

OCTOBER 24, 2023

Re-shaping Data & AI into Actionable Intelligence

Digital Reliability Centered Maintenance & Beyond

Sheetal Jain, AVEVA

AVEVA

Today's Speakers



Mathew D'souza, P.Eng – Site Asset Management Head, Sanofi Toronto

Reliability & Performance Engineering practitioner. He has worked in Manufacturing, Food & Beverage and Biopharma industry to mature company's capability in adapting World Class Technology Solutions for Maintenance.



Vinodh Rodrigues – VP of Customer Success, Industry Solutions

Manufacturing technology analytics practitioner. He has worked in R&D, process modelling and optimization. Has implemented bio-pharmaceutical specific data science models and IIoT.

About Us – Sanofi

Company Strategy:

Transform the practice of medicine through breakthrough science and make a positive impact on our people and the communities we serve.

Engineering & Technical Services Mandate:

Support Reliable Supply of products to our Customers

Reliability Focus:

Ensure affordable Vaccine's through **Relevance** in Digitalization & Emerging Technologies

BUSINESSES	Specialty Care, Vaccines, General Medicines and Consumer Healthcare
HEADQUARTERS	Paris, France
EMPLOYESS	Approximately 91,000 worldwide
CORE PRODUCT CATEGORIES	Vaccines, Immunology, Neurology, Oncology, Rare Blood Disorders, Diabetes and Cardiovascular Diseases

The Sanofi logo consists of the word "sanofi" in a bold, lowercase, sans-serif font. The letter "s" is black, while the letter "i" is purple. There are two purple dots: one above the "i" and one to the left of the "s".

About Us – Quartic.ai

Quartic.ai was founded by a veteran team of process manufacturing and reliability experts in conjunction with data scientists to make AI deployment easy and scalable in manufacturing.

Technology Offering

AI platform for rapidly deploying **manufacturing** analytics & solutions including:

- Data contextualization & visualization
- Reliability & predictive maintenance
- Multi-variate data analysis (MVDA)
- Process optimization for offline, online, predictive, & prescriptive optimization
- Predictive quality
- Automated PAT

Differentiation

- Can be leveraged by any size plant regardless of digital maturity and readiness
- Cloud native, cloud agnostic, and centrally managed
- Deploy, configure, and see value in under a month
- Self-Service machine learning for both subject matter experts and data scientists



Agenda – A Digital RCM Implementation

- The digital Reliability Centered Maintenance (RCM) approach
- Next-gen Reliability – AVEVA PI System and Quartic together
 - Phase 1 – Data, Anomaly detection, & IoT
 - Phase 2 – Predictive maintenance & IoT enhancement
 - Phase 3 – Integrated Prescriptive Maintenance (IPM)
- Results
- Beyond Reliability – Next-gen manufacturing

AVEVA PI System

Connectivity



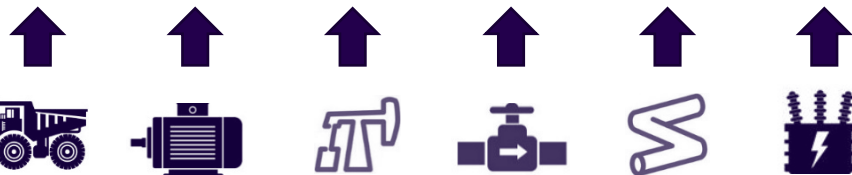
Data



Context



Connect the *right data* to the *right people* in the *right context* for the right decisions in real-time



sanofi

Quartic.ai Analytics Platform

Context

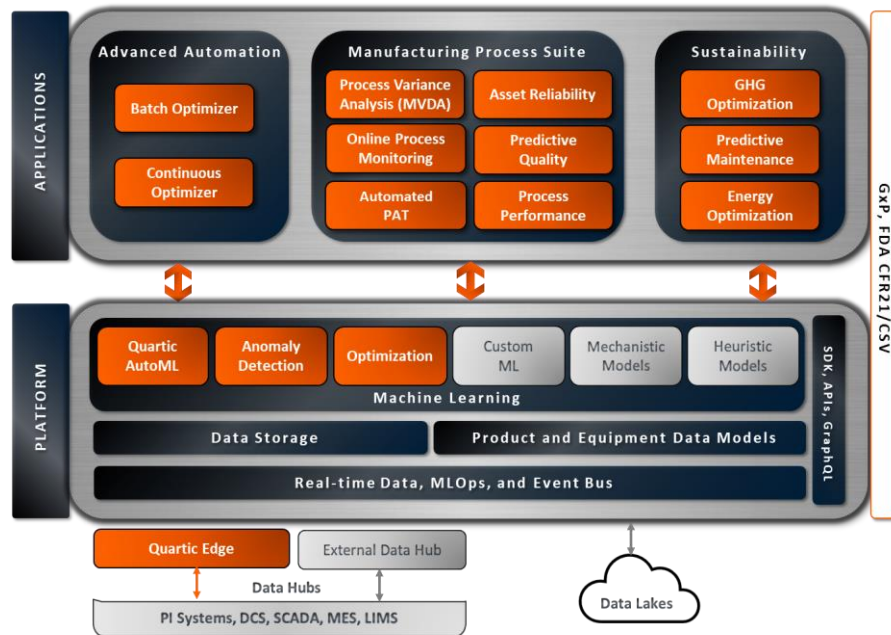


Analytics

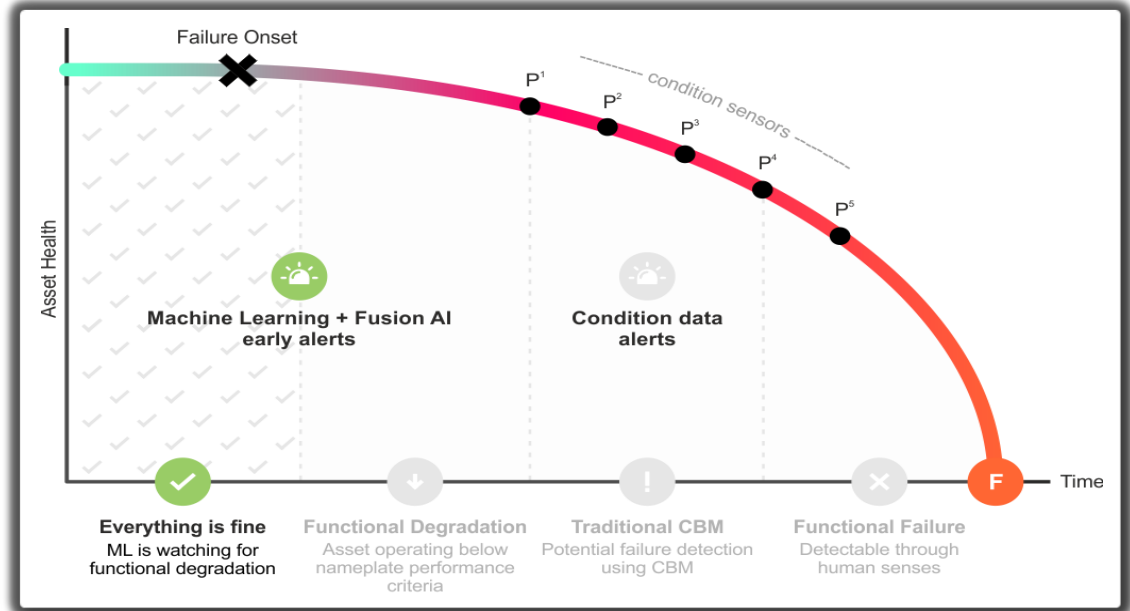
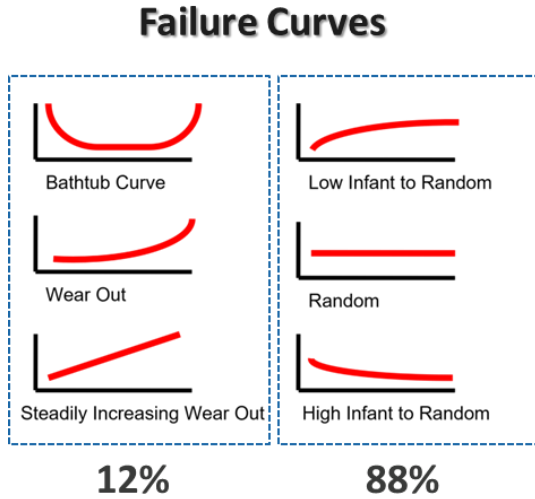


Applications

Democratize industrial AI to deliver *analytics* and *applications* at scale



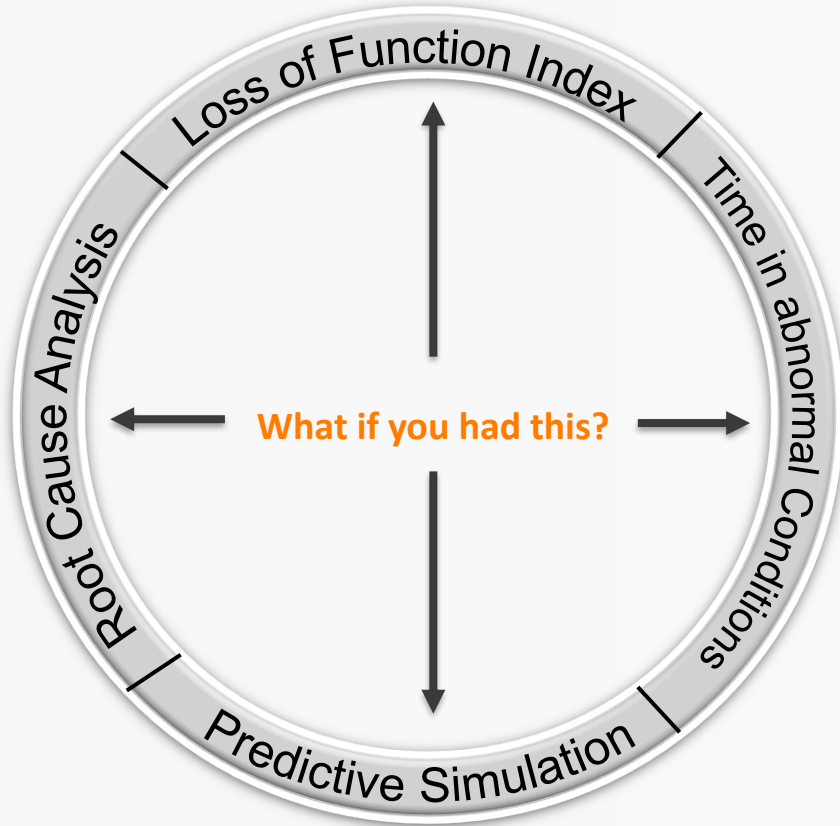
Reliability Centered Maintenance



Risk = Severity x Occurrence x **Detectability** (of a set of failure modes)

Machine learning improves detectability

Reliability & Predictive Maintenance



CHALLENGES

- ▶ Detecting asset health degradation from **random failure modes**
- ▶ Baselining asset condition data to **changing operating conditions**
- ▶ Planning and scheduling **efficient inspections and maintenance**

SOLUTION

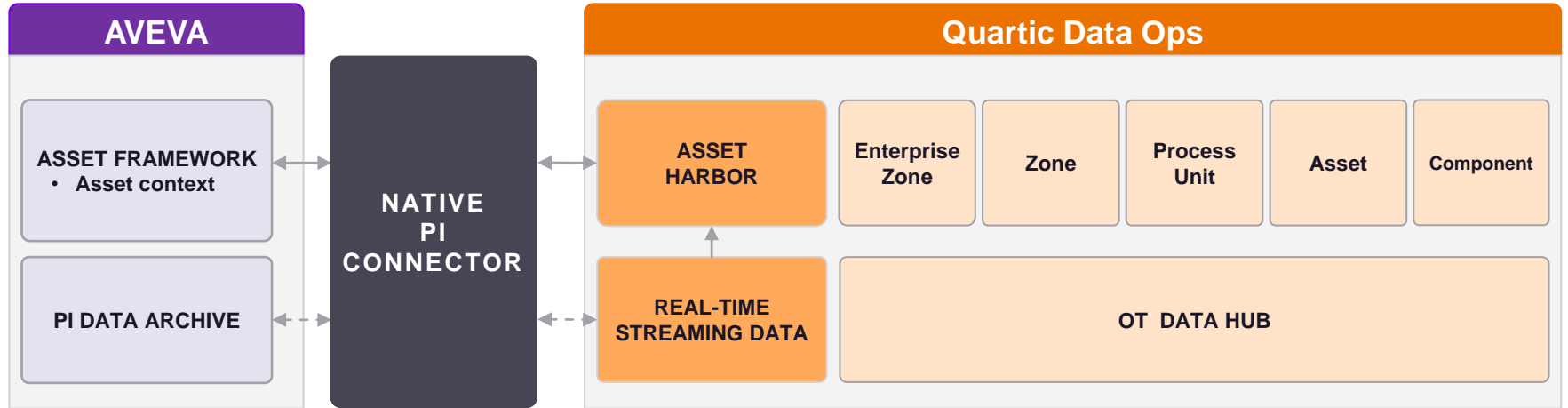
- ▶ **A digital implementation of RCM** (Reliability Centered Maintenance)
- ▶ Combine operations, condition sensing and electrical data
- ▶ Deploy agents for each failure mode using ML and rules

BENEFITS

- ▶ **Early detection of incipient faults** with influencing factors
- ▶ Predictive measurement of Risk to Loss of Function of an asset
- ▶ Visibility into contribution of each failure mode to risk
- ▶ **Risk based maintenance action planning**

Leverage PI Data Models and Context within Quartic

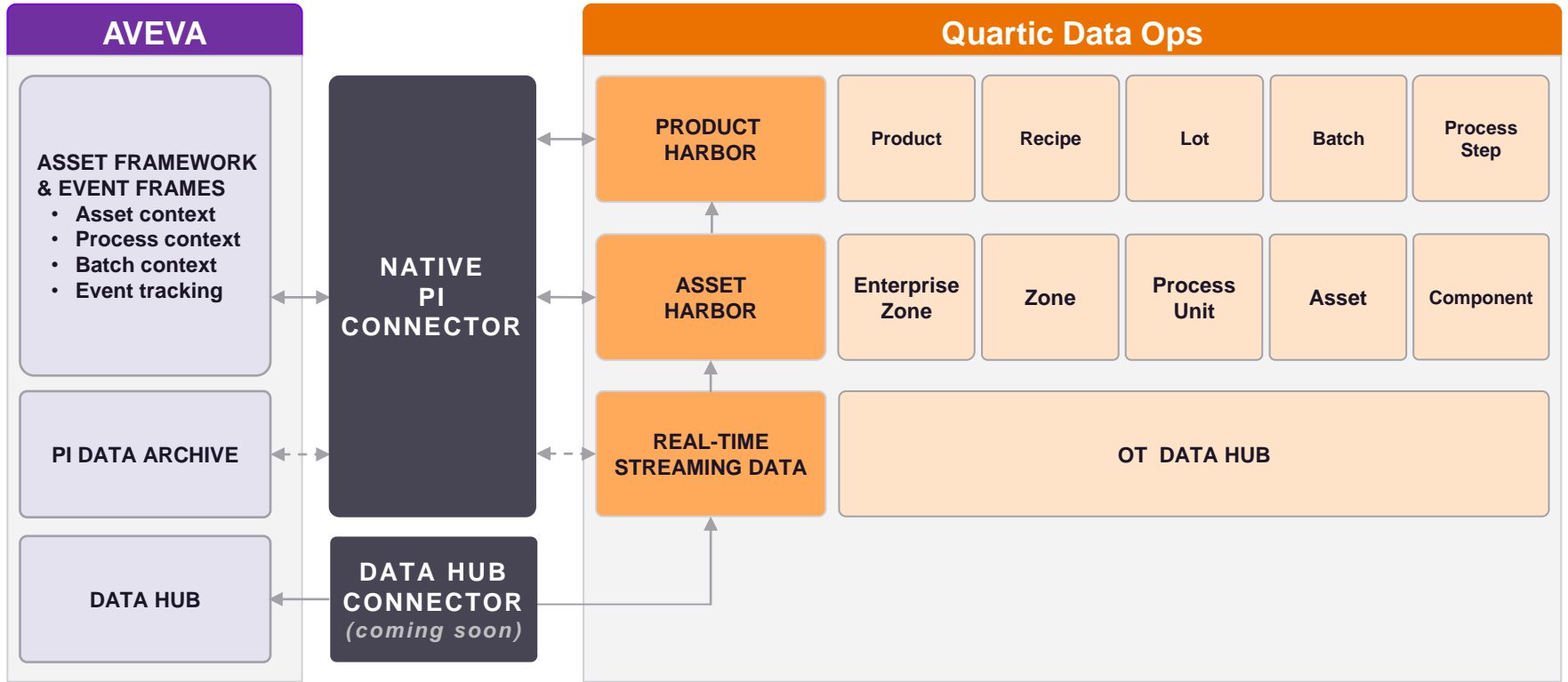
used for the RCM project



Bi-directional connectivity enables sending analytic outputs and ML results – predictions, recommendations, etc. – back to PI

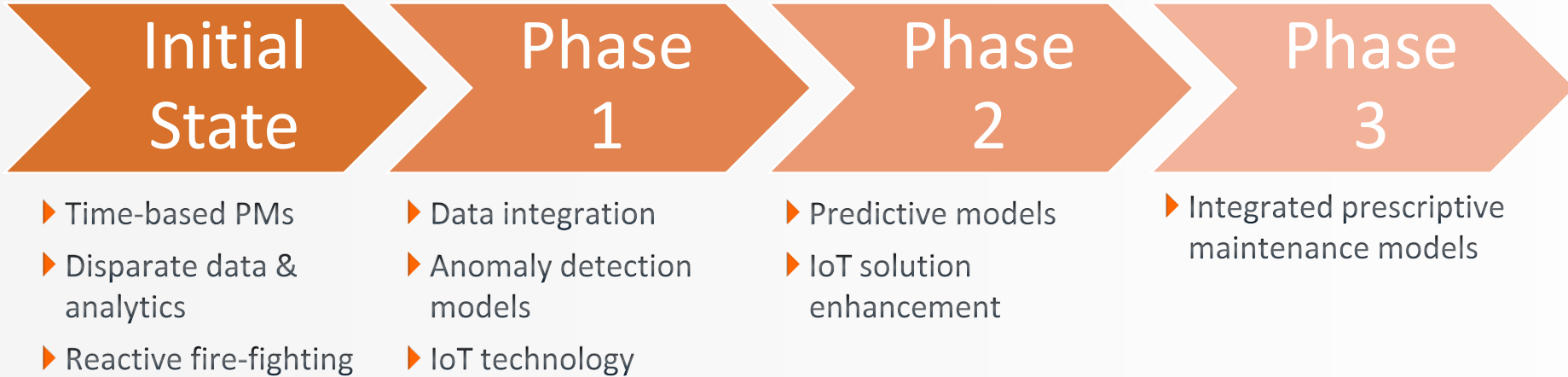
Leverage PI Data Models and Context within Quartic

complete AVEVA & Quartic integration functionality



Bi-directional connectivity enables sending analytic outputs and ML results – predictions, recommendations, etc. – back to PI

Typical Digital RCM Implementation



Sanofi ETS Reliability Team & Function

Program based approach: Supporting Legacy Operations, New Project C&Q & Regulatory compliance expectations

Operator Care Program

- Operator Checklist
- Production Master Priority List
- Feedback Incorporation (Trades & Users)

Failure Elimination Program

- Technical Root Cause Analysis
- Bad Actor Targeting
- ETOP Review

Regulatory Support Program

- Deviation & Manufacturing Investigations
- CAPA review and Implementation
- Regulatory & Audit support

Obsolescence and Risk Mitigation Program

- Detailed System Risk Assessment
- Functional Equivalency assessment & identification
- Long Term Asset Plan (LTAP)

Reliability Centered Maintenance Program

- Criticality Assessment & Actions prioritization
- PM Creation, Optimization & Harmonization
- Improved Design Reliability (System modifications)

MRO Spares Optimization Program

- Bill of Materials Criticality assessment
- Data driven Safety Stock levels
- Standardization to support digitization

Predictive Technology and Analytics Program

- Robotic Process Automation
- Online (IoT) & Condition Base Monitoring
- Live Health Status monitoring & maintenance prioritization

Agile + Adaptive

Challenging Status Quo

Deliver Compelling Business Needs

Background & Skills:

Mechanical & Chemical Engineers (recent graduates to decades of experience)



Sanofi Toronto:

Across 54 acres of land, R&D and Bulk Manufacturing

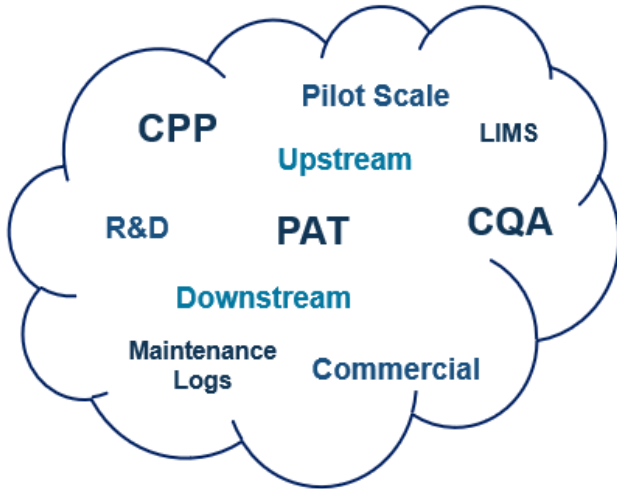


COGS Improvement Needs

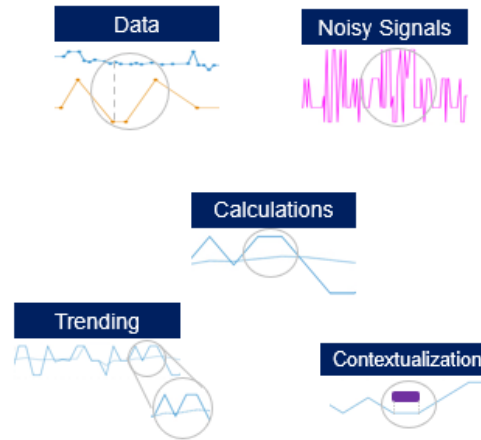
Problem: How do I leverage my data?

Problem: Where is the Crystal ball?

Disparate Data Sets



Analytical Challenges



Solution: Build my own Crystal ball using a predictive technology platform

Solution Overview



Leveraging a new AVEVA PI System installation in a Legacy & New Gen facility, we integrated PI with Quartic.ai as part of a digital strategy supporting Reliability Centered Maintenance (RCM) to improve equipment performance, maintenance workflows, and optimize maintenance spend.



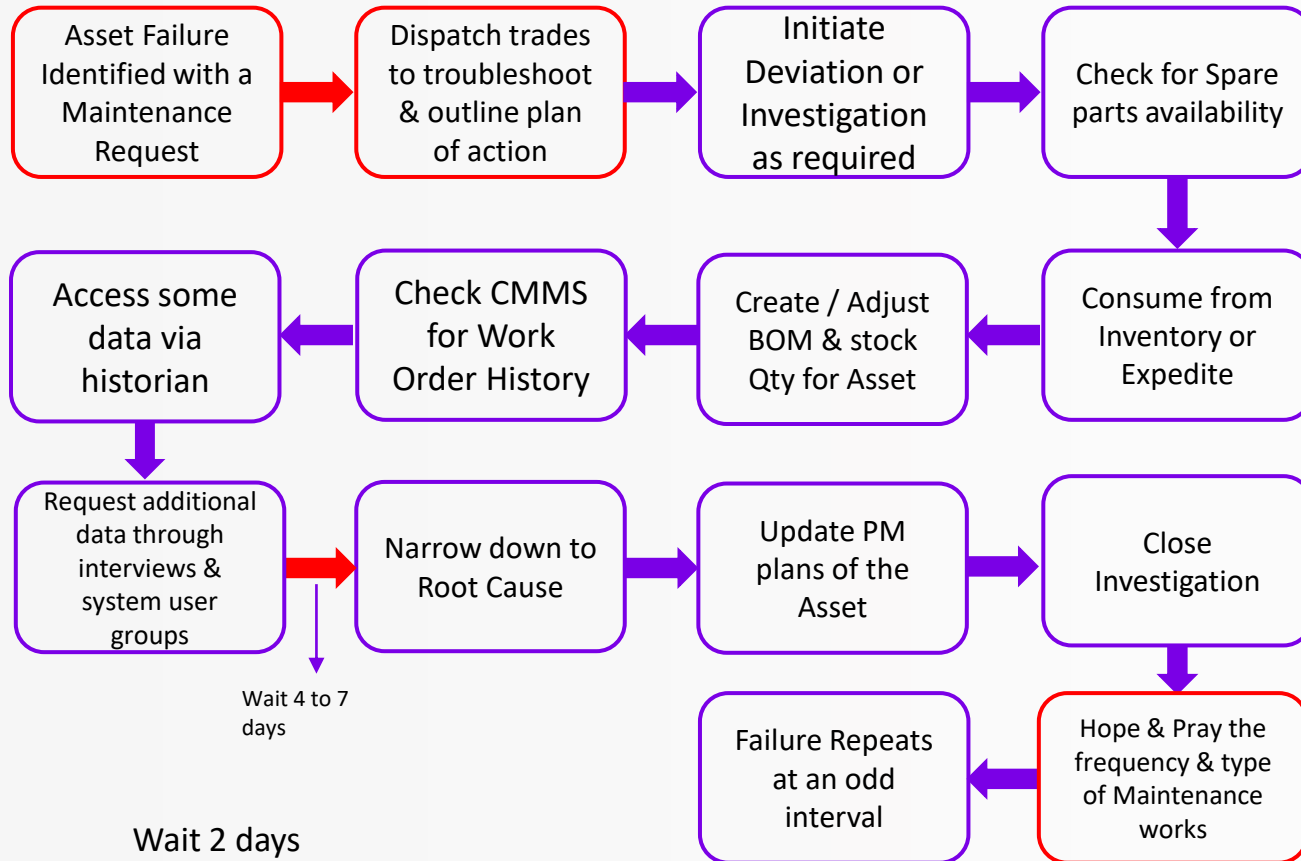
Manual assessments, workflows and investigations were replaced with automated ML based solutions to allow Reliability Engineers to monitor critical failure modes from equipment across the site.



Strategic goals include integration with BAS, CMMS, ERP, and ad-hoc IIoT to digitize engineering and process monitoring & controlling efforts.

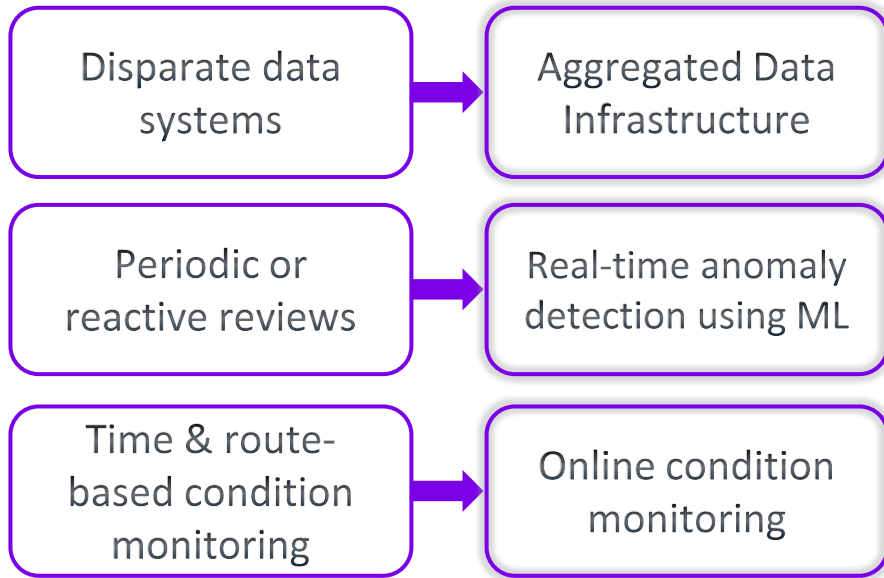
Initial State (pre-project)

(before 2020)



Phase 1 – Anomaly Detection Models + IoT technology

(2020-2021)



Benefits:

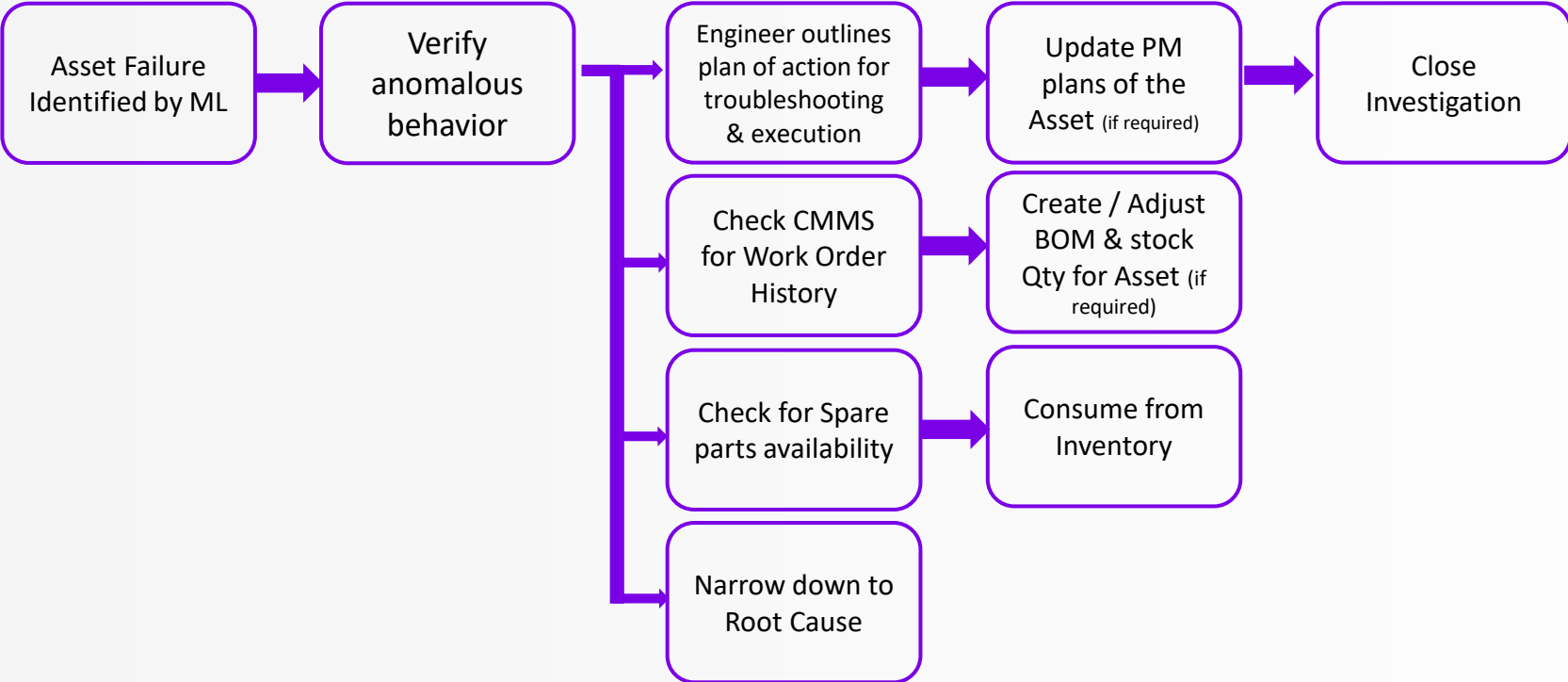
- ▶ Workflow Automation – work planning & forecasting
- ▶ Productivity improvements
- ▶ Enhanced Engineers capabilities
- ▶ More Control & Empowerment
- ▶ Improved process & asset understanding

Challenges:

- ▶ Time-based PMs
- ▶ Global team buy-in
- ▶ IT – One way data flow
- ▶ Dedicated IT support People – Lack of initiative understanding & motivation
- ▶ Go-Live Timeline

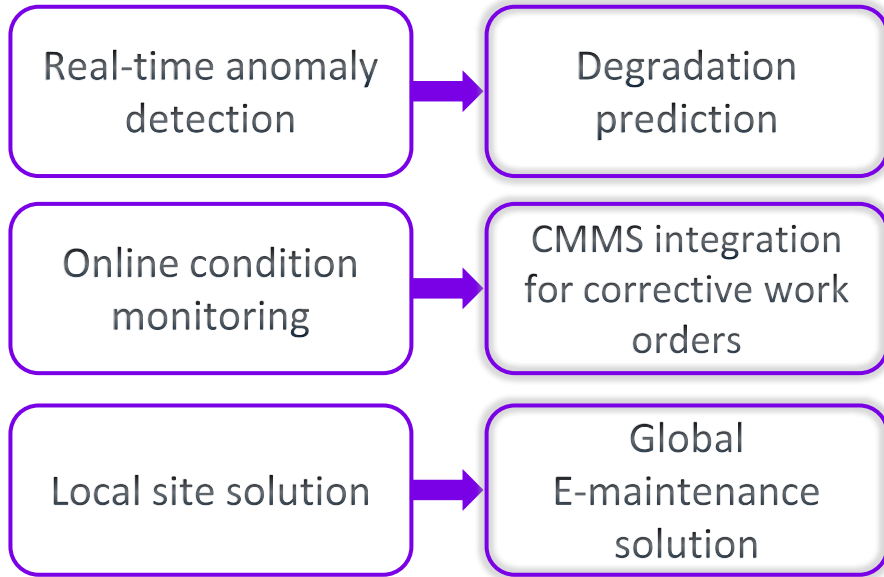
Target Final State

(2025+)



Phase 2 – Predictive Models + IoT solution enhancement

(2022-2024)



**We know the capabilities of
AVEVA PI System & Quartic
and need to expand the usage**

Benefits:

- ▶ Uniform, global E-Maintenance solution
- ▶ Proactive, more efficient maintenance planning & activities
- ▶ Reduction in COGS
- ▶ Targeted 35% reduction in PM cost by 2025

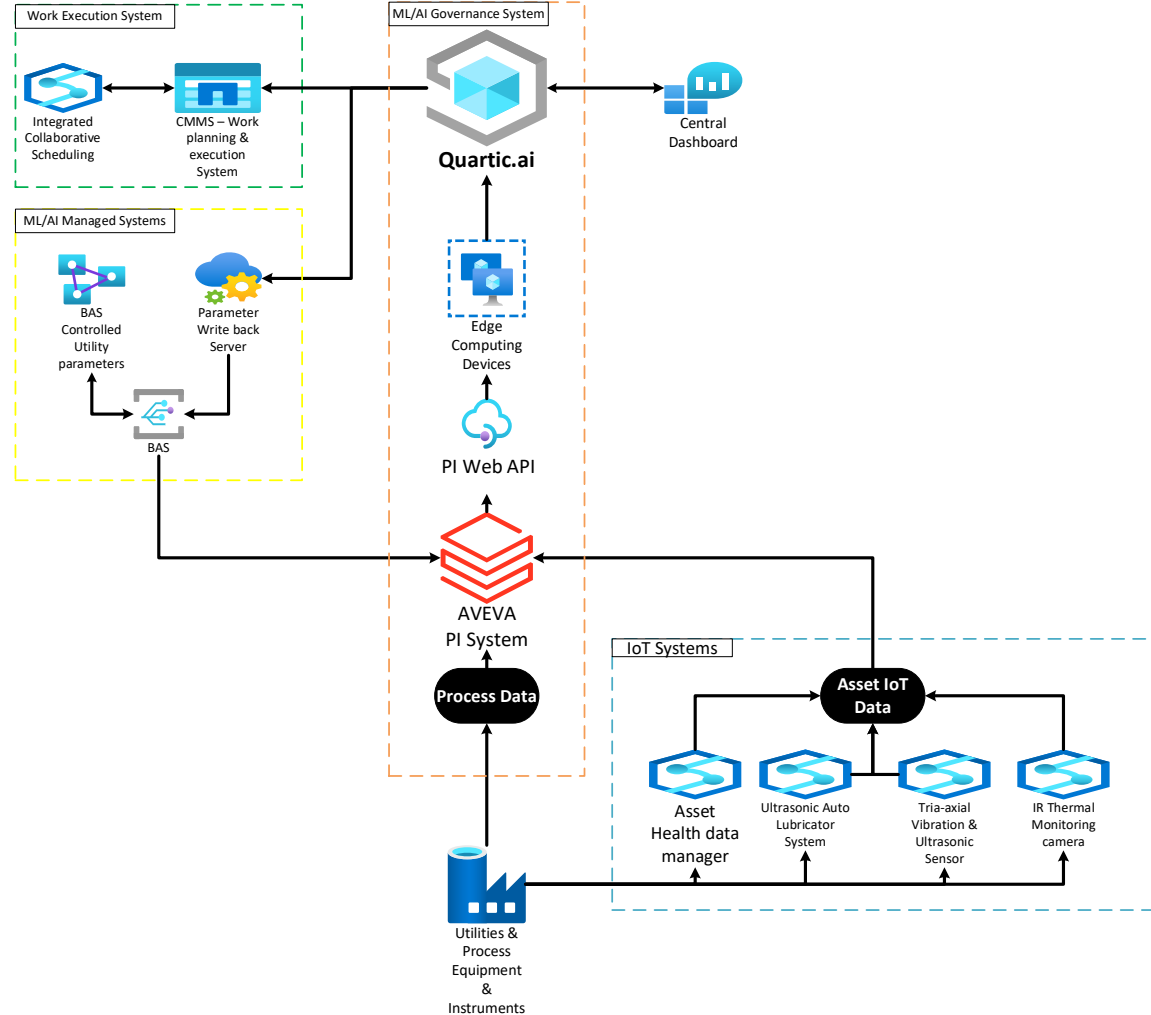
Challenges:

- ▶ No globally defined solution or guidance
- ▶ Operational quality buy-in
- ▶ Stringent cyber security policy for data ownership & flow
- ▶ Only connection to validated PI System
- ▶ People – fear of job obsolescence

Step towards Digital 4.0 in Maintenance

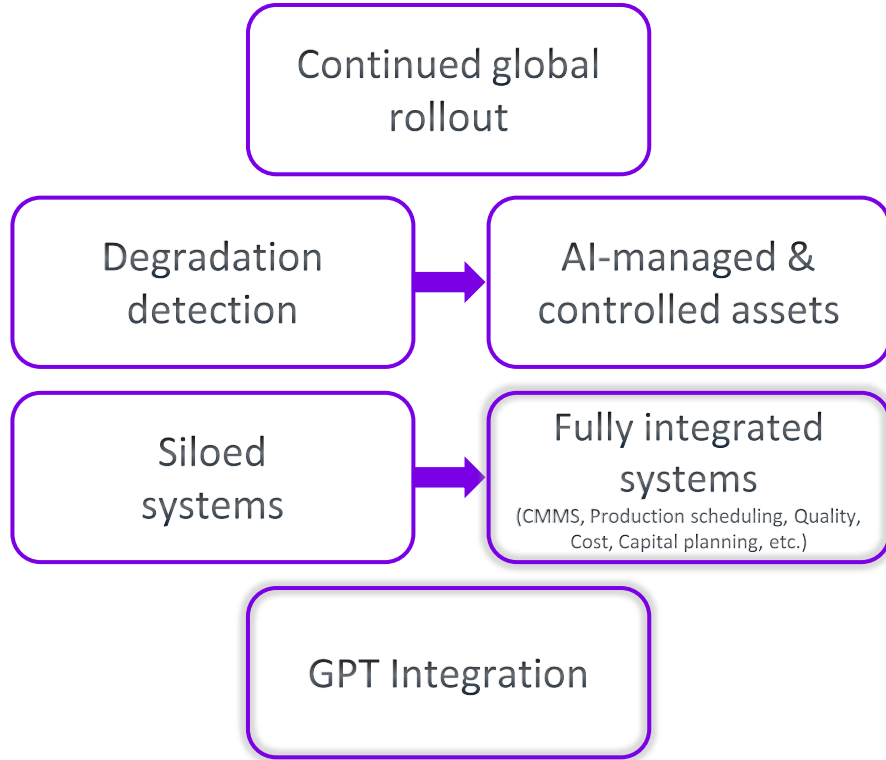
Example: HVAC/Sterile Air Supply System

- ▶ Supply/Exhaust fans have Ultrasonic Lubricators – Bearing Pillow block
- ▶ Supply/Exhaust fan motors have – Triaxial vibration sensor
- ▶ PCS data is monitored: Current, RPM, Duct pressure, Actuator/damper position, CFM, Filter DPMs, etc.
- ▶ Critical parameters are being trended: Room RH & Room Temp
- ▶ Predictive models help build confidence on Loss of Function



Phase 3 – Integrated Prescriptive Maintenance (IPM) model

(2025+)



Scaling Vision:

- ▶ Build standards for each Asset & System
- ▶ Build URS' to include IPM requirements
- ▶ Build a database of IoT devices that will compensate for missing data points that support IPM model
- ▶ Make IPM a Global initiative

Anticipated Challenges:

- ▶ Knowledge retention
- ▶ Regulatory guidelines
- ▶ Changing cybersecurity policies
- ▶ Technology obsolescence – 8 years
- ▶ Plant connectivity capabilities
- ▶ Technology adaptation capabilities
- ▶ Rogue AI?

Next Generation Reliability

Business Challenges

- ▶ Maintenance was time-based and reactive
- ▶ Data, applications, and systems were all siloed
- ▶ Legacy assets and systems have limited monitoring & connectivity capability
- ▶ Need to create a global solution with full team buy-in

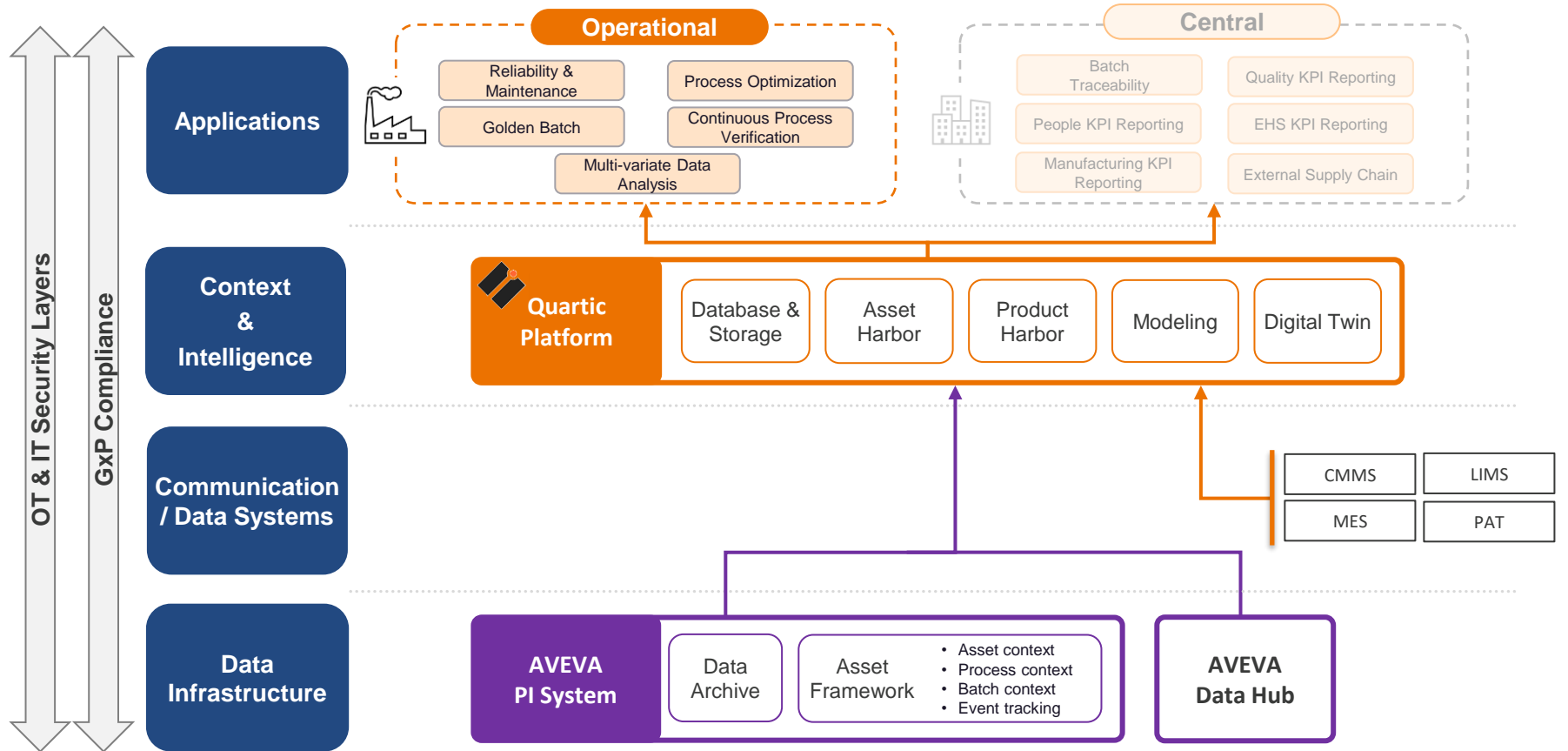
Solution

- ▶ Implement PI as a standard data & context infrastructure
- ▶ Implement Quartic as an advanced analytics & application platform for Reliability 4.0
- ▶ Build out IoT capabilities to address legacy equipment
- ▶ Leverage PI & Quartic to rollout global E-Maintenance solution
- ▶ Build trust and skill inside of Sanofi team

Results & Benefits

- ▶ Reduced COGS
- ▶ Reduce preventative maintenance cost by 25%
- ▶ Less Software platforms to manage
- ▶ Targeted capital planning and spend
- ▶ Productivity hours gained
- ▶ Reduced needs of contractors
- ▶ Team's responsibility scope increase – do more with less
- ▶ Upskilled entire engineering teams
- ▶ Built foundation for additional ML/AI initiatives
- ▶ More conferences & panel interviews for me! 😊 (plus a happy boss)

Applications Beyond Reliability



 [linkedin.com/company/aveva](https://www.linkedin.com/company/aveva)

 [@avevagroup](https://twitter.com/avevagroup)

ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

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