World Class Maintenance

8.2 Industri 4.0 og ditialisering

Industry 4.0 in Practice: R&M as the Driver of Digital Value

Aleksandra Knödlseder
Sr. Principal R&M and Digital Specialist
Cognite

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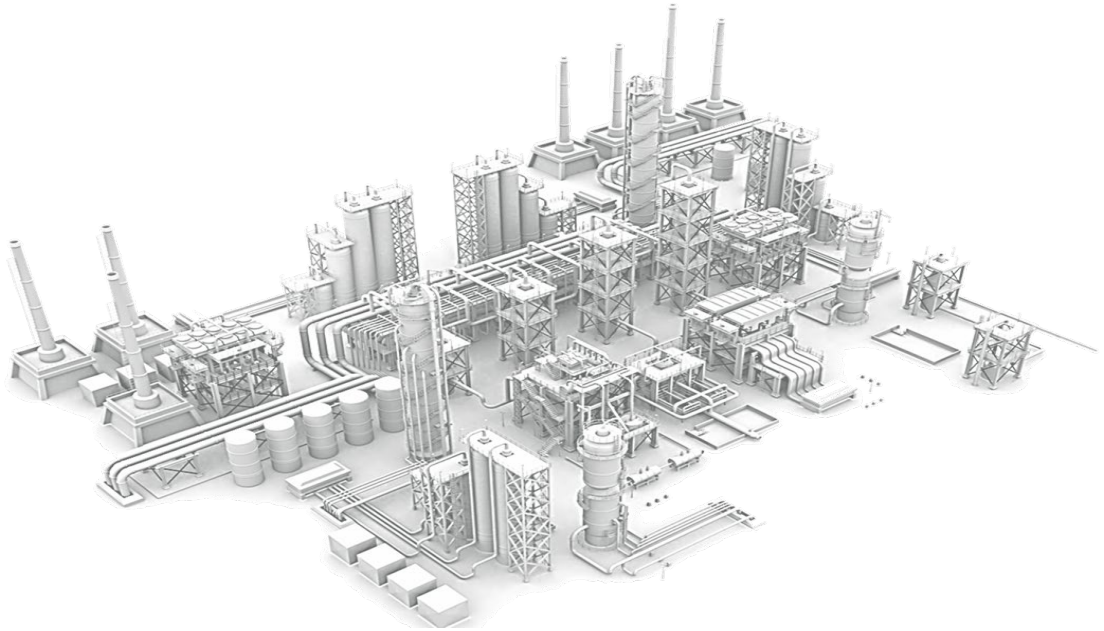
Part 1: The Strategic Imperative & The Great Blocker

Part 2: The Solution Framework & The Path Forward



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Part 1

The Strategic Imperative & The Great Blocker

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Challenges and Negative Consequences

Business level

- Lack of real time overview of cirtical business KPIs
- Lack of easy understanding of what drives negative trends
- Ageing workforce, limited resources
- Failing digital and AI initiatives

Negative Consequences

- Increasing operational risk (HSE)
- Increasing OPEX
- Increasing CAPEX
- Too high Energy

Maintenance org. level

Lack of real-time and holistic insights wrt.:
1) Bad Actors and KPIs
2) Condition health of equipment
3) Troubleshooting and diagnostics
4) Predictive Maintenance
5) Planning maintenance (Calendar instead of CBM)

- Data chaos and silos: SAP/IFS/Maximo + PI + Excel
- Technicians searching instead of solving
- Data cleaning instead of insights
- Limited collaboration

Negative consequences

- Unplanned downtime
- Higher maintenance cost
- Poor prioritization
- Repeatable failures
- Hidden operational inefficiency

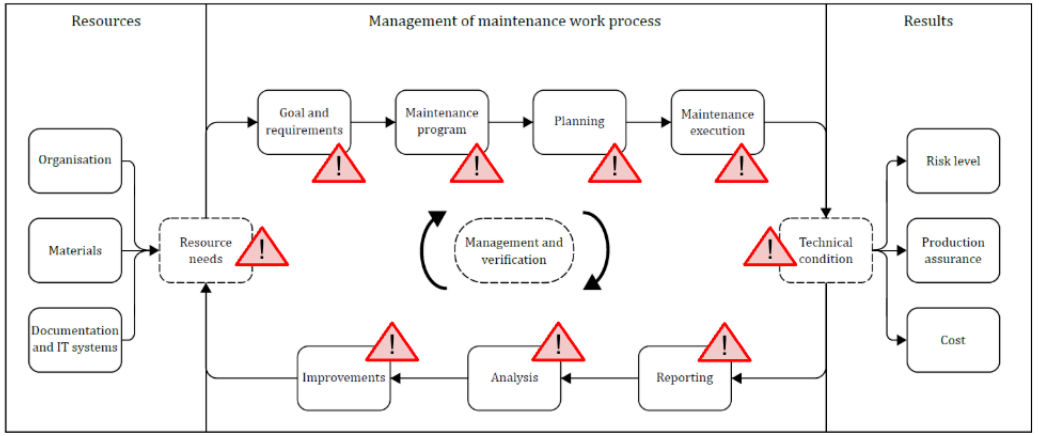

Figure 2 — Maintenance management process

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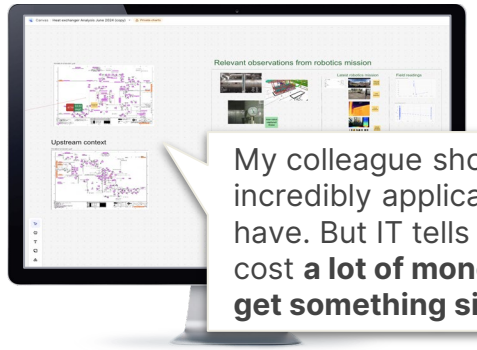
Part 1: BEFORE scenario - Data is a problem, not a solution (yet)

I need to find the latest P&IDs, ISOmetrics, work order history, live sensor data, OEM sheets .. **Where do I even begin..?**

Engineer (SMEs)

I find it so difficult to get all the data I need for my morning meetings, and **I don't want to wait 3 months** for someone to build a dashboard for me

Dashboards



My colleague showed me this incredibly application they have. But IT tells me it would cost **a lot of money for me to get something similar**

Applications

Honeywell
OSIsoft
OPC UA
documentum
SharePoint
opentext™
SAP PM Plant Maintenance
meridium
SAP
IBM MAXIMO
ODBC
AF
PostgreSQL
3rd party vendors
OEMs

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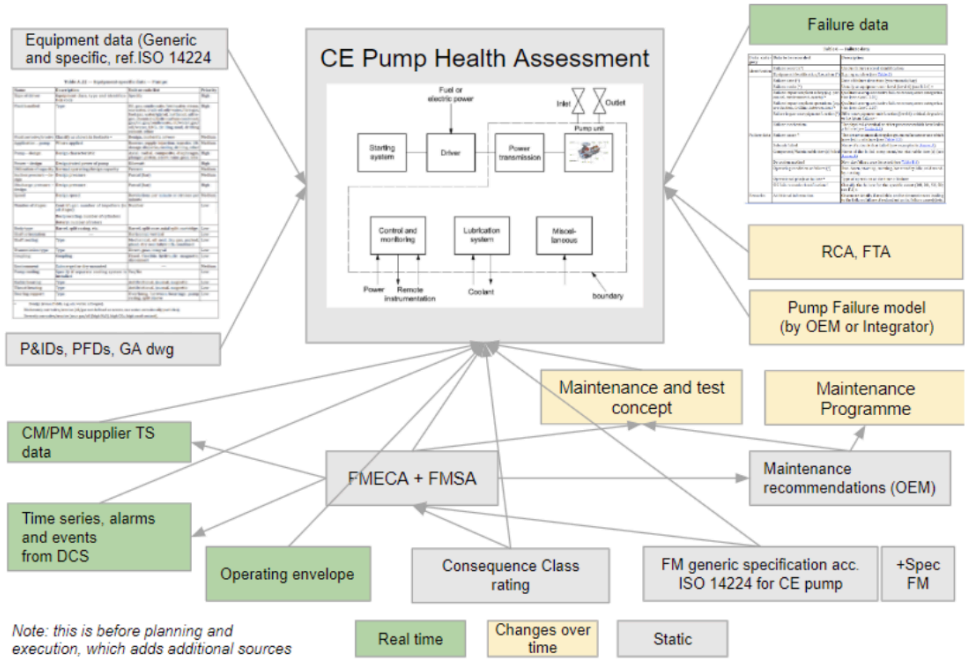
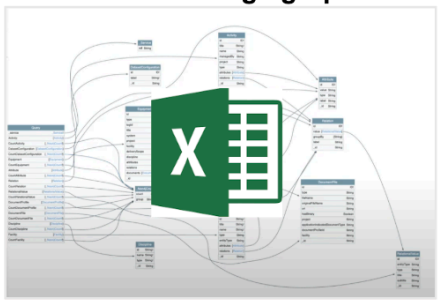
Real example, to assess the status of a pump it could require more than 15 data sources which today is scattered and unstructured



O&M knowledge graph:



Applicable standards:
ISO 15926 & CFIHOS
ISO 14224
ISO 17359
ISO 13374
ISO 13379
ISO 13381

NORSOK Z-008

DNV-RP-A204 and ISO 8000
OREDA

Pain Points

Cross-Value Chain

- Not having single source of truth to align across all actors at any given time
- Multiple handovers
- Lack of transparency on impact of changed on shared KPIs

Technological

- Large app portfolios, with wide range of maturity and capability
- Mix of point-to-point interfaces and data warehouses
- Inconsistent data preserves reliance on emails, spreadsheet and dashboards

Execution Model

- Document-centered execution model
- Current change process drives complexity and efficiencies
- Cost level

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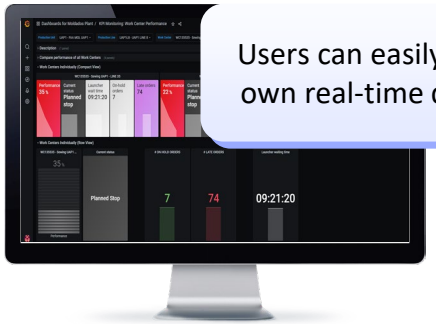
Part 1: AFTER scenario – How does it look like?

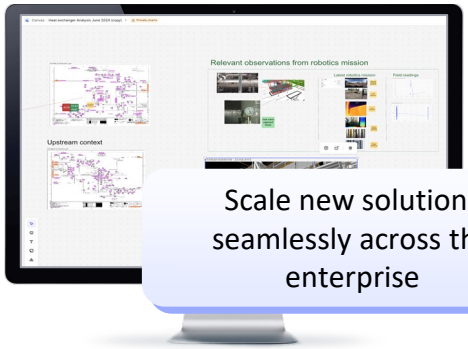
All data available and contextualized in one place

Engineer (SMEs)



Users can easily build their own real-time dashboards

Dashboards



Scale new solutions seamlessly across the enterprise

Applications

Cognite Data Fusion®

Honeywell, OSIsoft, OPC UA, documentum, SharePoint, opentext™, SAP PM Plant Maintenance, meridium, SAP, IBM MAXIMO, ODBC, AF, PostgreSQL, 3rd party vendors, OEMs

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Ideal State: The "After Scenario" and PBO

Business level

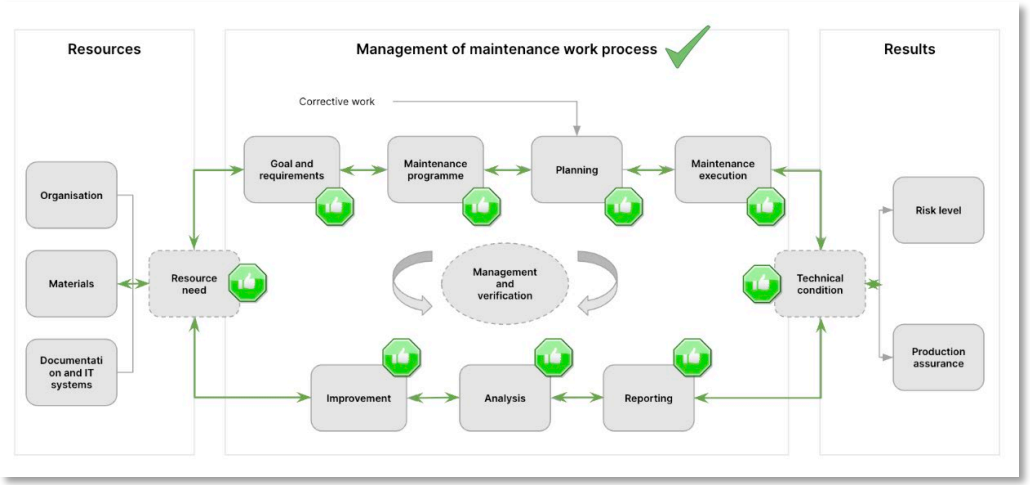
- Optimized workforce capacity due to cross-functional flexibility
- Truly unified operations with no data or application silos
- Fully engaged, informed, and empowered leadership and workforce with cross-functional flexibility
- Quickly build and scale solutions across the organization that enable data-driven decision making
- Flexible and productive use of production capacity (people and machines)
- Empower workforce through data and AI access to production data

Positive Business Outcomes

- No HSE events
- Optimal OPEX
- Optimal CAPEX
- Optimized Energy consumption

Positive Business Outcomes

- Reduced downtime
- Smarter, leaner PM programs
- Higher asset availability
- Reliable, data-driven decisions



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ROADBLOCK

No simple access to complex industrial data (Missing Context)

Lacking context from unstructured data

Cross-department data silos

Lack of scalability across sites

Siloed digital tools and AI solutions

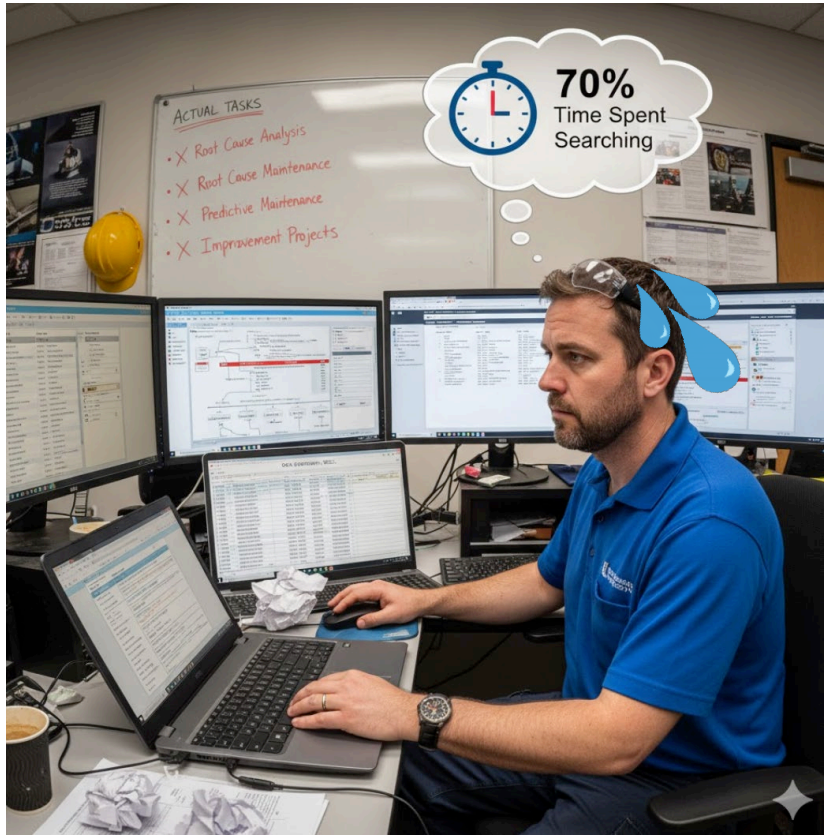
How much time did you spend last week… searching for information before you got all the data - and the insights you need in order to do your task.

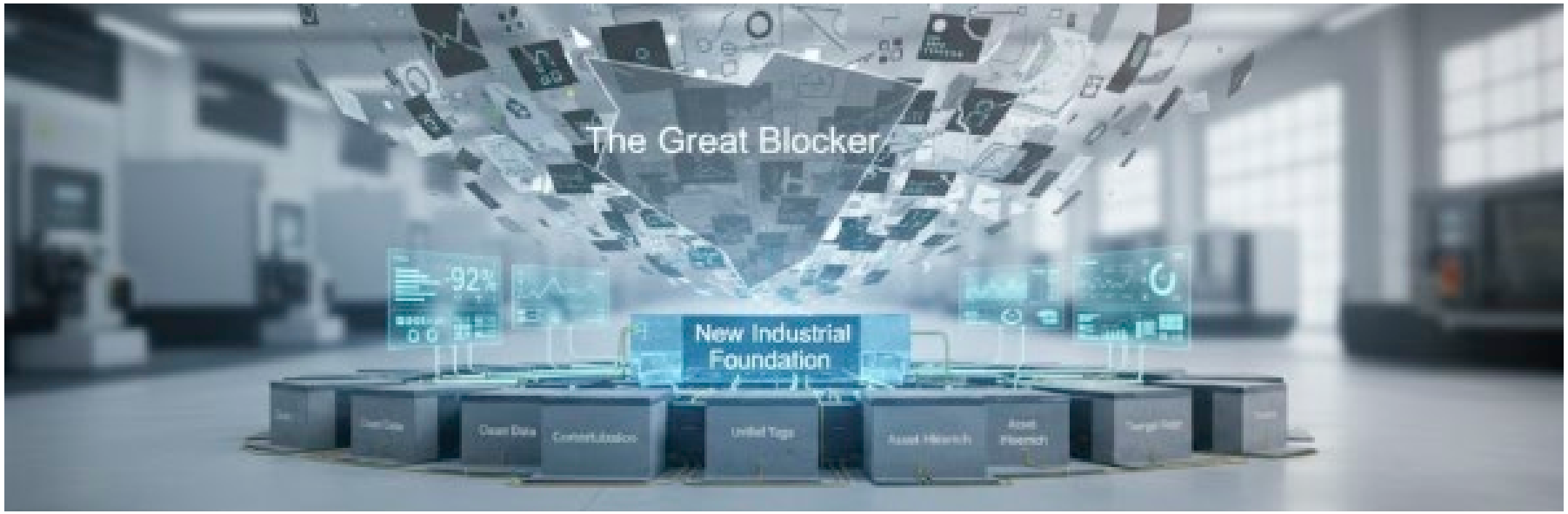
- Was it real-time?
- Did it have context available?

All R&M eng. across industries confirm the same problem

→ **it takes ca. 60 – 80% of time to gather data** and process it

Instead of doing the actual tasks, doing more complex tasks, or improving current ways of working to be more data and AI driven.




The Great Blocker
92%
New Industrial Foundation

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Part 2

The Solution Framework & The Path Forward

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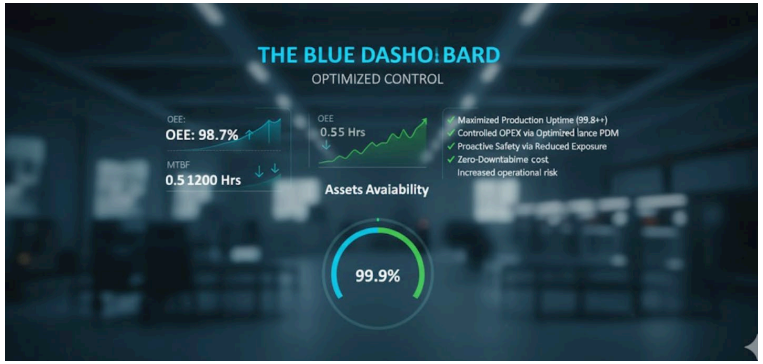
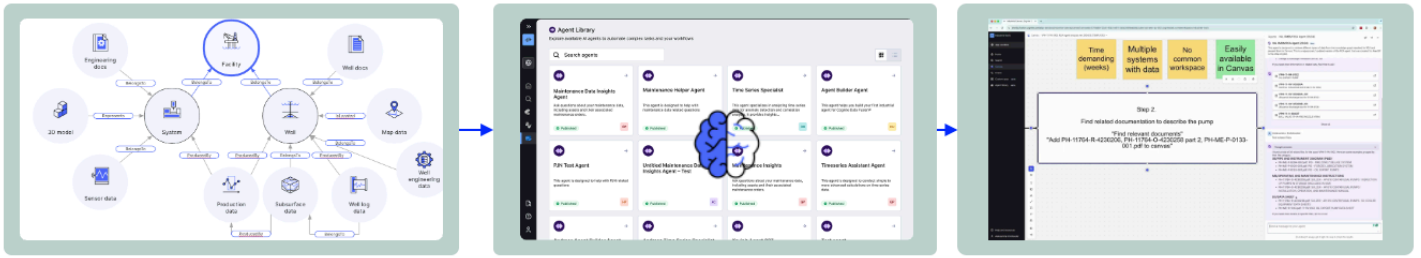


1. Simple Access to Data > 2. Advanced AI Agents > 3.Optimise & Automate

Data Foundation: An Industrial Knowledge

The Intelligence: LLM-Powered Agents

Industrial Tools with AI



Cross functional teams: DE/DS SMEs

IT data		Operations data					Engineering data				
ERP & CMMS	Tabular documents	Asset hierarchy	Time series & Historian	MES	QMS	Events & alerts	Simulated data	Images	3D Models	Engineering documents	P&IDs

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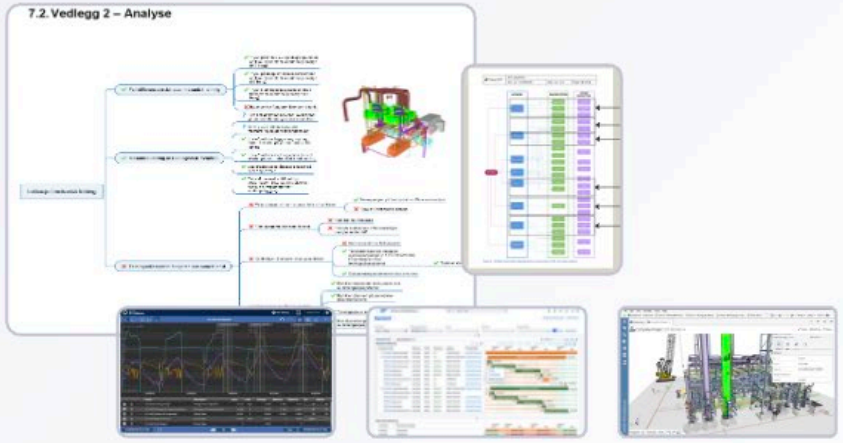
70-97% Efficiency Gain Achieved

BEFORE

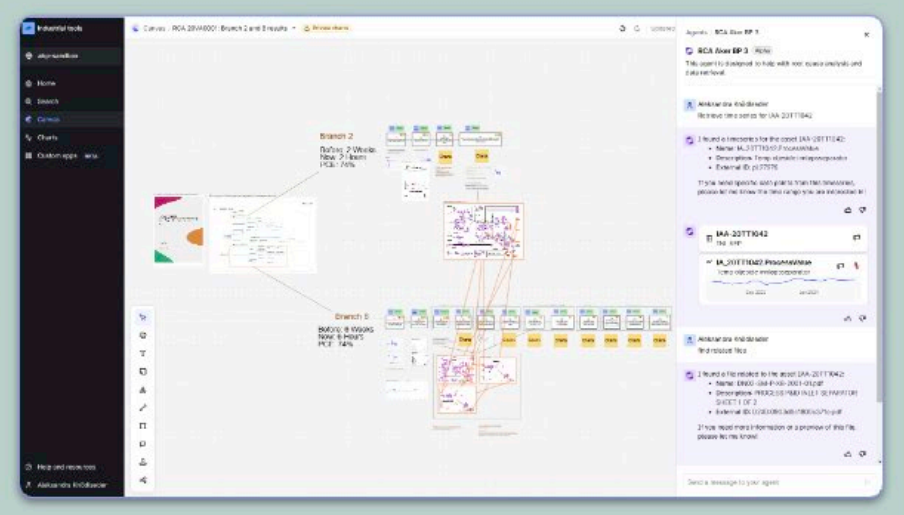
Weeks spent on Data Collection and Months on single RCA



- RCA Duration: Weeks to 9 Months
  - Up to 97% time on data gathering
  - Manual and limited quality of RCAs
- Previous AI Unsatisfactory for Industrial environment

AFTER

AI-Powered Insights and Automated Workflow



- RCA Duration: Reduced to Hours
  - Eliminated “Data gathering” with CDF and AI Agents)
  - Automated RCA workflow with improved Quality
- Grounded an trustworthy AI agents

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Part 2: Aker BP Example: AI driven RCAs –> **BEFORE & AFTER**

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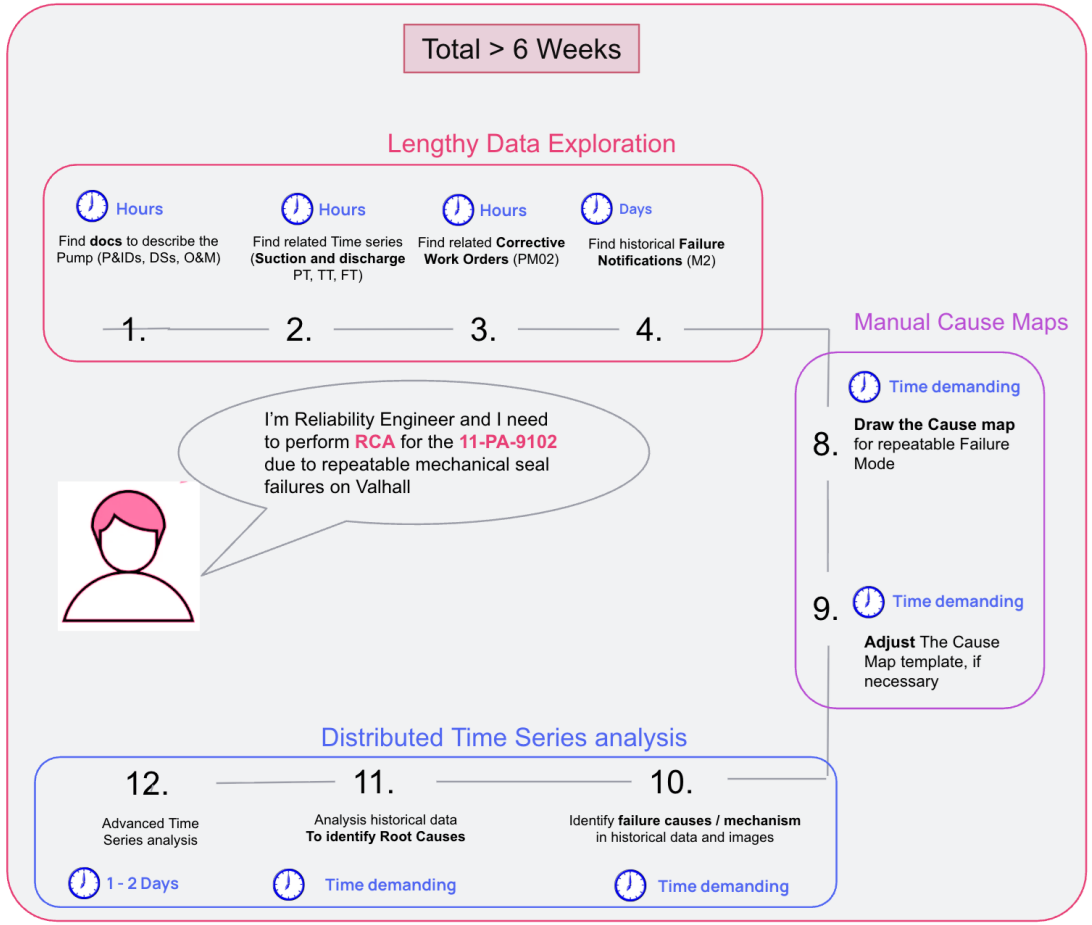

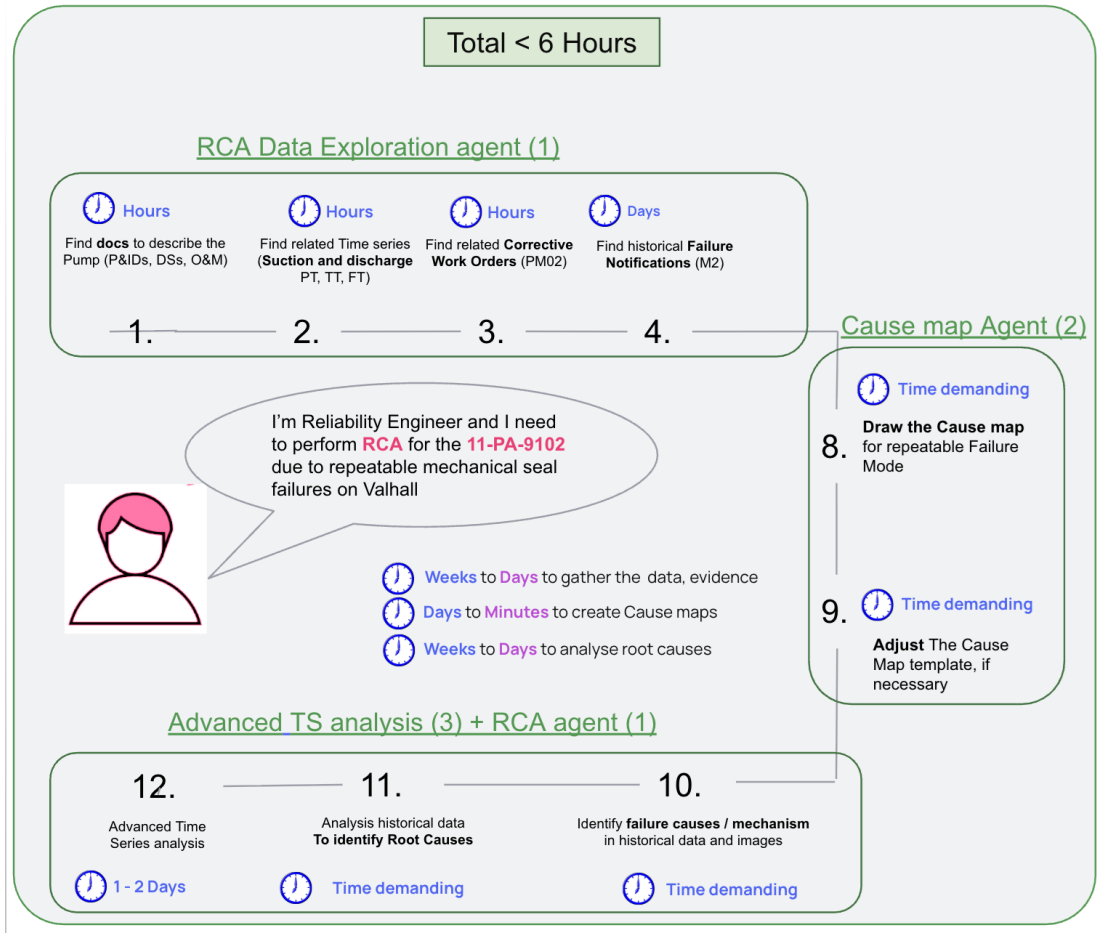

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AI FOR INDUSTRY
AkerBP
Gen AI
for Root Cause Analysis
llmModel1
Connect credentials *
Model name
Temperature
Additional parameters
LLM Chain
Language model *
Prompt *
Output parser
Chain name
Home
ProcessOptimizer
EnergySaver AI
Hourly
LLMs benchmark
Resume your activity


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AkerBP
Troubleshooting
VPH-11-PA-9102 with
Atlas AI agents
ChatOpenAI
Connect credentials
openai4
Model name
gpt-4.0-turbo
Temperature
0
Additional parameters
Inputs
LLM Chain
Language model
Prompt
Output parser
Chain name
Home
EnergySaver AI
ProcessOptimizer
Hourly
LLMs benchmark
Claude 3 sommet
GPT 3.5 Turbo 16k
Gemini 1.5 Pro
by Google
Codellama 3
by Meta
iPhone Mirroring

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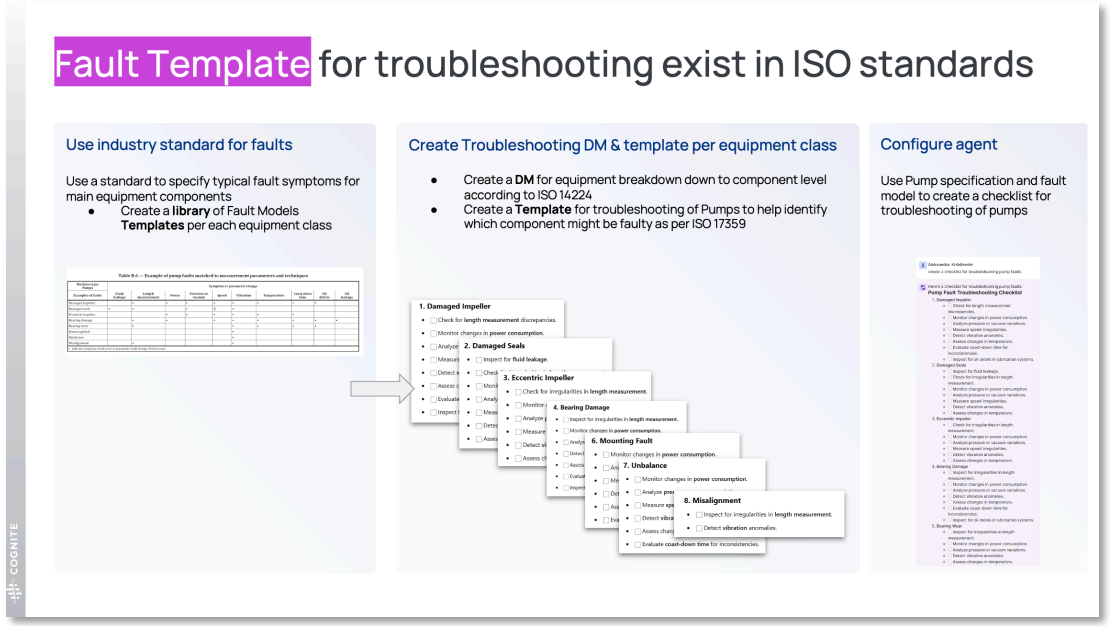
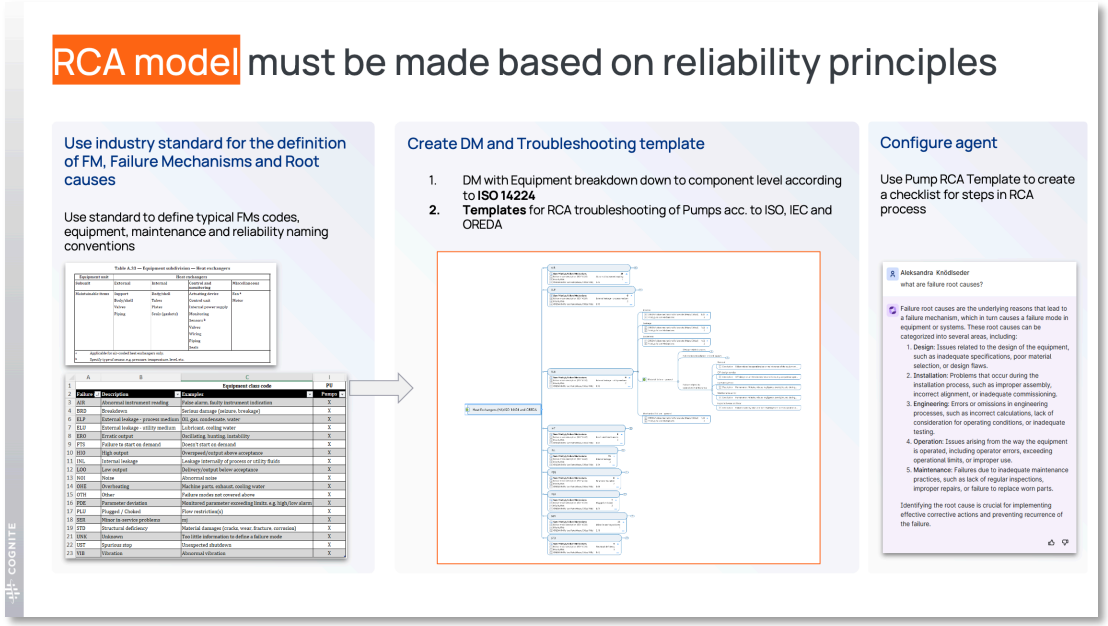
Agent with Fault Model based on ISO 17359 for CM and Diagnostics of Machines and ISO 14224



Agent with RCA model based on ISO 14224, OREDA and IEC 60812 standardized by R&M SME (A.Knoedlseder)



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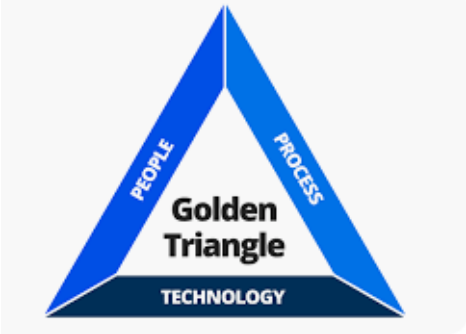

TECHNOLOGY

Industrial Data Foundation
Open Architecture
Existing Data + DQ Improvements
AI-ready DATA
Human Centric

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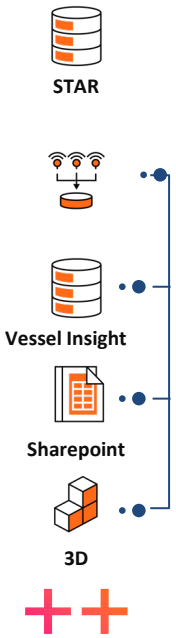
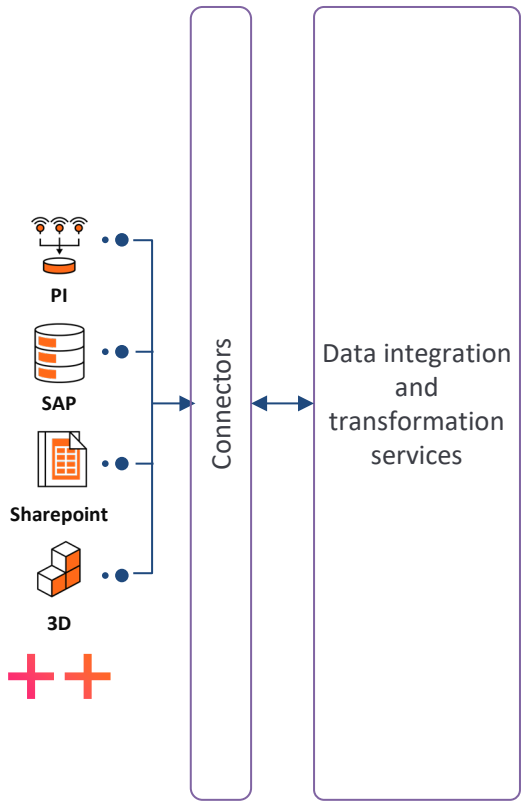
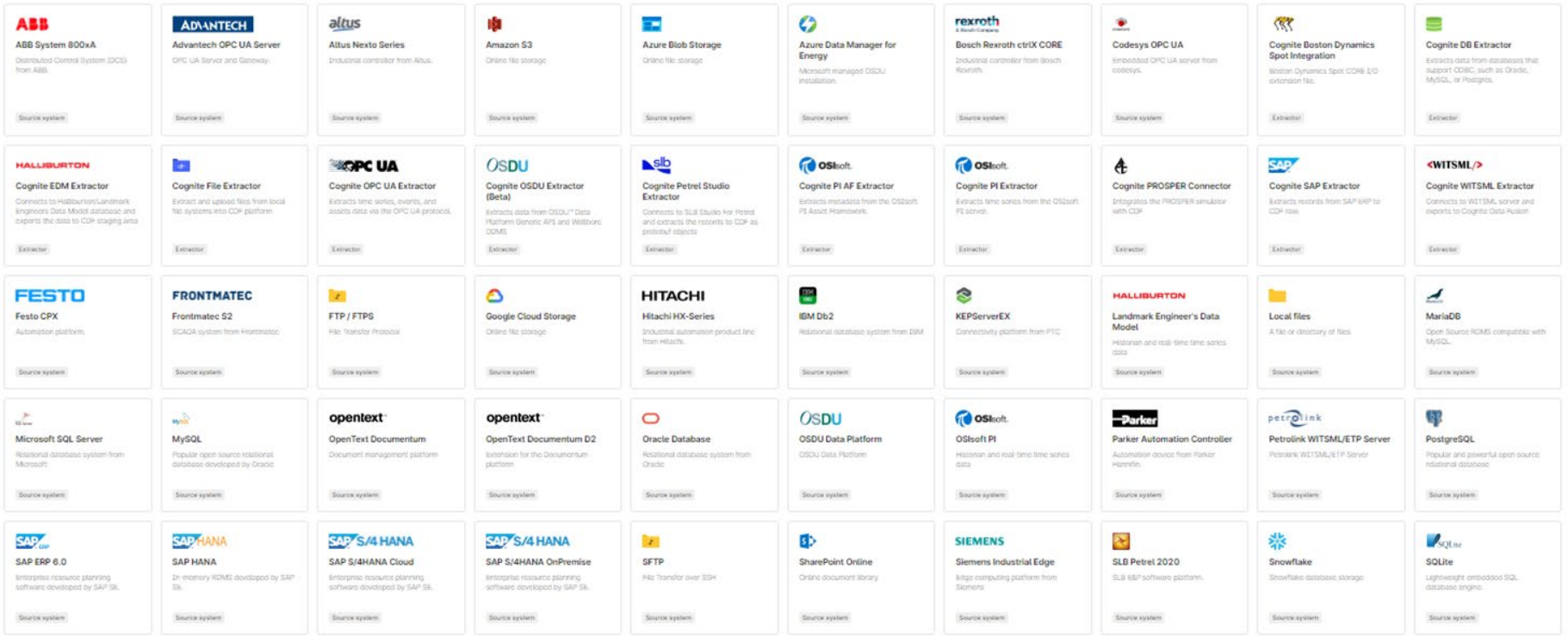
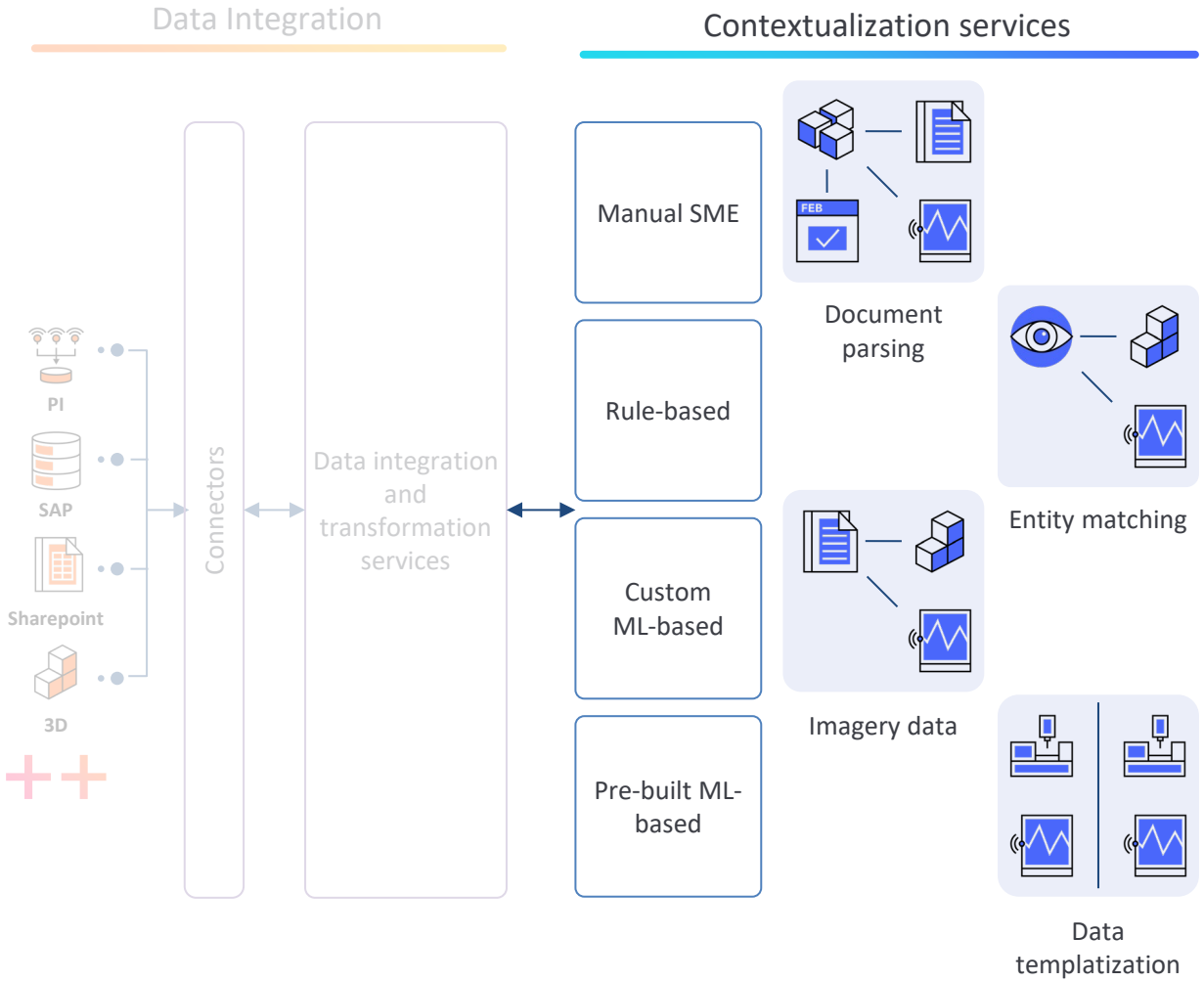

STAR
Vessel Insight
Sharepoint
3D

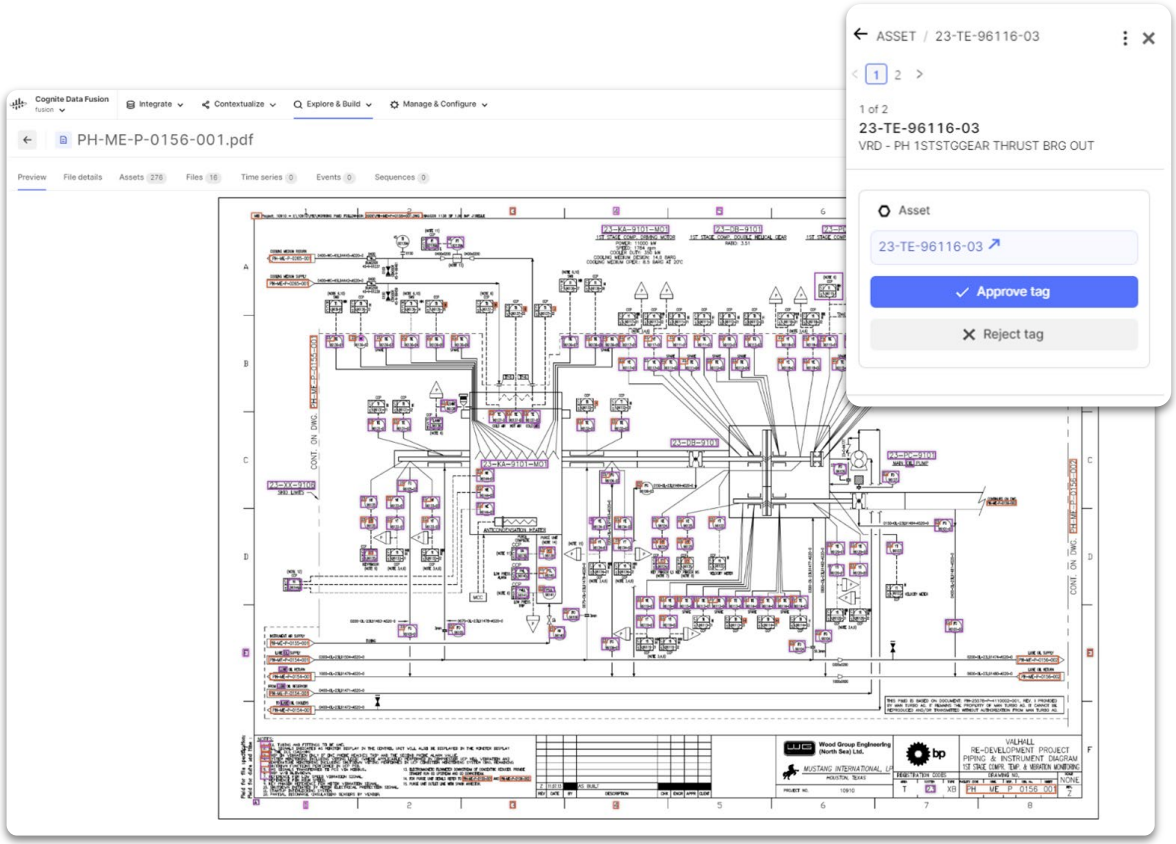
Data Integration





Part 2: Required Technology Capabilities – **Programmatic Contextualization tools**





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Part 2: Required Technology Capabilities – **Flexible Industrial Knowledge Graph**

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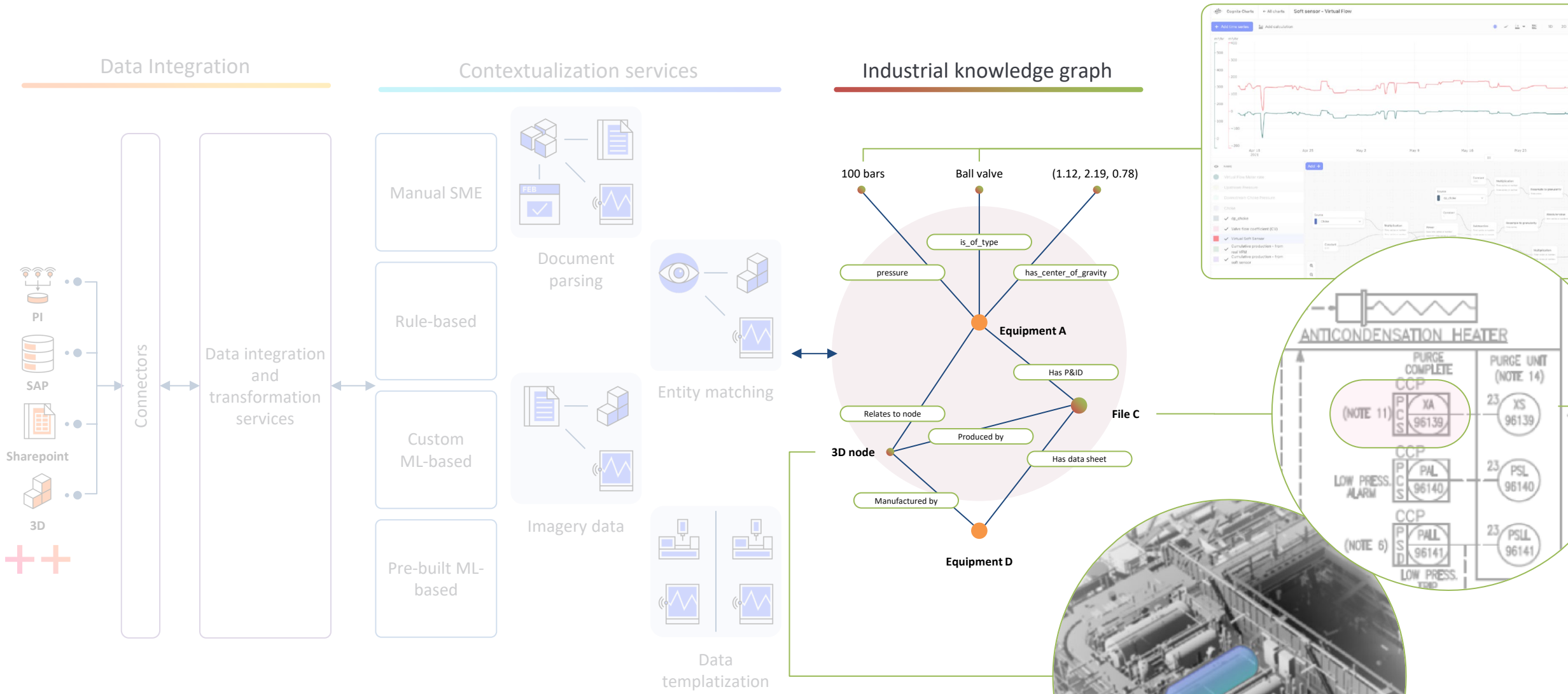

Part 2: Required Technology Capabilities – **Low code** for SMEs and Data Engineers

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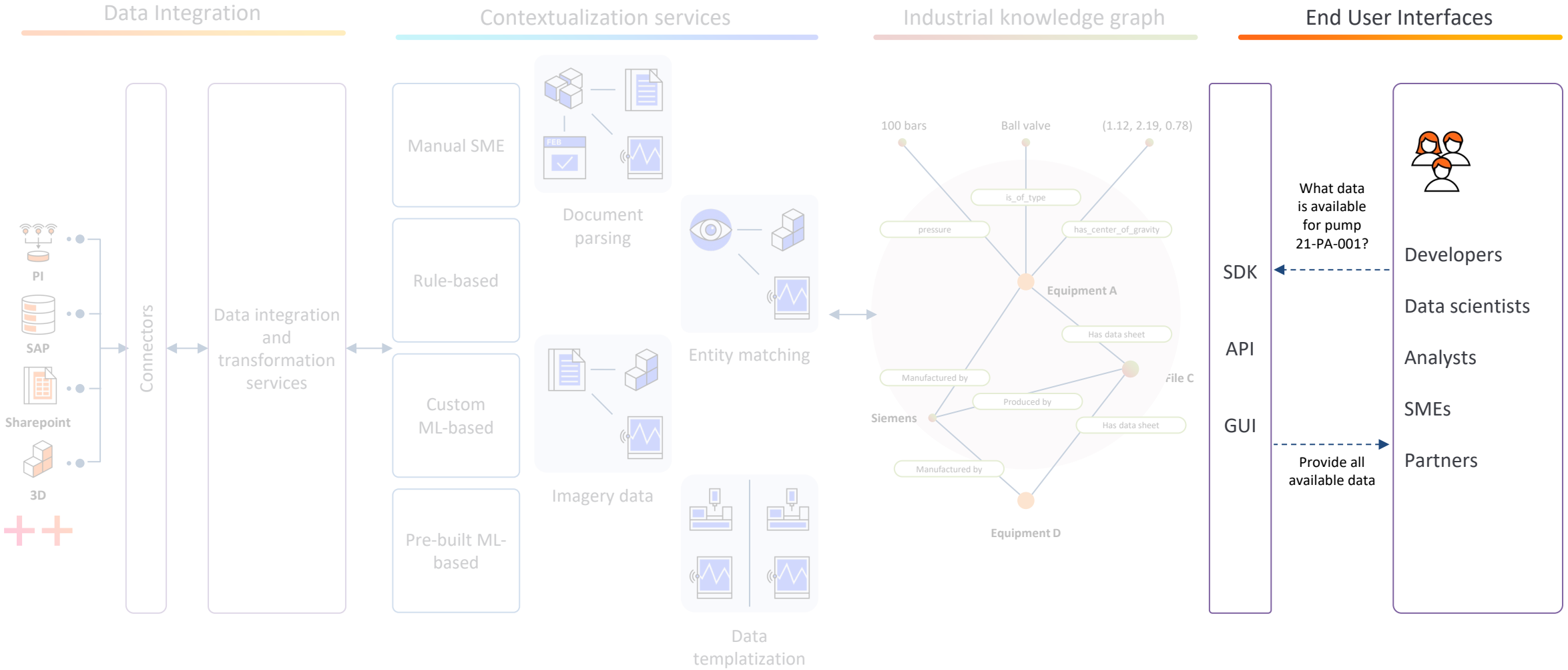

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Data Integration

Contextualization services

Industrial knowledge graph

End User Interfaces

PI

SAP

Sharepoint

3D

++

Connectors

Data integration and transformation services

Manual SME

Rule-based

Custom ML-based

Pre-built ML-based

Document parsing

Entity matching

Imagery data

Data templatization

100 bars

Ball valve

(1.12, 2.19, 0.78)

is_of_type

pressure

has_center_of_gravity

Equipment A

Has data sheet

Manufactured by

Produced by

Siemens

Has data sheet

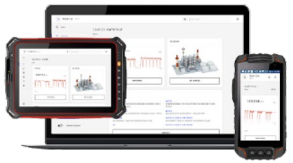
Manufactured by

Equipment D

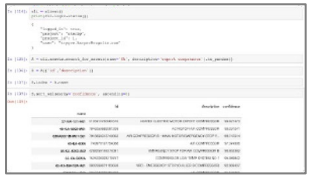
SDK

API

GUI



Cognite Industrial Applications



Professional Developers

Low/No Code (e.g., PowerBI)

Part 2: Required Technology Capabilities – **Centralized Atlas AI Solutions**

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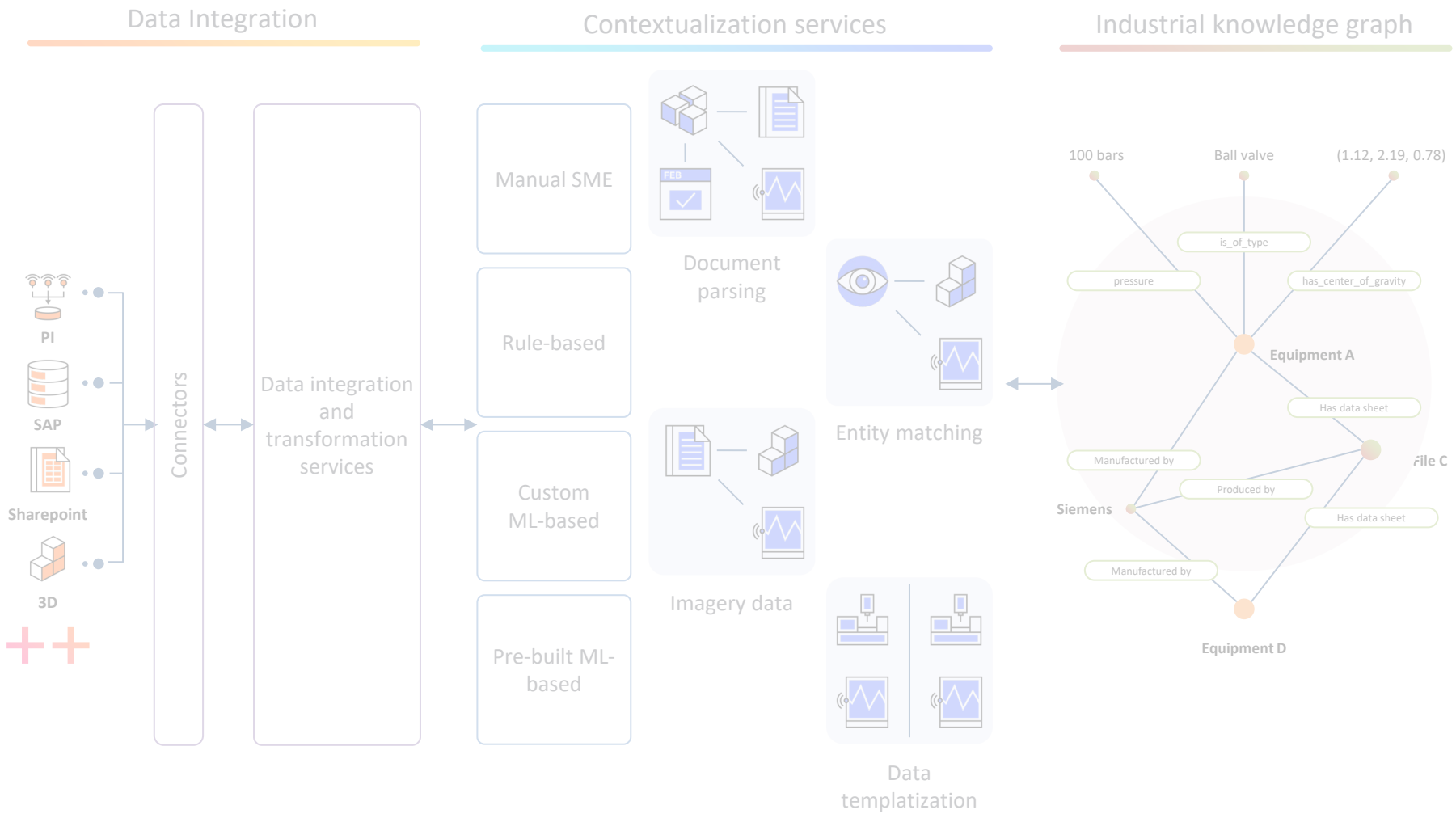

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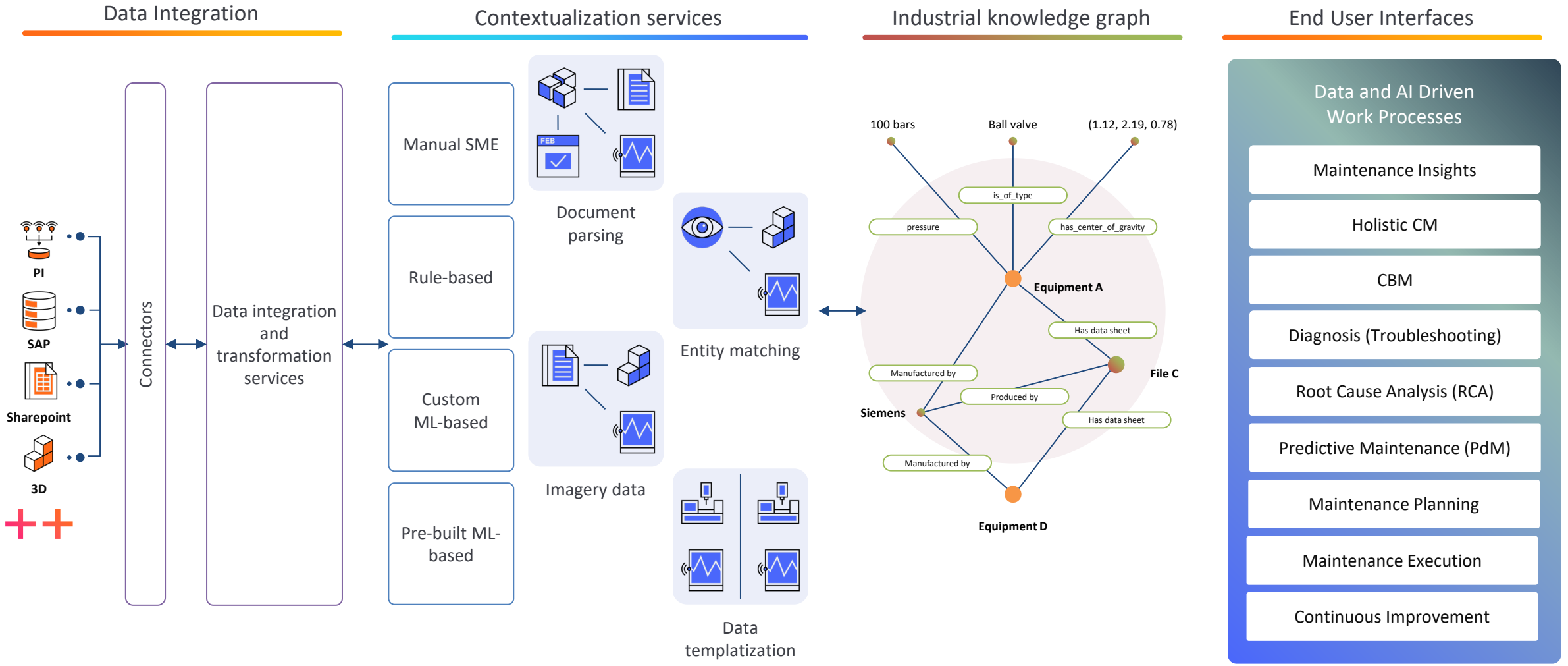
Part 2: Required Technology Capabilities – **Industrial Data OPS (Foundation) for R&M Workflows**



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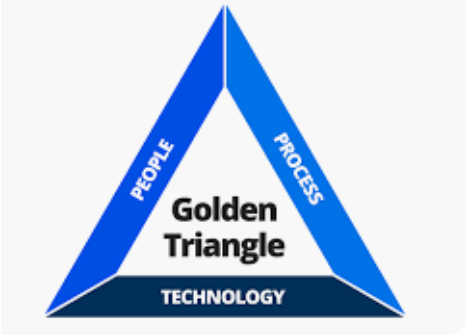

TECHNOLOGY

Industrial Data Foundation
Open Architecture
Existing Data + DQ Improvements
AI-ready DATA
Human Centric

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World Class Maintenance

PROCESS:

Workflow-first approach
Start from value, not technology
Focus on reliability outcomes
Automate what's repetitive
Build MVP → Scale fast

- Pilot (MVP)
  - Implement into BMS
    - Scale

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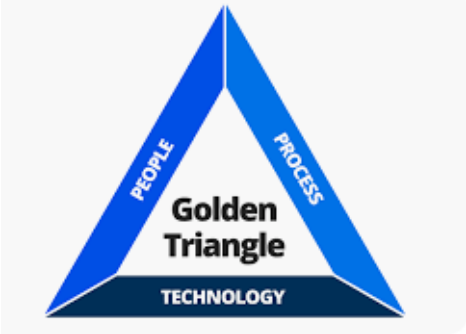
Part 2: HOW to do it? **Data and AI driven Organisation** - **TODAY**, not Tomorrow

PEOPLE and ORGANISATION

AI driven Organization
SME Training (data & AI)
Cross functional TEAMS



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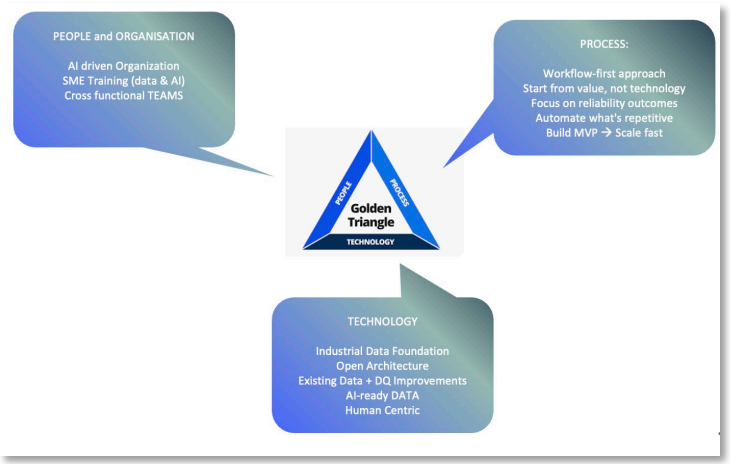

Conclusion: Stop "Managing" Data. Start *Using* It.

Digital maintenance is about enabling People!
Better information → better decisions
Reliability creates value —> every day

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Q&A

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Thank you

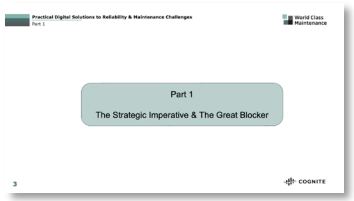
Aleksandra Knödlseder
Sr. Principal R&M and Digital Specialist
Cognite

Practical Digital Solutions to Reliability & Maintenance Challenges

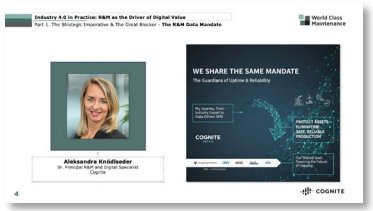
Part 1 The Strategic Imperative & The Great Blocker

Intro

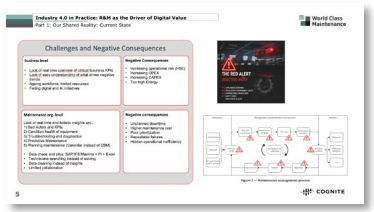
Agenda



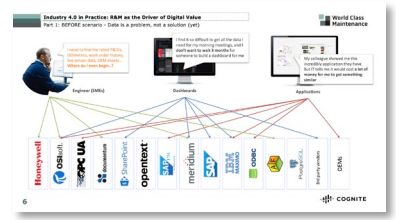
Part 1 Intro



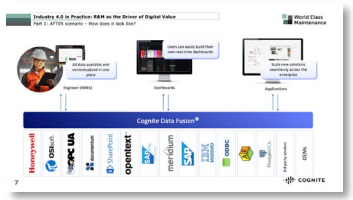
AK Intro: Not here as tech vendor but SME and want to share the experience and the realistic approach on how to rip value for R&M with data and AI



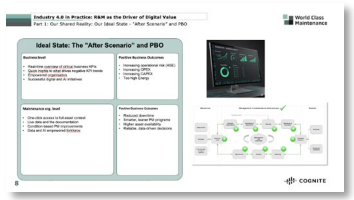
Our shared reality: Lets be honest about BEFORE scenario, hostage to the red alert! With Negative consequences to business and high cost of doing Nothing



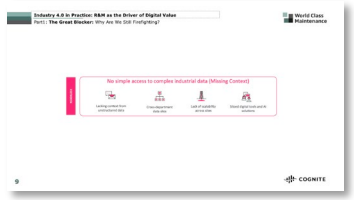
Example of BEFORE which we are hostage to



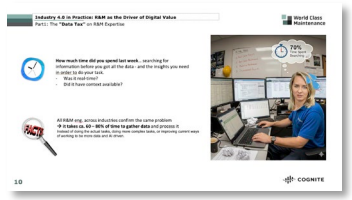
Example of how good should look like



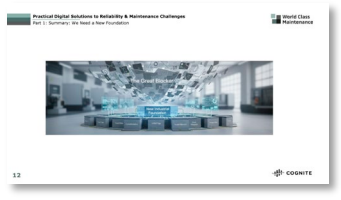
Summary of AFTER and Positive Business Outcomes



So, if we all know where we need to go, why are we still stuck?
Why Are We Still Firefighting?



It's a Data chaos = Data Tax



We need a better data foundarions!
- Intro to part 2.