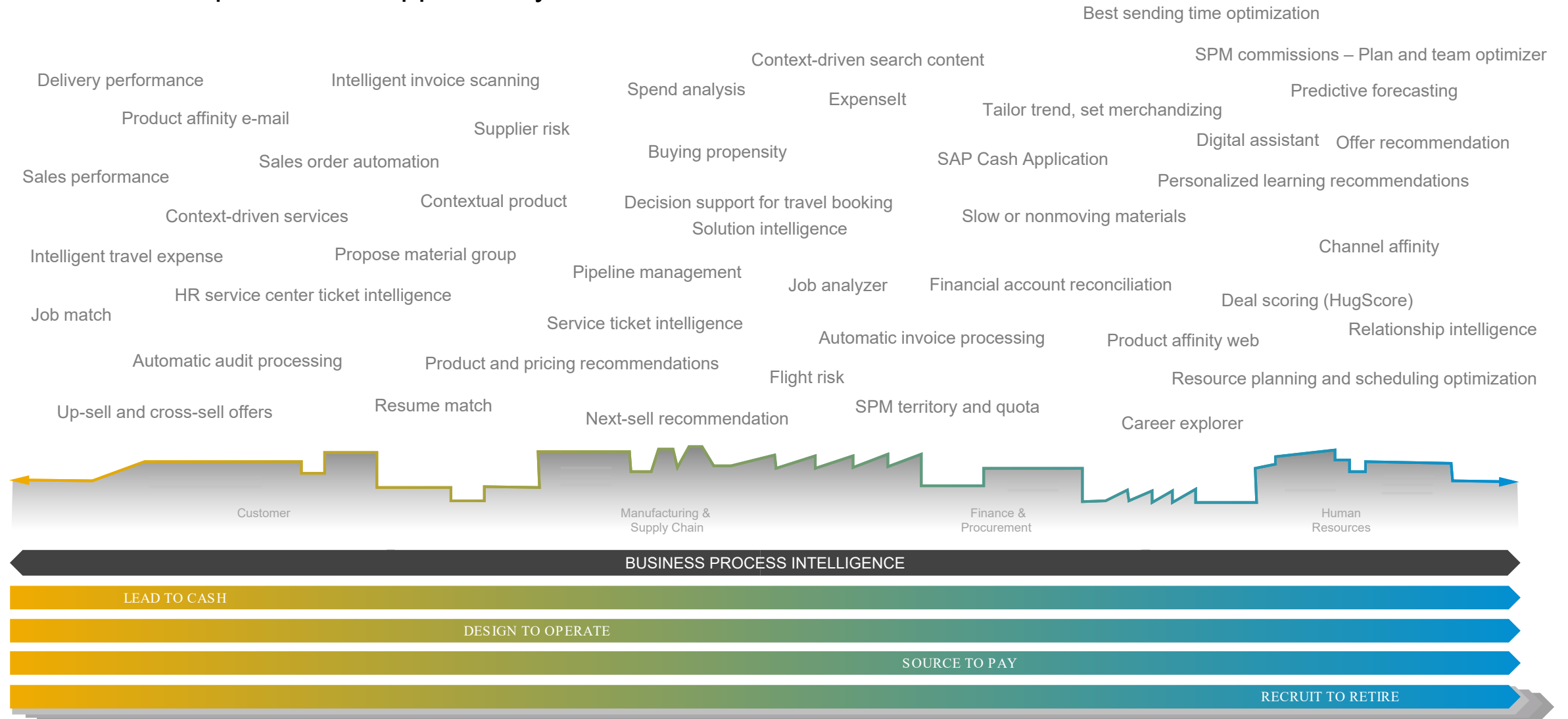
Bot Design   Bot Deployment   Bot Analytics

Workflow   RPA   Business Rules   Process Visibility

## SAP Business Technology Platform

# Enterprise artificial intelligence

## AI in business processes supported by SAP software



Artificial Intellig... x 399 Road Map Items x Q

Products Processes Industries Focus Topics 1 Suite Qualities Earliest - Latest Save

Q1 2022 CURRENT 14 Road Map Items	Q2 2022 11 Road Map Items	Q3 2022 6 Road Map Items	Q4 2022 14 Road Map Items	Q1 2023 14 Road Map Items
<p>SAP S/4HANA 2021 +1</p> <p><b>Account and Contact Management</b></p> <ul style="list-style-type: none"> <li>Microsoft Teams deal rooms for sales scenarios</li> <li>SAP Cloud for Customer core applications</li> </ul> <p><b>Activity Management and Visit Planning</b></p> <ul style="list-style-type: none"> <li>Microsoft Teams deal rooms for sales scenarios</li> <li>SAP Cloud for Customer core applications</li> </ul> <p><b>Asset Maintenance Demand Processing</b></p> <ul style="list-style-type: none"> <li>Leverage machine-learning (ML) algorithms to provide system...</li> <li>SAP S/4HANA</li> </ul>	<p>Future Release</p> <p><b>Access Monitoring</b></p> <ul style="list-style-type: none"> <li>Basic service for security monitoring</li> <li>SAP Enterprise Threat Detection, cloud edition</li> </ul> <p><b>Analytics Design</b></p> <ul style="list-style-type: none"> <li>Optimized View Mode</li> <li>SAP Analytics Cloud</li> </ul> <p><b>Business Entity Recognition</b></p> <ul style="list-style-type: none"> <li>Automated support for making annotations to a document</li> <li>Business Entity Recognition</li> </ul>	<p>Future Release</p> <p><b>Accounts Receivable</b></p> <ul style="list-style-type: none"> <li>Payment advice engine</li> <li>SAP S/4HANA Cloud</li> </ul> <p><b>Business Entity Recognition</b></p> <ul style="list-style-type: none"> <li>Service availability in the US21 data center</li> <li>Business Entity Recognition</li> </ul> <p><b>Demand Planning</b></p> <ul style="list-style-type: none"> <li>Forecasting with external algorithms build in e.g. R or Python</li> <li>SAP Integrated Business Planning for Supply Chain</li> </ul>	<p>Future Release</p> <p><b>Account and Contact Management</b></p> <ul style="list-style-type: none"> <li>Live data connection integration with SAP Analytics Cloud</li> <li>SAP Cloud for Customer core applications</li> </ul> <p><b>Activity Management and Visit Planning</b></p> <ul style="list-style-type: none"> <li>Live data connection integration with SAP Analytics Cloud</li> <li>SAP Cloud for Customer core applications</li> </ul> <p><b>Claims, Returns, and Refund Management</b></p> <ul style="list-style-type: none"> <li>Live data connection integration with SAP Analytics Cloud</li> <li>SAP Cloud for Customer core applications</li> </ul>	<p>Future Release</p> <p><b>Use</b></p> <ul style="list-style-type: none"> <li>Role man</li> <li>SAP</li> </ul>



# Intelligent **Factories** via Improved Data Quality



**7x Faster** to process packaging specification information from vendors

**>10** Related data management use cases identified where the technology can enable process efficiencies

**50%** Less time required for systems maintenance

**Minimize out-of-stock situations for packaging materials**

"With the successful launch of our next-generation enterprise data management, we now have an integrated, self-learning, scalable platform that frees experts from manual data entry and classification tasks when entering information in SAP ERP. This results in tremendous efficiency improvements and enhanced data quality.."

- Frank Schmale, Head of Enterprise Data Management, Global IT  
Evonik Industries AG



# Different persona working together to create value from data

SAP provides one platform to address a variety of perspectives & needs

Needs:

- Easy to consume insight
- In-context Information
- Pre-build content



**Business User**

Needs:

- Flexible access to data
- Ease of use of given Algorithms
- End to end Business Self-service



**Business Data Scientist**

Needs:

- Easy data access
- Flexible use of any tool and technology
- ML Model Development with HANA ML



**Data Scientist**

Needs:

- Integration of new tech & existing systems
- Integrate Real-Time Inference Pipelines
- Integrate ML into business processes



**IT Lead / Data Engineer**



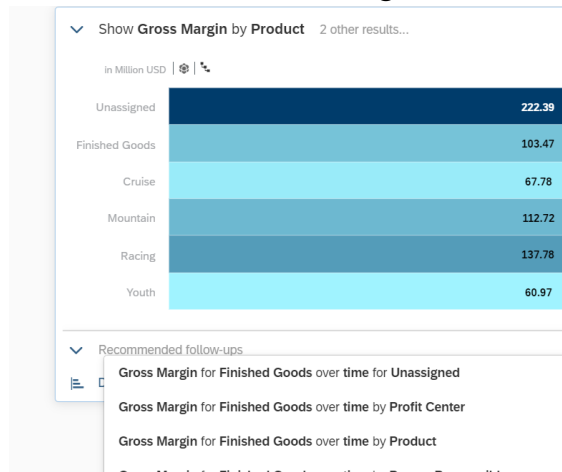
# Augmented Analytics

Make smarter and faster decisions with automated insights powered by machine learning



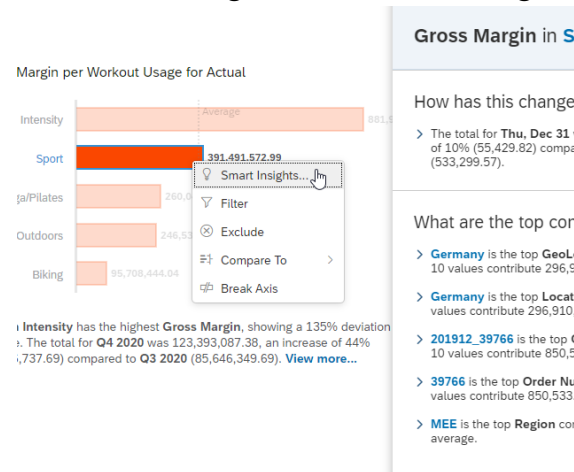
Business User

## Conversational Search to Insight



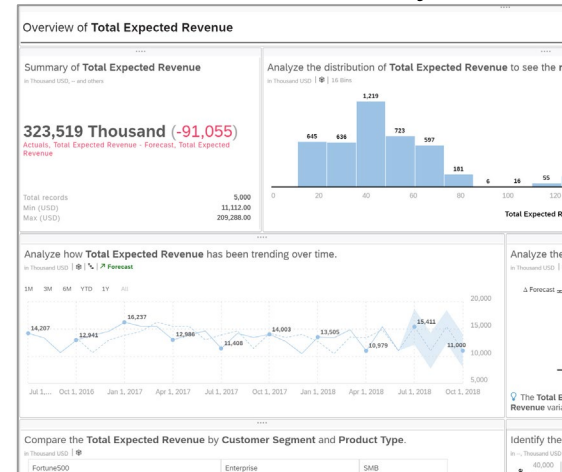
Ask questions conversationally and SAP Analytics Cloud finds and visualizes your answers

## Automated Insights Smart Insights & Forecasting



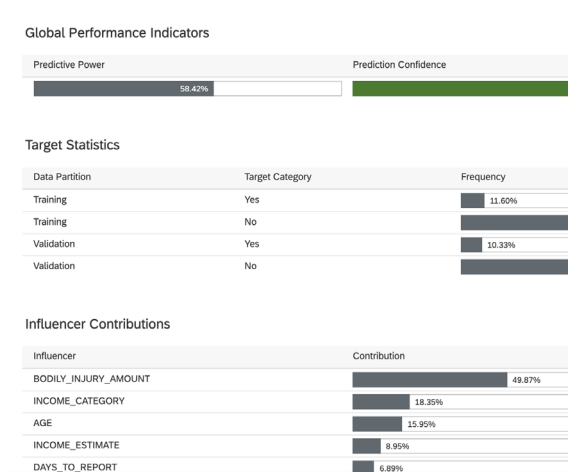
Automatically add forecasts and find top influencers in your data, shown in natural language

## Automated Discovery Smart Discovery



Automatically generate stories that reveals trends, relationships, patterns, and outliers in your data

## Predictive Analytics Smart Predict



Run regression and classification scenarios, and generate forecasts without data scientists

Business User

Business Data Scientist





**Business  
User**



**Business Data  
Scientist**



# Demo

SAC SmartPredict as a self-service analytics platform

## Welcome to Predictive Scenarios

Create predictive scenarios that make it easy to compare and choose the right predictive model for a business question requiring a prediction of future events or trends. [Learn More...](#)

### Create New



Classification



Regression



Time Series Forecast

### Recent Files (2)

Search In: Recent Files

Name	Description	Created By	Created On	Changed By	Changed On
product_planning_forecast <a href="#">My Files / I538914</a>		Max Lautenbach	Aug 17, 2022 11:40:29	Max Lautenbach	Aug 17, 2022 11:41:46
product_planning_forecast_by_month <a href="#">My Files / I538914</a>		Max Lautenbach	Aug 16, 2022 18:04:21	Max Lautenbach	Aug 16, 2022 18:04:48

- Home
- Files
- Apps
- Stories
- Analytic Applications
- Data Analyzer
- Digital Boardroom
- Datasets
- Modeler
- Data Actions
- Allocations
- Value Driver Trees
- Predictive Scenarios
- Multi Actions
- Calendar
- Content Network
- Security >
- Transport >
- Connections
- System >

Click "Train" once you have configured your Predictive Model's settings.

Train

Settings

Details

General

Description:

Training Data Source: \* *i*  
Customer Churn *o*  
*o* Edit Column Details

Predictive Goal

Target: \* *i*  
Contract Activity *o*

Influencers

Exclude As influencer: *i*  
Customer ID x *o*

Limit Number Of Influencers: *i*  
Off

Train

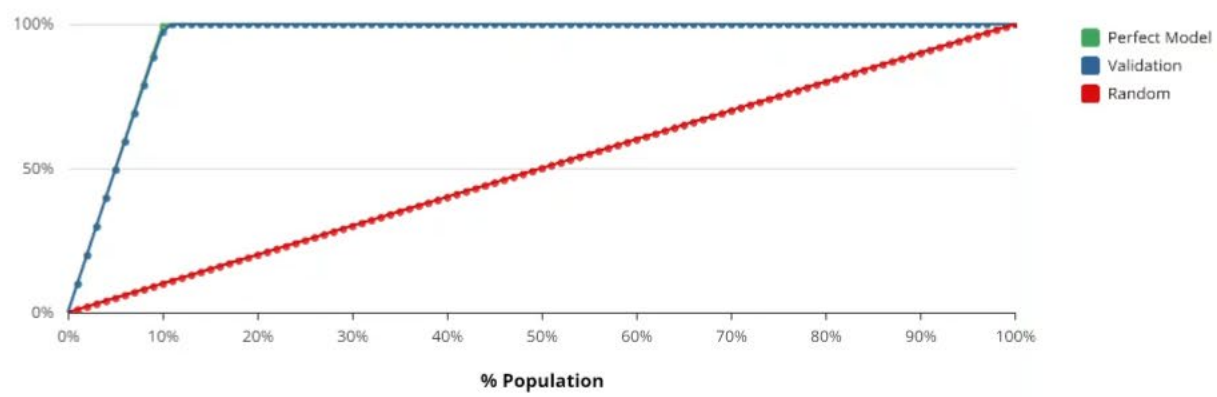
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Training	Active	89.70%
Validation	Churned	10.06%
Validation	Active	89.94%

### Influencer Contributions

Influencer	Contribution
Average Marketing Activity (Bi-yearly)	15.74%
Average Visit Time (min)	14.09%
Delta Revenue (Previous Month)	13.76%
Pages per Visit	11.72%
Customer Lifetime (days)	8.81%

### % Detected Target



Settings
Details

**General**

Name: Model 1

Type: Classification

Description:

Training Data Source: \* Customer Churn

**Predictive Goal**

Target: \* Contract Activity

**Influencers**

Exclude As influencer: Customer ID x

Limit Number Of Influencers: Off

Train

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Page 1

Story Data

File Insert Data Format Display More

### Customer Churn Results

Prediction Probability 2

Time (min)	Pages per Visit	Delta Revenue (Previous Month)	Revenue(Current Month)	Service Failure Rate(%)	Customer Lifetime (days)	Product Abandonment	Prediction Probability
6.30	0.60	5	55	1.70	631	18	1.00
6.30	0.60	5	55	1.70	631	18	1.00
6.30	0.60	5	55	1.70	631	18	1.00
7.70	0.20	-15	55	1.00	1,379	16	1.00
12.10	4.20	-10	55	1.50	898	10	1.00
12.10	4.20	-10	55	1.50	898	10	1.00
12.10	4.20	-10	55	1.50	898	10	1.00
16.30	4.10	-35	55	0.90	1,092	13	1.00
0.60	7.50	-5	55	1.50	812	10	1.00
0.60	7.50	-5	55	1.50	812	10	1.00
0.60	7.50	-5	55	1.50	812	10	1.00
4.80	0.20	-5	55	0.90	1,702	10	1.00
4.80	0.60	-25	55	1.60	1,041	13	1.00
4.80	0.60	-25	55	1.60	1,041	13	1.00
4.80	0.60	-25	55	1.60	1,041	13	1.00
13.80	4.80	-40	55	0.00	364	20	1.00
14.20	3.30	-50	50	1.10	249	15	1.00
14.20	3.30	-50	50	1.10	249	15	1.00
14.20	3.30	-50	50	1.10	249	15	1.00
15.50	0.40	-40	55	1.40	294	16	1.00

### Builder

Data Source: Customer Churn Results

+ Add Linked Models

#### Table Structure

- Adaptive Column Width
- Arrange Totals / Parent Nodes Below
- Optimized Presentation

#### Rows

- Customer ID
- Contract Activity

+ Add Dimensions

#### Columns

- Measures (9 Model Measures)

+ Add Dimensions

#### Filters

- Measures (9): Average Marketing Activity (BI-yearly), Average Visit Time (m...)

+ Add Filters

#### Reporting

- Auto-size And Page Table Vertically

#### Properties

View Mode

- Enable Explorer
- Enable Data Analyzer



# SAP HANA Cloud | Embedded Machine Learning

Automated or hand-crafted



Data Scientist



## Automated Predictive Library (APL)

- Framework that scales the use of Machine Learning
- Covers steps from variable selection, data preparation, variable encoding, missing value handling, outlier handling, binning and banding, model testing and best model selection
- **Proprietary framework**, with global and local explainability

## Predictive Analysis Library (PAL)



- Expert algorithm library, with over **100 classic and trending machine learning algorithms**
- Individual algorithms with full control for Data Scientists
- Requires manual insight, ie for parameterization
- Highly reproducible
- AutoML based on PAL in development (currently in beta)



Classification



Association analysis



Regression



Outlier detection



Time series forecasting



Recommender System



Cluster analysis

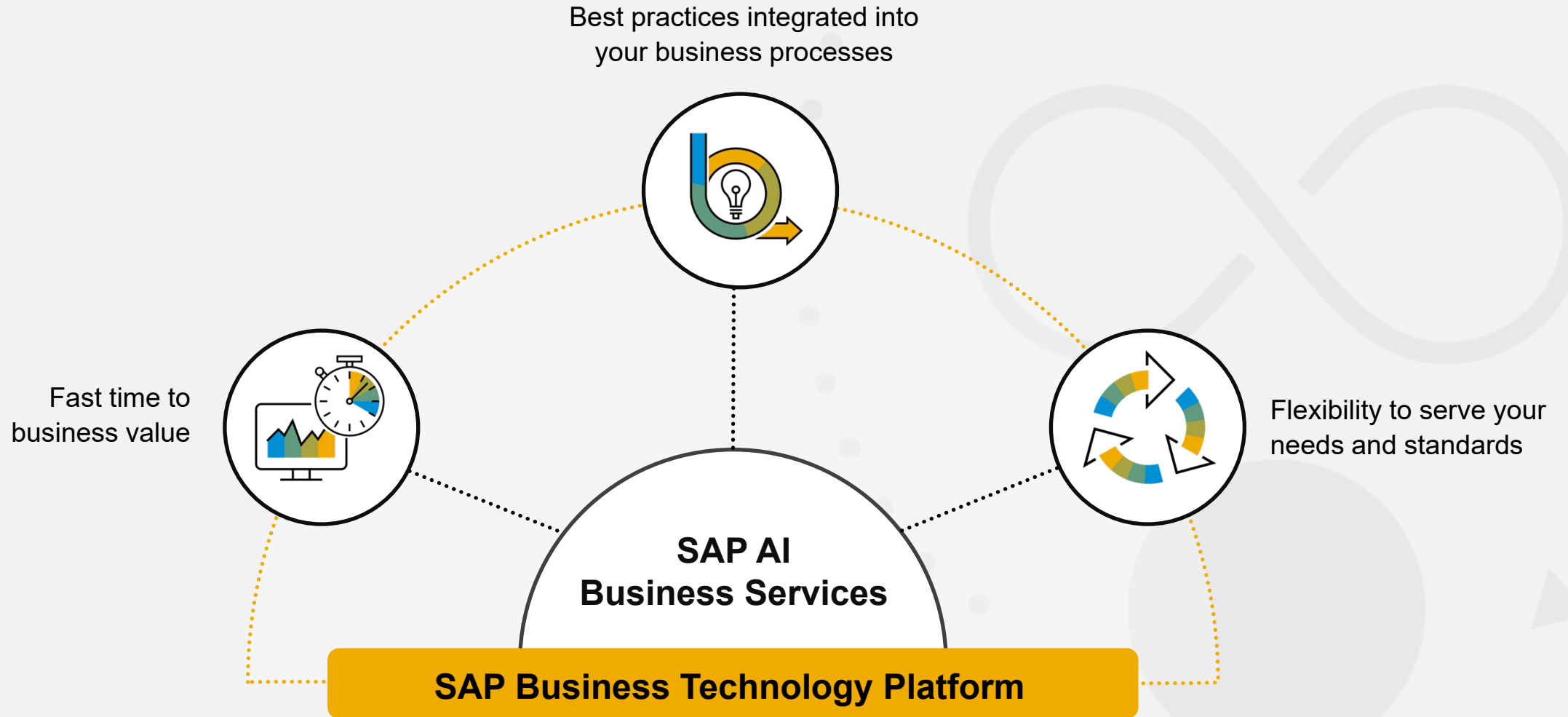


Link prediction

# Realize Rapid Value from AI Technologies with Ready-to-use AI



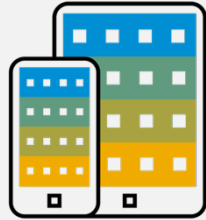
IT Lead /  
Data Engineer



# Ready-to-use AI



IT Lead /  
Data Engineer



[SAP AI Business Services](#) provide strategic machine learning capabilities that help you automate and optimize processes while enriching the customer experience. These reusable services are available on SAP Business Technology Platform.

## Business document processing



### Business Entity Recognition

Detects and highlights named entities in unstructured text



### Document Information Extraction

Automatically extracts information from unstructured documents



### Document Classification

Classifies unstructured documents



### Data Attribute Recommendation

Automates creation, maintenance, and management of structured data



### Invoice Object Recommendation

Recommends general ledger accounts and cost centers for invoices without order reference



### Service Ticket Intelligence

Classifies and recommends tickets automatically

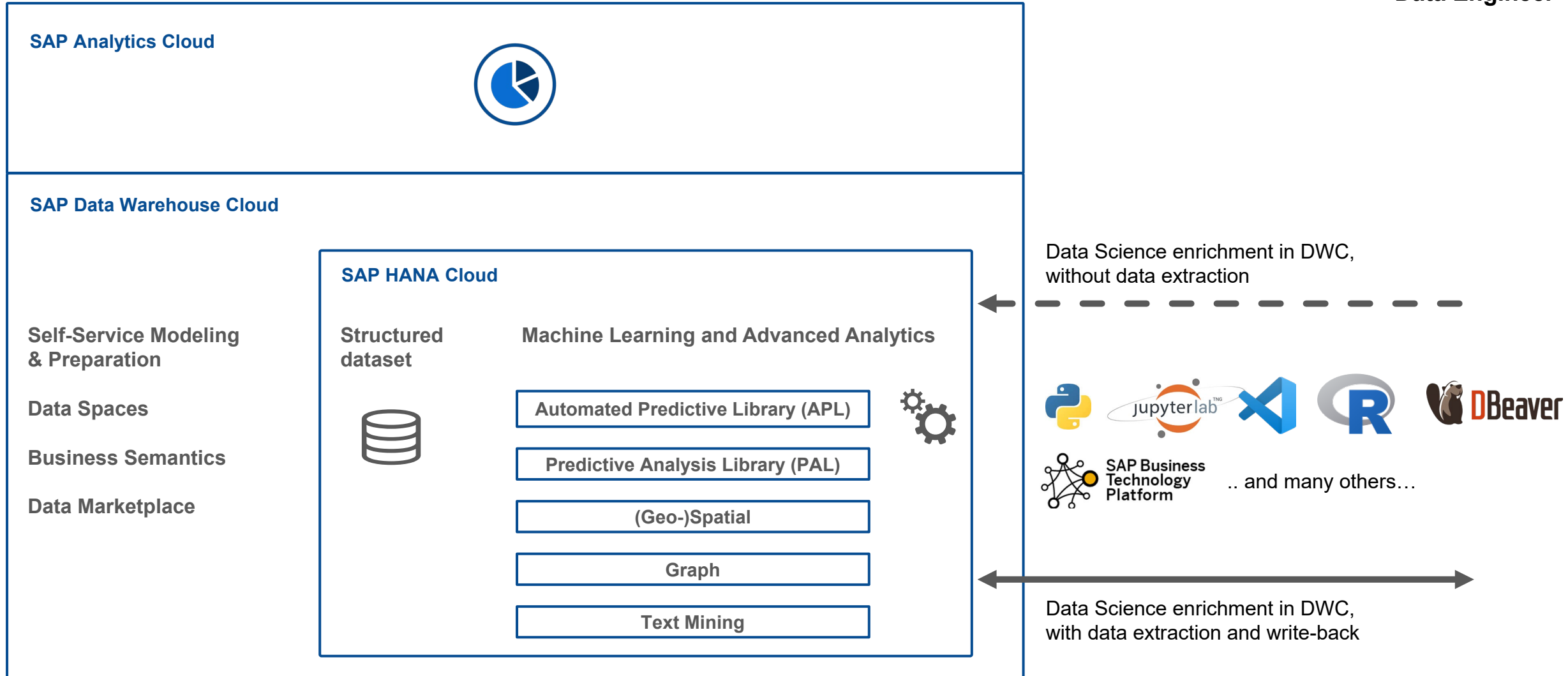
Available via CPEA

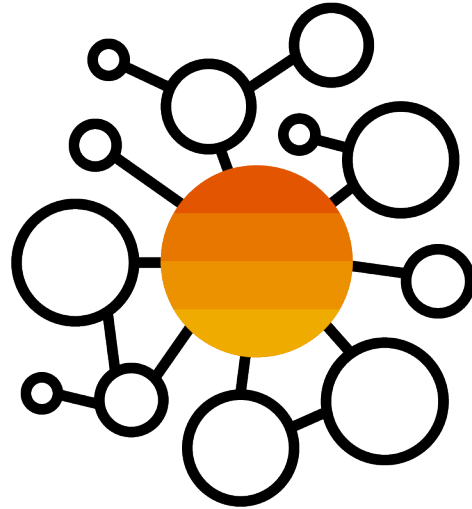
# SAP Data Warehouse Cloud / SAP HANA Cloud

## Embedded Machine Learning and Advanced Analytics



IT Lead /  
Data Engineer





# How it all fits together



# Use Case: Manufacturing Quality

## Before: Challenges and Opportunities

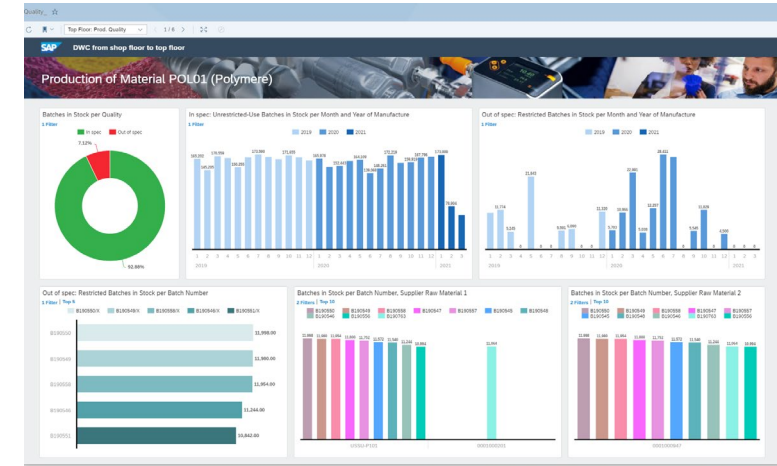
- Lack of a centralized data access to IoT sensor data and structured data from multiple data sources
- Understand where quality issues are most likely to occur and what drivers lead to low quality
- Gain faster and reliable insights and take preventative actions to avoid quality decline and thereby improve manufacturing quality

## Why SAP?

- Access distributed data from multiple sources, e.g., real-time sensor data from production plants
- Reuse SAP semantics to build data models and gain end-to-end view of all data (Sensor, Raw Material, Quality and Supplier)
- Leverage machine learning technology, provide real-time quality advices and automate prediction process
- Empower enterprise-wide collaboration, e.g., plant managers, business analysts, data scientists and IT experts

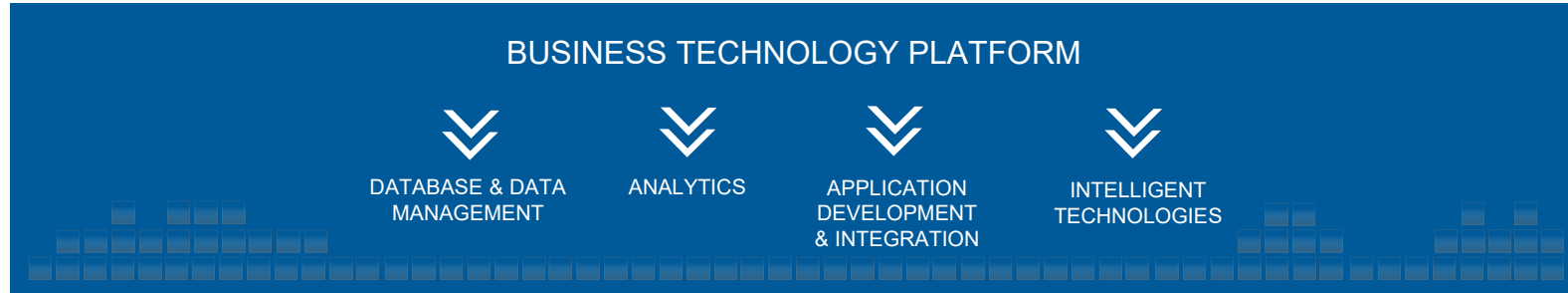
## After: Value -Driven Results

- A data-driven and collaborative approach to decision-makings, in which plant managers can explore quality in real-time, uncover quality drives and easily inform operators
- Improved manufacturing quality through data-driven predictive analysis (not based on assumptions of processes in plants)
- Automate pattern detection process and enrich existing knowledge of plant managers and business analysts

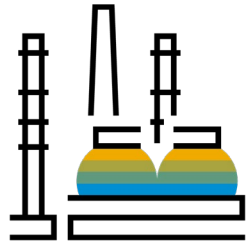
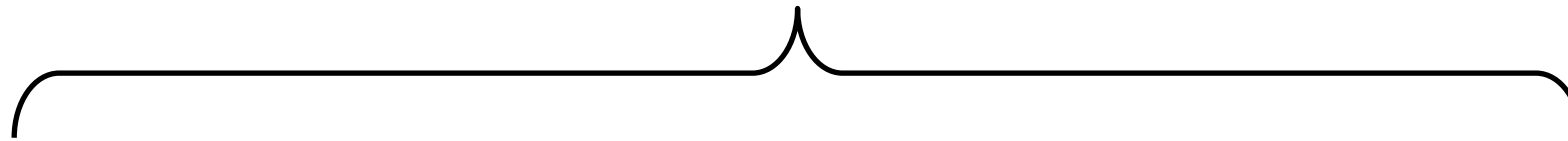


# Manufacturing Quality

## Exemplary use case for SAP's Business Technology Platform



- Advise in real-time
- Apply Machine Learning
- Merge the data source



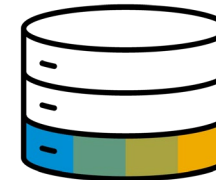
### Production plant

- Sensor data



### SAP ERP

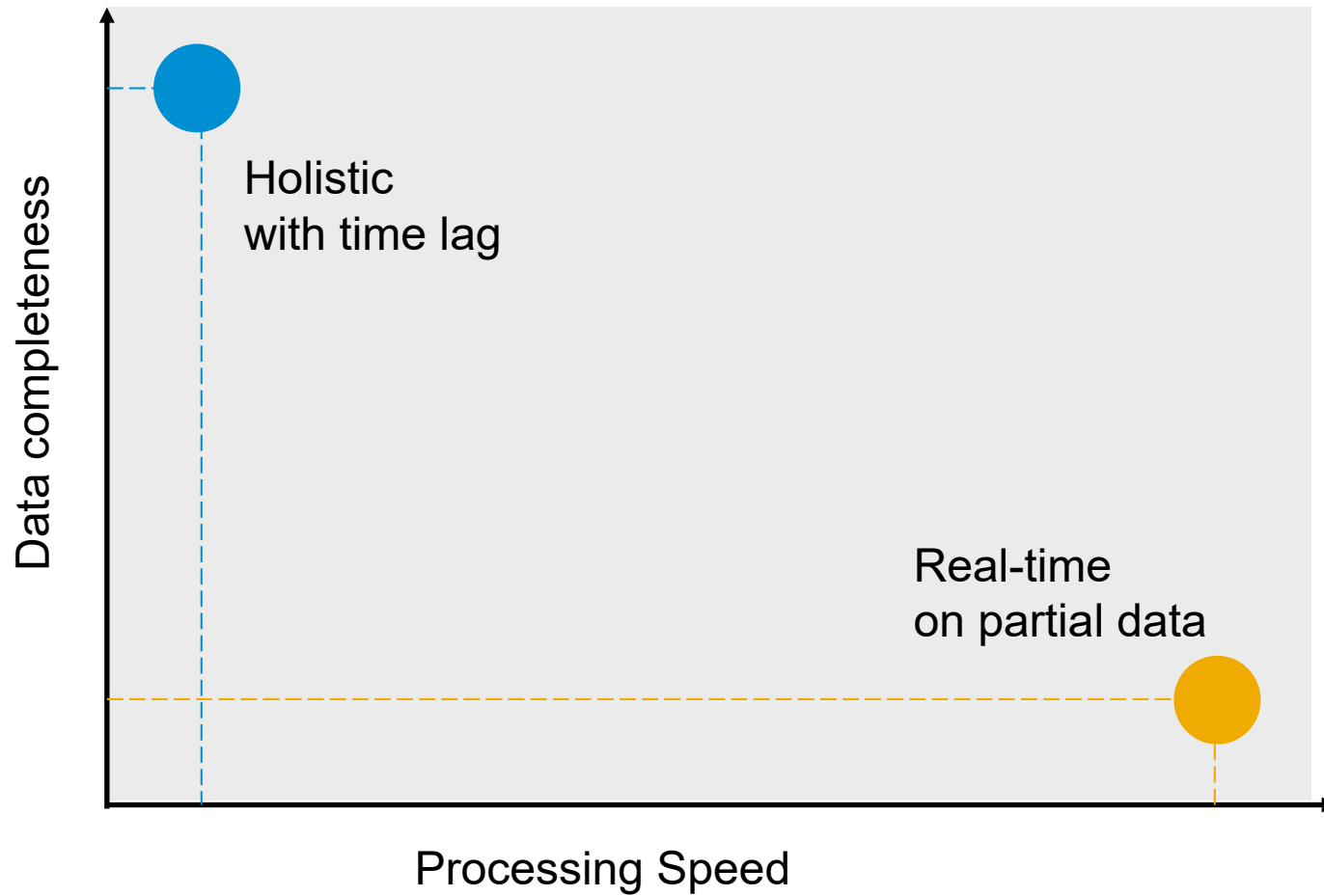
- Historic quality data
- Raw materials
- Supplier details



### Further data sources

- ...

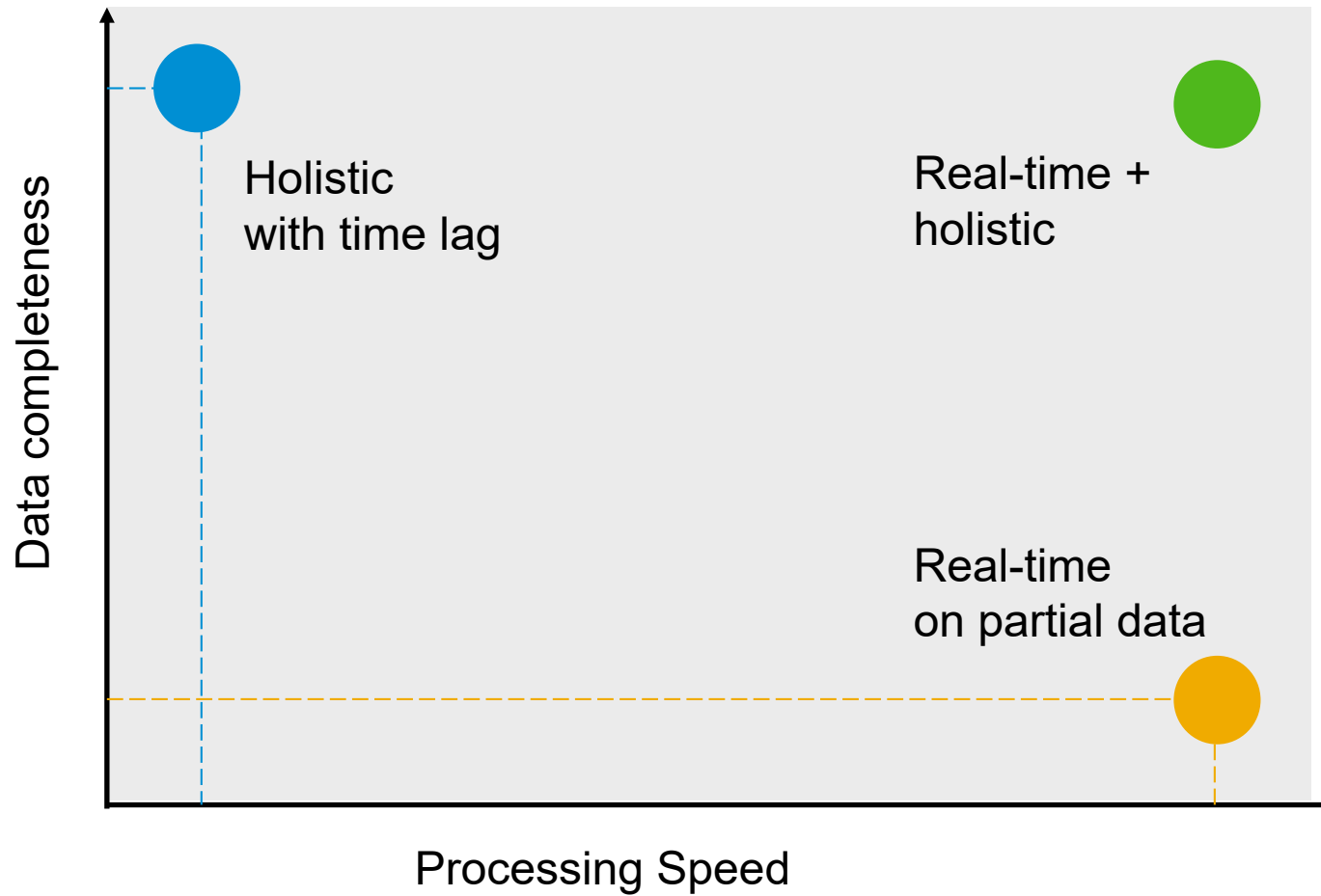
# Manufacturing Quality



**Analysing Manufacturing Quality is often a compromise for Manufacturers**

- **Holistic:** sensor + ERP with delay
- **Real-time:** sensors only

# Manufacturing Quality



**Analysing Manufacturing Quality is often a compromise for Manufacturers**

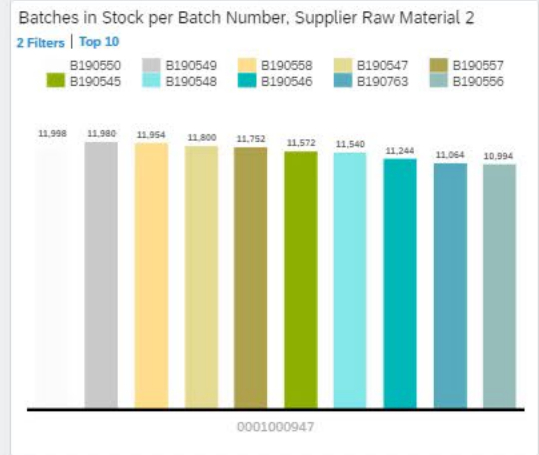
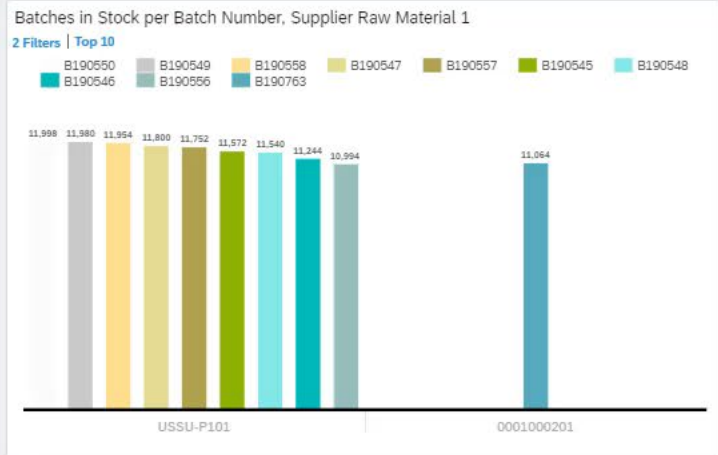
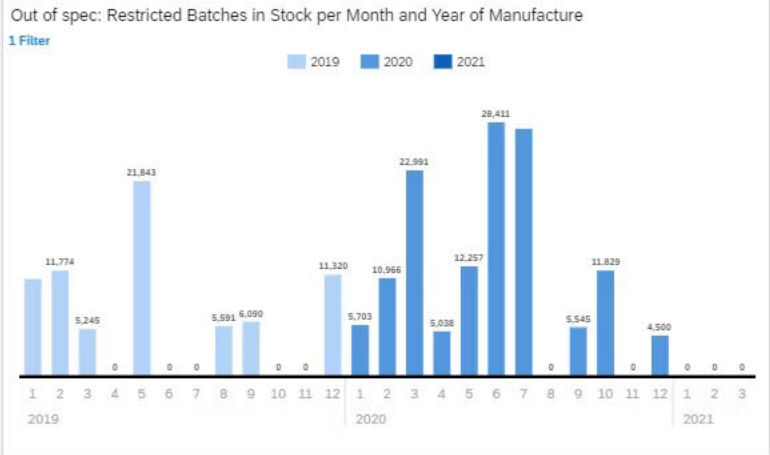
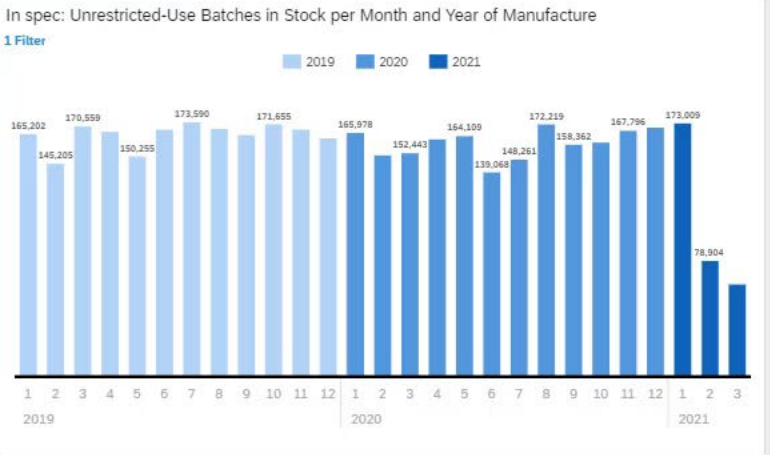
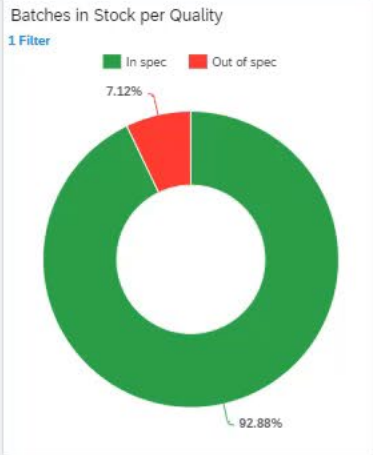
- **Holistic:** sensor + ERP with delay
- **Real-time:** sensors only
- **SAP Business Technology Platform:** sensors + ERP in real-time

# Demonstration Manufacturing Quality

## Plant Manager







# Demonstration Manufacturing Quality

## IT and Data Scientist



# 17458 Manufacturing Quality Version 1

[Create Version](#) [Import Content](#) [Open in Metrics Explorer](#) ... [↶](#) [☆](#)

[Datasets \(0\)](#) [Notebooks \(8\)](#) [Pipelines \(5\)](#) [Executions \(115\)](#) [Models \(5\)](#) [Deployments \(0\)](#)

**Datasets (0)** [Register](#) [Edit](#) [Delete](#)

Name	URI	Description	Technical Identifier	Created By	Created On
No items available					

**Notebooks (8)** [Create](#) [Edit](#) [Delete](#)

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<a href="#">00 Admin Setup</a>	To prepare for demo	4/9/21, 11:35 AM	4/9/21, 11:35 AM
<a href="#">50 Real-time scoring</a>	Score new observations in real-time with JavaScript, as deployed in... <a href="#">Show More</a>	4/8/21, 3:06 PM	4/8/21, 3:06 PM
<a href="#">Deployment-Test</a>		3/25/21, 11:27 AM	3/25/21, 11:27 AM
<a href="#">100 data upload</a>		3/19/21, 12:21 PM	3/19/21, 12:21 PM
<a href="#">40 Apply ML model</a>	Apply the trained and saved model to predict the manufacturing qu... <a href="#">Show More</a>	12/23/20, 6:01 PM	12/23/20, 6:01 PM
<a href="#">30 Train ML model</a>	Train Machine Learning model to predict and analyse the manufact... <a href="#">Show More</a>	12/23/20, 3:12 PM	12/23/20, 3:12 PM
<a href="#">20 Data exploration</a>	Explore the data for a first understanding	12/21/20, 12:11 PM	12/21/20, 12:11 PM
<a href="#">10 Connectivity.ipynb</a>		8/27/20, 12:47 PM	8/27/20, 12:47 PM

**Pipelines (5)** [Create](#) [Execute](#) [Deploy](#) [Edit](#) [Delete](#)

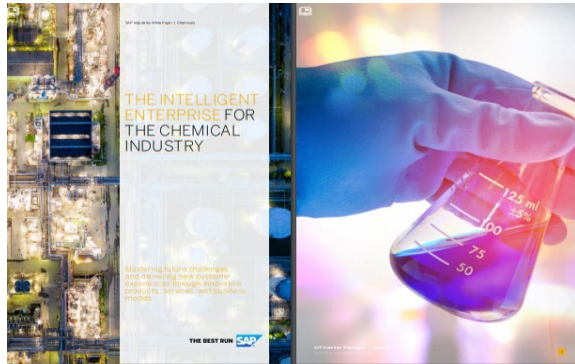
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<a href="#">100 Real-time prediction based on IT/OT</a>	Retrieve data from S4 and OSIsoft. Predict the quality and write details such as con... <a href="#">Show More</a>	Blank	4/8/21, 3:02 PM



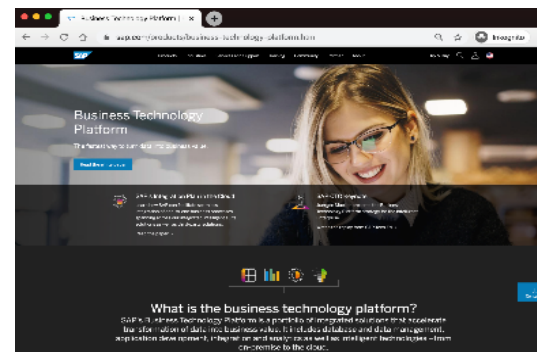
# Next Step: Learn More

## Intelligent Enterprise for the Chemical Industry

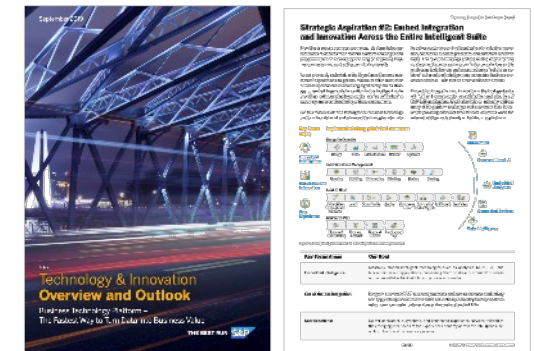
### → SAP Industries White Paper



### → Business Technology Platform



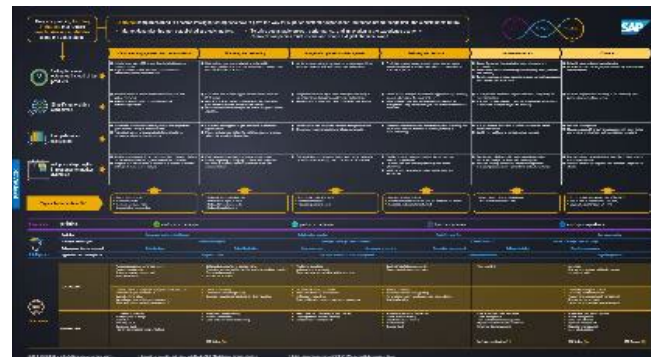
### → Technology and Innovation Overview and Outlook



### → Industry 4.0 Strategy

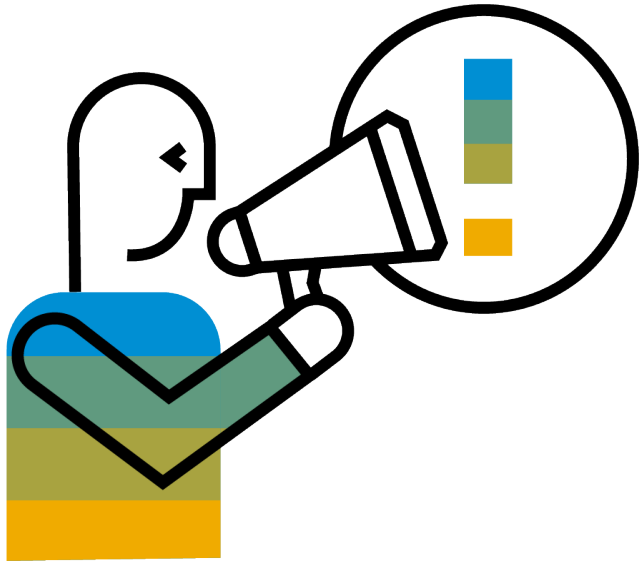


### → Intelligent Enterprise Poster



### → The Intelligent Enterprise for Chemicals





**Call to action:** Reach out if you want to learn more!

## Experience Academy



Self-guided hands-on offering. (Low-Touch)  
Designed for

- Business & IT Leaders
- Digital/Innovation Officers
- Business Users

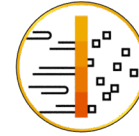
## Technical Academy



Hands-on deep dive workshops. (High-Touch)  
Designed for

- Solution Architects
- Technology Managers

## Data-to-Value Workshop



Use-case driven workshops.  
Designed for

- Business & IT Leaders
- Digital/Innovation Officers
- Business Users

## Continuous-process improvement Workshop



Interactive workshops with use-case discovery part  
Designed for

- Business & Data Analysts
- Process owners
- Innovation teams

# Q&A and Feedback





# Open Discussion and Q&A



**Muriel Rakotomalala**  
Industry Business Unit Chemicals  
[muriel.rakotomalala@sap.com](mailto:muriel.rakotomalala@sap.com)

**Andreas Forster**  
Machine Learning Expert  
[andreas.forster@sap.com](mailto:andreas.forster@sap.com)

# Thank you.

**Muriel Rakotomalala**

Industry Business Unit Chemicals

[muriel.rakotomalala@sap.com](mailto:muriel.rakotomalala@sap.com)

**Stojan Maleschlijski**

Global Center of Excellence

[stojan.maleschlijski@sap.com](mailto:stojan.maleschlijski@sap.com)

**Andreas Forster**

Global Center of Excellence

[andreas.forster@sap.com](mailto:andreas.forster@sap.com)