

# The Collaborative Supply Chain

Presented by **Nick Ward** - Senior Product Manager  
Predictive Equipment Health Management



# The collaborative supply chain

*“The industrial market is recognising the benefits of advanced analytics to predict equipment failure or loss of performance. To get the best from this approach, operators and remote diagnostics providers need to collaborate to combine the strengths of both groups. The Connected Supply Chain model from OSIsoft is a great approach to help make this happen.”*



Sophisticated analytics make alerts actionable but require a new way of collaborating between Operators and Service Providers, using **PI Cloud Connect**

# About OSyS

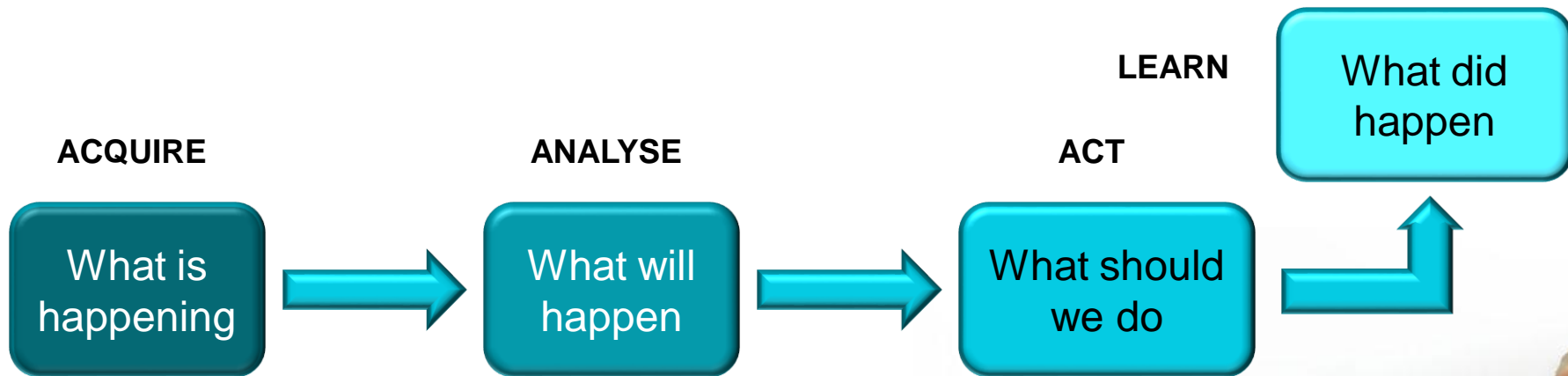


- **Optimized Systems and Solutions**
  - Founded in 1999
  - Part of the Rolls-Royce Group
- **450+ Customers Across Multiple Industries**



- Predictive Equipment Health Management
- Process Assurance and Compliance
- Operational Optimization
- Maintenance Management





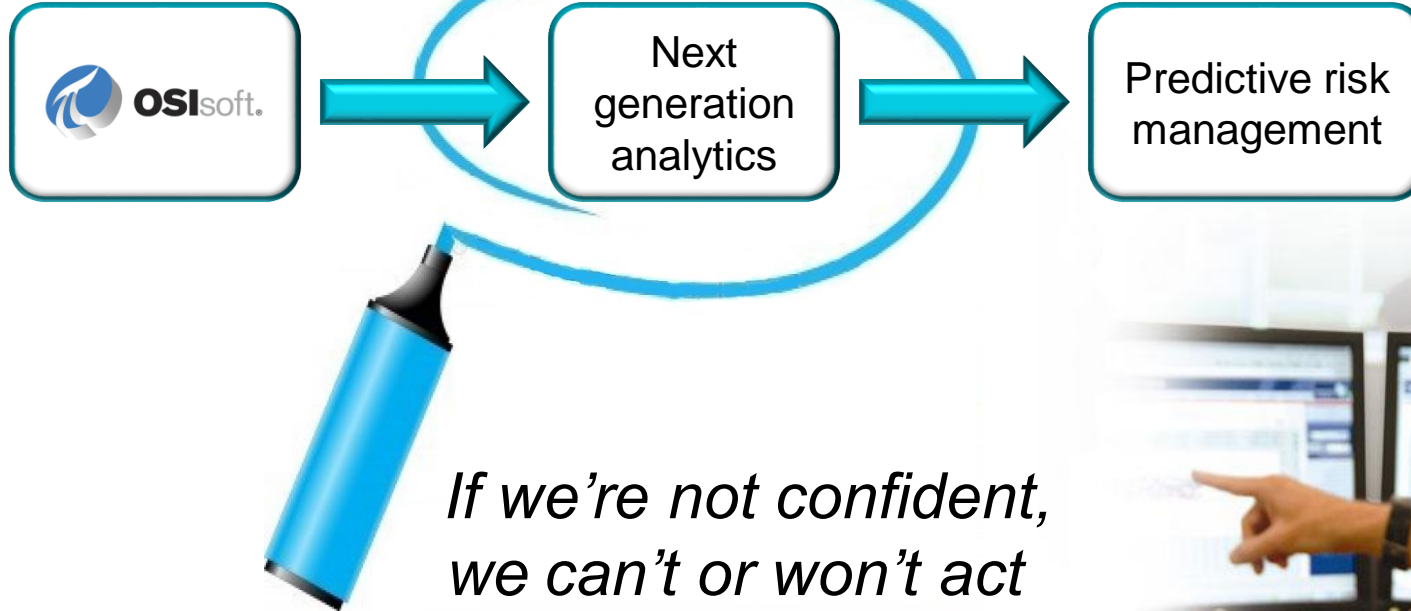
*If we know what is likely to happen,  
we can plan to prevent it,  
or plan to reduce its impact*



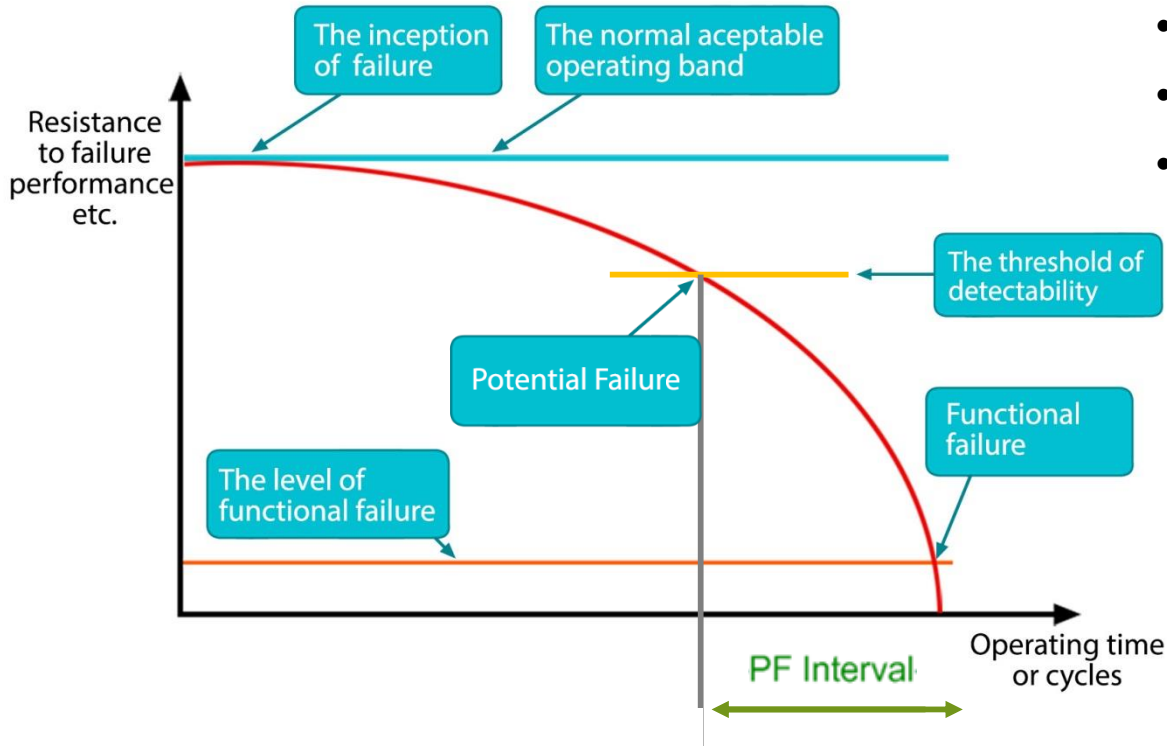
**ACQUIRE**

**ANALYSE**

**ACT**



# Accurate & confident predictions

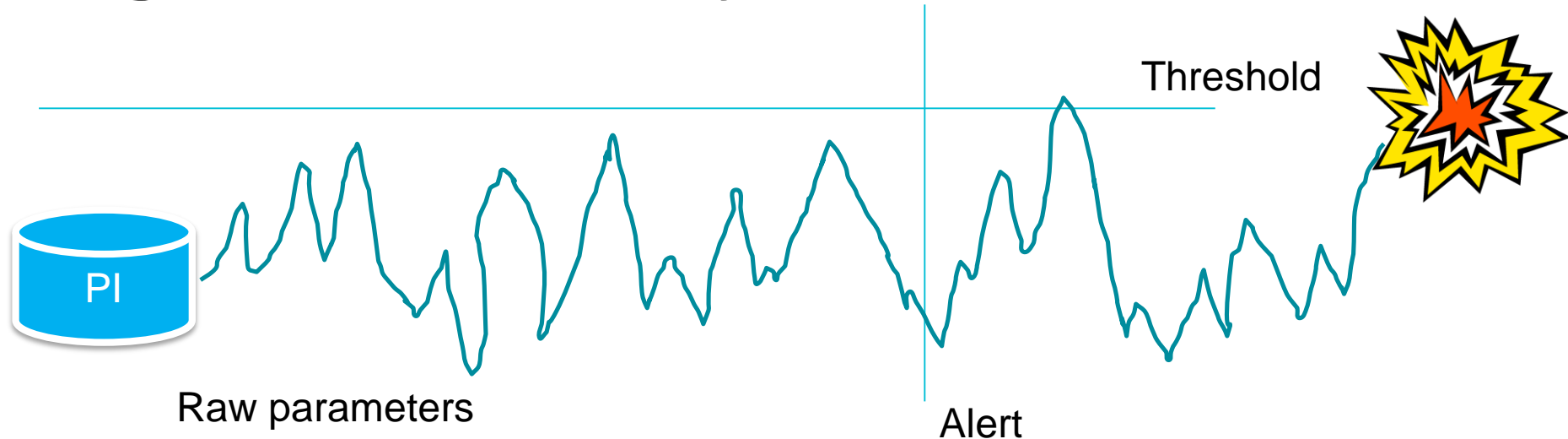


- **Detecting earlier**
- With a **confident diagnosis**
- And **minimum false alerts**

Longer detection intervals  
drive better mitigation  
planning

But only if alerts are trusted

# 1<sup>st</sup> generation analytics

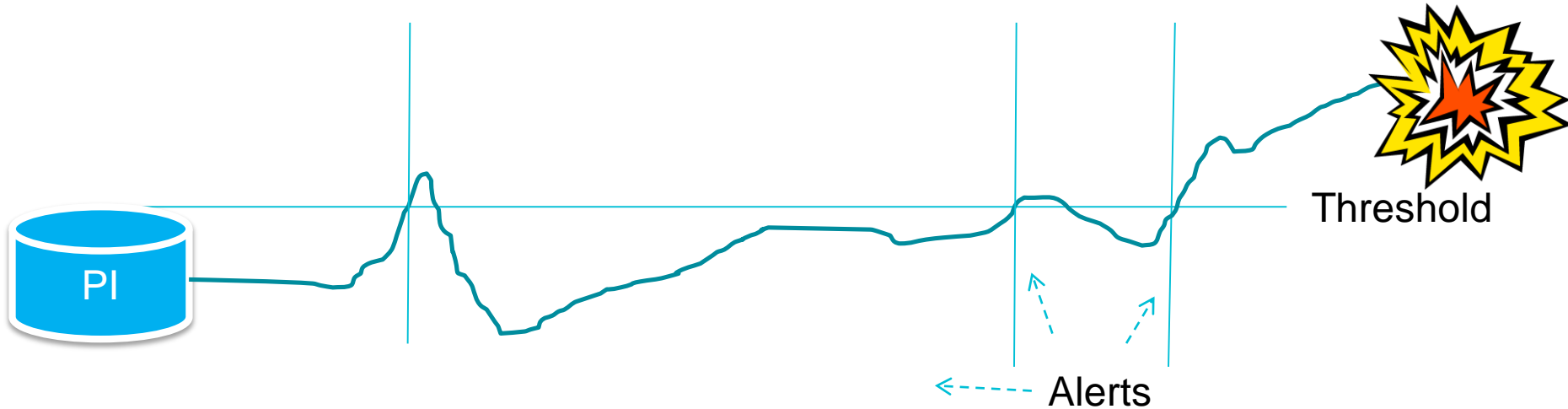


*Raw data is spiky = limited practical alerts*

*Thresholds are often too high to allow reaction time*

# 2<sup>nd</sup> generation analytics

## ANOMOLY DETECTION

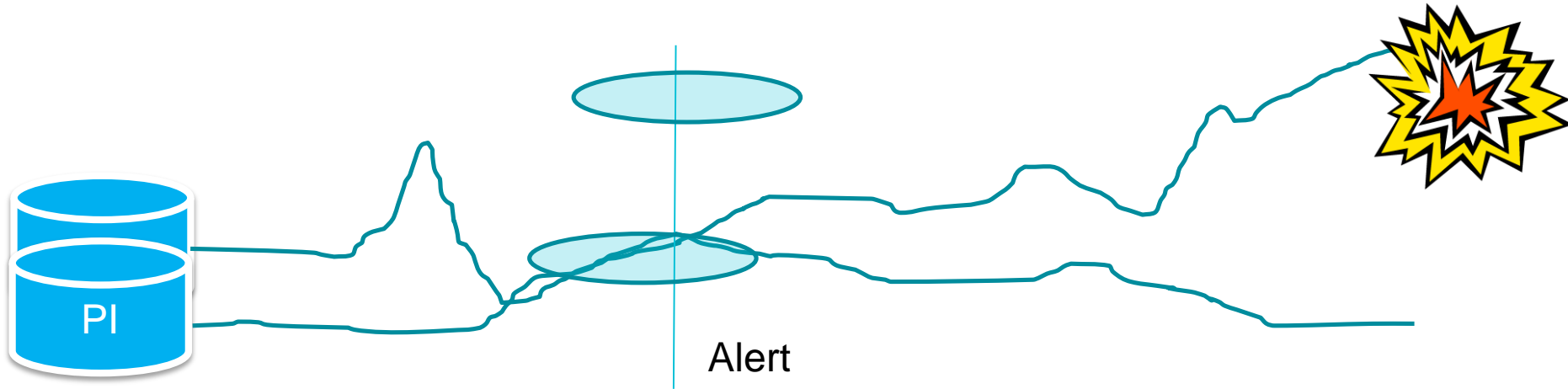


- *Use algorithms to model expected behaviour, and compare to actual*
- *Models smooth the data, but set thresholds too high = late alerts*
- *or thresholds too low = many false alerts*



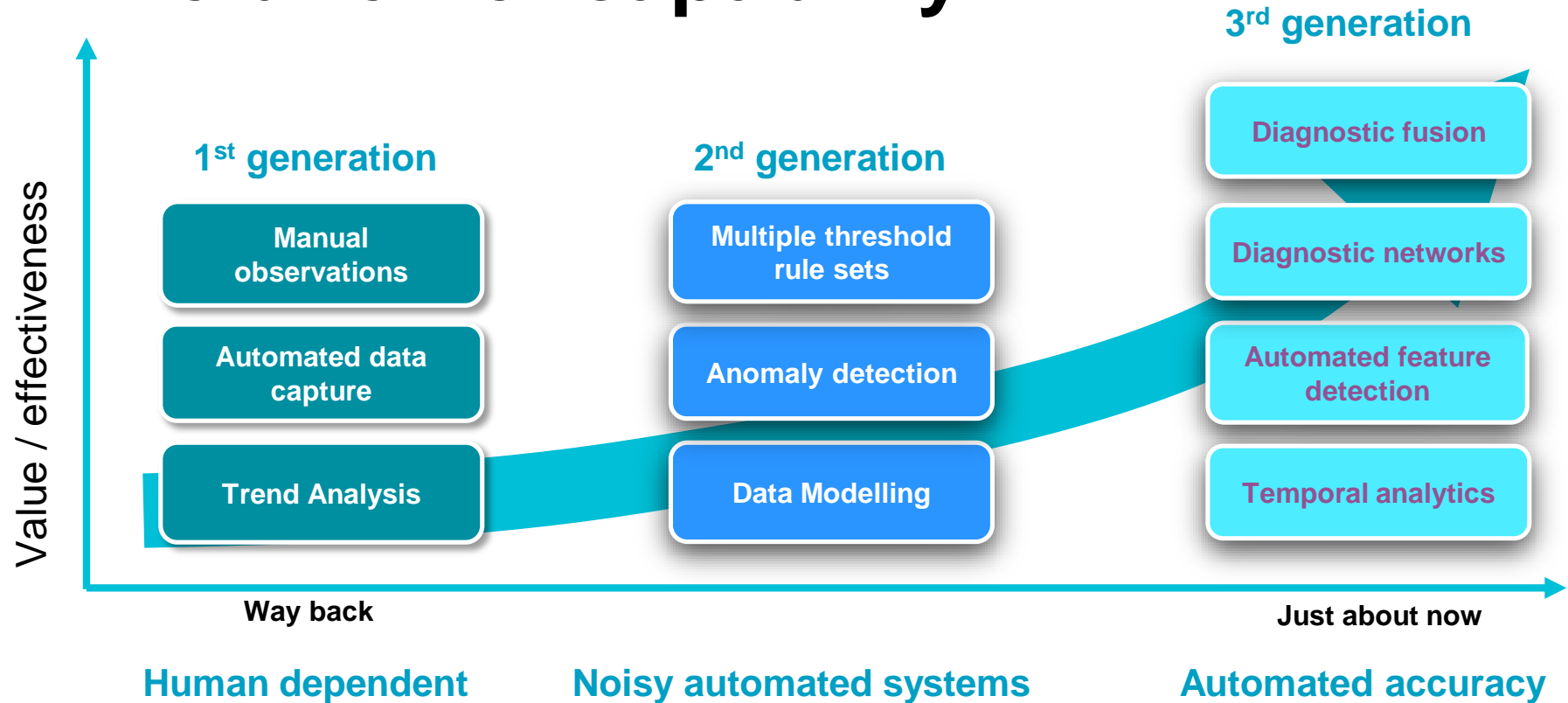
# 3<sup>rd</sup> generation analytics

## FAILURE MODE DETECTION



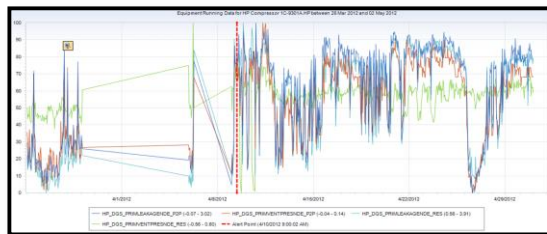
- *Reverse-engineer backwards from the way in which equipment fails*
- *Identify & look for linked subtle features. Individually inconsequential, but powerful when combined in a “Diagnostic Network”*
- *Fuse multiple techniques (oil, performance, vibration and others) for a holistic view*
- *Alert when confidence reaches an acceptable level*

# Evolution of capability



# O&G examples

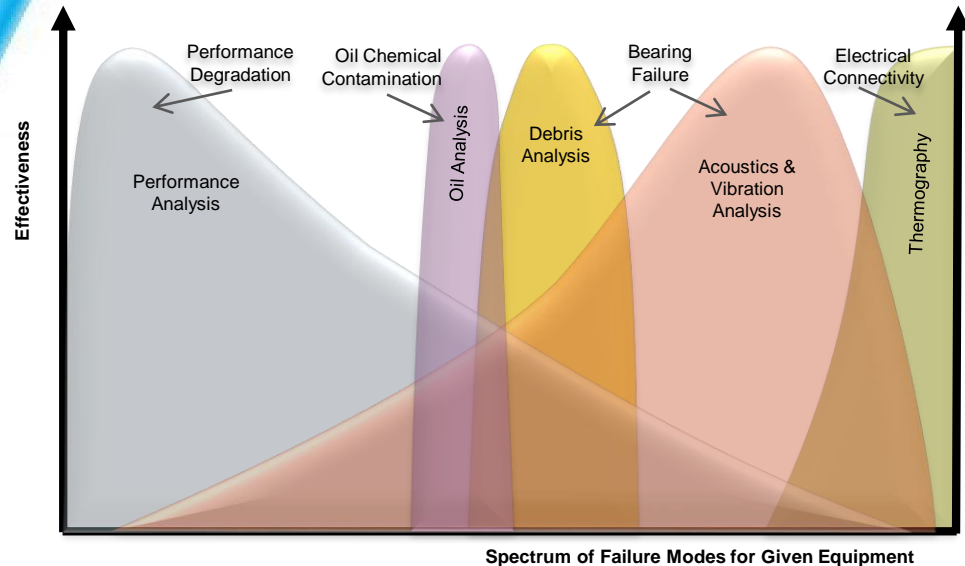
*Across over 3,000 aero engines:  
2013: zero missed events.  
2014: <10% false alerts*



- Dry gas seal failure
- Serial #1 with no history
- 3 weeks warning provided based on engineers specifying a pattern to look for
- Pump seal failure
- 6 months warning provided
- HP turbine blade damage
- 3 major events missed by online vibration monitoring
- 2-5 weeks warning provided

# So advanced analytics work...

- But they require careful application and fine-tuning to be effective & trusted
- To be successful you need:
  - The data
  - The operational problem to solve
  - The analytical toolbox and skills



# Two common operational models

## Managed by the plant

### The data

- ✓ Local
- ✗ Global fleet

## Managed by a service provider

### The data

- ✗ Some local data, not enough or timely
- ✓ Global fleet

### The operational problem

- ✓ Close to the business

### The operational problem

- ✗ Distant from the operator's goals

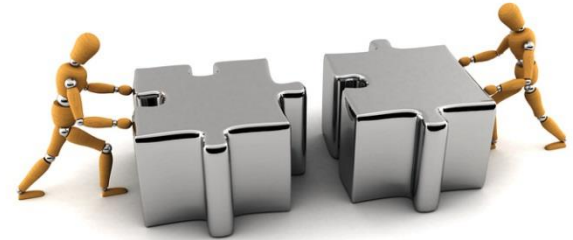
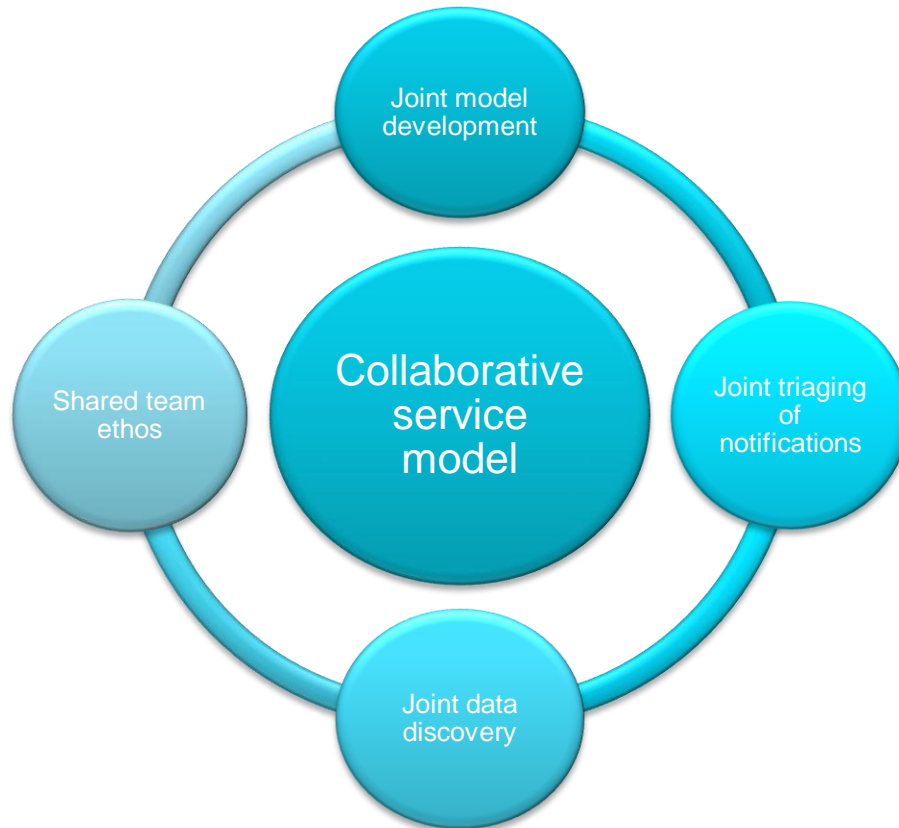
### Analytic toolbox & skills

- ✓ Strong **local** engineering domain
- ✗ Rigid tools – closed systems
- ✗ Expertise limited to the site or organisation

### Analytic toolbox & skills

- ✓ Strong **global** engineering domain
- ✓ Agile tools – able to prototype
- ✓ Scalable expertise

# Collaborative services is the best of both



- ✓ Close to the business
- ✓ Strong engineering domain
- ✓ Access to global learning
- ✓ Scalable services
- ✓ Open data, open systems

We need a shared data infrastructure.  
I wonder who can help with that?

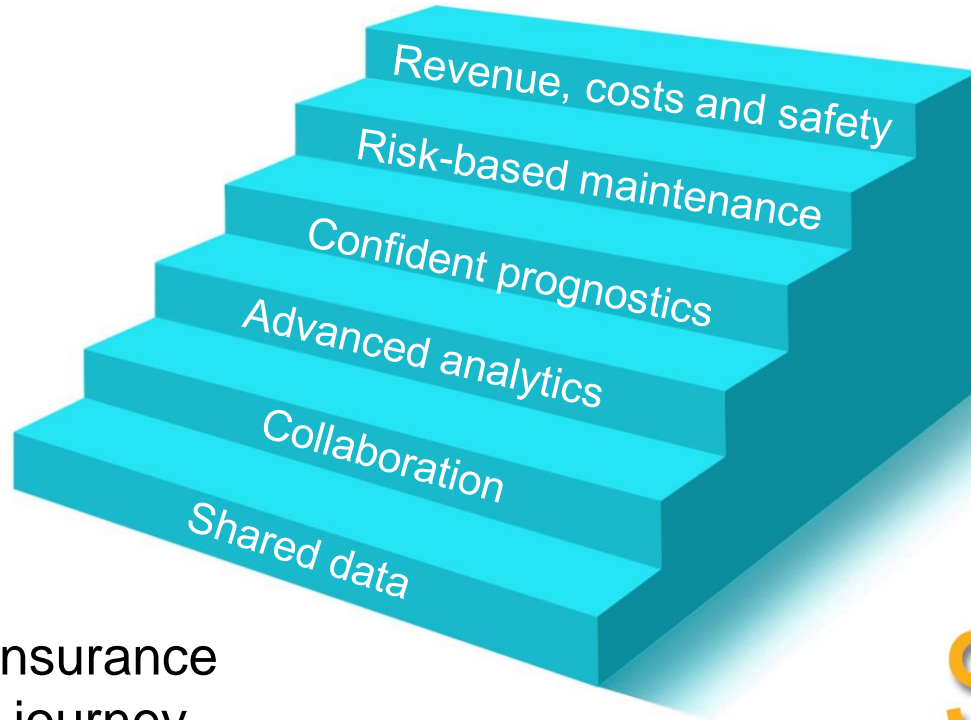
- PI Cloud Connect will connect us on a transaction level with customer data
- We can seamlessly republish derived data back
- We can simultaneously work on the same virtual dataset
- We cut the time to address new issues by months, even years



# Why is this important?



Risk-based  
equipment  
management



Not just an insurance  
policy, but a journey





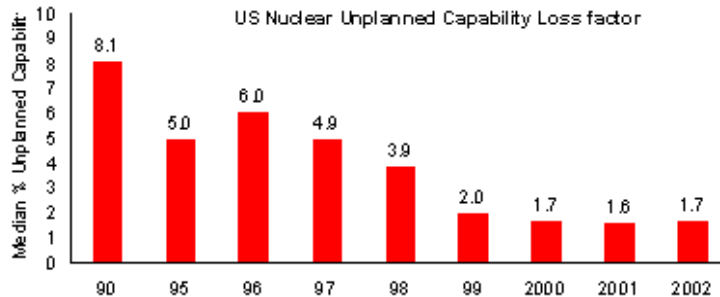
# Aerospace & nuclear have led the way

- 10 years ago Rolls-Royce transitioned to a **predictive** service business
- Underpinned by **advanced analytics** to manage 12,000+ jet engines & industrial equipment
- Predicting 10x more benefits to come



600% share price growth since 2009

20 years ago the nuclear market switched to a **risk management** ethos & every KPI shows the improvement



Source: WANO

- Production Costs decreased by 45%
- Capacity Factor increased from 75% to 92%
- Refueling outages reduced from 105 to 37 days
- Safety reportable events reduced by > 80%

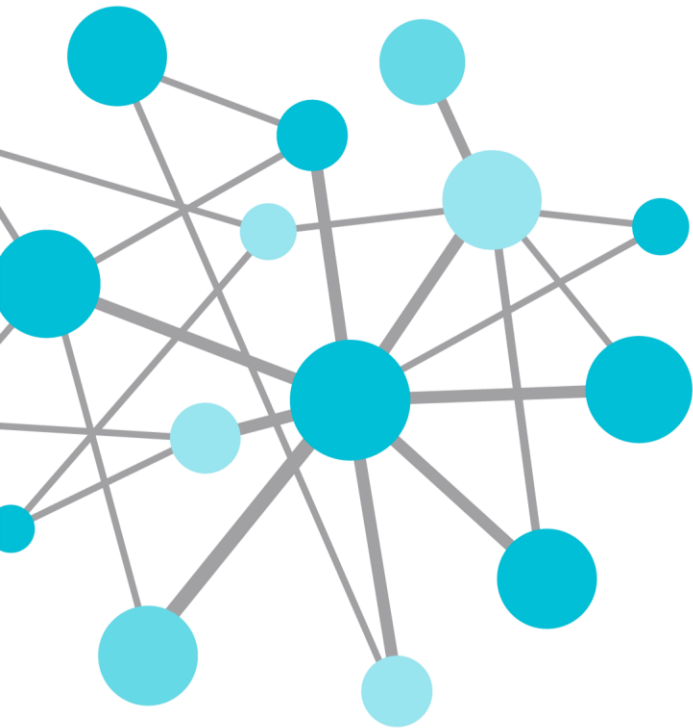
Now dealing with obsolescence and an aging expert workforce

# Summary

- If you want people to **trust & act** on data alerts, you need a certain level of sophistication in your analytics
- **Sophisticated analytics** are complex by definition, and no single organisation has all the inputs
- Therefore a **collaborative relationship** is necessary
- And **OSIsoft PI Cloud Connect** can underpin such a relationship

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THANK  
YOU

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