
Operations Data Science and Predictive Analytics for Process Improvement Training Course

3 – 7 May 2027
Tokyo





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Programme Summary

Operations data science and predictive analytics for process improvement is a five-day training course for operations leaders at strategic level, culminating in an analytics-led improvement case for a process they own. Plants and service operations generate sensor, transaction and event data every minute, yet most improvement decisions still rest on averages, monthly reports and experience. The approach combines statistical control, forecasting, predictive maintenance and anomaly detection with a disciplined project lifecycle. Mars Training Centre UK delivers this programme in operations data science and predictive analytics.

The Business Case

Unplanned stoppages, hidden process variation and forecasts that miss demand all consume capacity and margin. Leaders who frame the right analytical question, judge model quality and turn predictions into changed routines move improvement from reaction to prevention.

- Asset Availability: Rises as failure risk is predicted from condition data and maintenance is scheduled before breakdown.
- Process Variation and Waste: Fall as control charts and regression expose the drivers of defects, scrap and rework.
- Planning Accuracy: Improves as demand and workload forecasts replace fixed planning assumptions.

Principles and Evidence Base

- CRISP-DM Lifecycle: Structures every analytics project from business understanding through deployment, introduced in Session 1.
- Lean Six Sigma DMAIC: Links each model to a defined problem, a measured baseline and a sustained control plan across Sessions 1 and 5.
- Statistical Process Control: Distinguishes common-cause from special-cause variation in Session 2.
- Supervised Learning and Time Series Forecasting: Underpin the predictive maintenance, anomaly detection and demand models in Sessions 3 and 4.

Intended Participants

- Leaders accountable for throughput, quality, cost and availability across plants or service operations.
- Executives who direct continuous improvement portfolios and approve analytics investment.
- Senior managers who sponsor predictive maintenance, quality analytics or forecasting projects.
- Heads of functions who must work with data science teams and judge their outputs.



The programme serves manufacturing, oil and gas, utilities, logistics and high-volume service operations such as healthcare and banking back offices.

Learning Outcomes

1. Participants will be able to frame operational problems as analytics questions using the CRISP-DM and DMAIC lifecycles.
2. Participants will be able to diagnose process variation with control charts, capability measures and regression.
3. Participants will be able to evaluate predictive maintenance and anomaly detection models for accuracy, cost of error and readiness.
4. Participants will be able to compare forecasting methods for demand, workload and inventory planning.
5. Participants will be able to prioritise analytics use cases by operational value, data readiness and effort.
6. Participants will be able to construct an analytics-led improvement case with a deployment and control plan.

Programme Structure

Day 1: Operations Data Science Foundations

Which operational problems can data science solve, and how should a project be framed?

- CRISP-DM Phases Mapped to DMAIC
- Operational Data Sources: Sensors, Historians and Event Logs
- Problem Framing and Value Hypotheses
- Data Quality and Preparation for Process Data
- Analytics Use Case Long List

Day 2: Diagnosing Process Variation

Where does variation come from, and which factors drive defects and delay?

- Control Charts and Special-Cause Signals
- Process Capability Indices
- Multiple Regression for Root Cause Analysis
- Design of Experiments Basics
- Process Mining from Event Logs

Day 3: Predictive Maintenance and Anomaly Detection

How can failures and abnormal behaviour be predicted early enough to act?



- Condition Monitoring Data and Feature Engineering
- Classification Models for Failure Prediction
- Remaining Useful Life Estimation
- Unsupervised Anomaly Detection Methods
- Confusion Matrix and Cost of False Alarms

Day 4: Predictive Analytics for Planning and Deployment

How are forecasts built, judged and put into daily operational use?

- Time Series Forecasting for Demand and Workload
- Forecast Accuracy Measures
- Model Deployment into Operational Dashboards
- Model Monitoring and Drift
- Roles Between Operations and Data Science Teams

Day 5: Applying Operations Data Science to Improvement

How are diagnosis, prediction and deployment combined into one improvement case?

- Use Case Prioritisation Matrix for a Participant Operation
- Baseline Measures and Target Benefits
- Control Plan for a Deployed Model
- Peer Challenge of Improvement Cases
- Analytics-Led Improvement Case Presentation

Methodology

The programme relies on data workshops supported by case analysis. Participants work with anonymised process, maintenance and demand datasets from manufacturing, utilities and service operations, interpret model outputs and judge whether each result is good enough to change a work routine. No programming is required.

- Suggested activity: Reading a control chart to separate special-cause events from routine variation.
- Suggested activity: Setting an alarm threshold for a failure prediction model against the cost of false alarms.
- Suggested activity: Comparing two demand forecasts and choosing one for a staffing plan.

Capstone Output

Each participant completes an analytics-led improvement case for a process in their organisation. It states the problem and baseline, the data and model approach, expected benefits, deployment steps, monitoring measures and the control plan, ready to present to an operations leadership team or improvement steering group.



Frequently Asked Questions

Is operations data science and predictive analytics suitable for leaders without a statistics background?

Yes. It suits strategic operations and improvement leaders and assumes familiarity with performance measures and basic improvement methods, but no programming or advanced statistics.

Which models underpin operations data science and predictive analytics?

It rests on the CRISP-DM lifecycle and Lean Six Sigma DMAIC, applied with statistical process control, supervised learning for failure prediction, anomaly detection and time series forecasting.

How is the operations data science improvement case used at work?

You return with a case your leadership team can approve, setting out the problem, data, model, benefits, deployment steps and control plan for one priority process.

How does operations data science differ from a general data analysis programme?

It applies prediction and statistical control to plant and service processes, and focuses on deploying models into operational routines rather than on reporting and visualisation.