Predictive Quality
Deliver High Quality Products &
Maximise Profit Margin

Laura Watts
Keith Mobley
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Today’s Topics and Speakers

Laura Watts
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How Predictive Quality is a *proven capability* and the *Business Impact*

The *Evolution* of Predictive Quality and *how it works?*

Predictive Quality *in Practice*

How to *succeed* with Predictive Quality

Keith Mobley
*Internationally recognised Thought Leader, Executive Advisor in the area of Maintenance and Reliability*
Predictive Quality
The manufacturing world is going through a ‘digital revolution’

Pressure on Margins
‘Sweat the assets’

Internet of Things
‘Cheap and Easy Sensoring’

Quality and Regulations
‘Ever increasing consumer expectations – mass personalisation’

Use of Unstructured Data
‘data format is unimportant’

Predictive Quality
Where Industry 4.0 Leaders are going
The right solution for the right business problem?
The right solution for the right business problem?
The right solution for the right business problem?

Root Cause, Anomaly detection and Quality Checks

What happened?
Why did it happen?
What will happen?
What should I do next?

Predictive Quality

Prescriptive Analytics

Analysis & Monitoring

Reporting

Predictive Analytics

n+1=x
Predictive Quality
What does it mean?

Unearthing characteristics that lead to an increased frequency of faults

Finding patterns in maintenance operations that could point to opportunities for improvements

Identifying assets at risk of fault production even when they have no previous history of fault production

Manufacturing
Predictive Quality
What does it mean?

Predictive Quality is about understanding the patterns in data to determine the areas of greatest risk and directing resources before risk becomes reality.

- Reduce recalls / warranty claims
- Reduce time to identify issues
- Reduce scrap work, Inspections effort and Warranty claims
- Make adjustments to predictive maintenance schedules and corrective actions
- Enhance operations, workforce and supply chain processes
- Capital and strategic planning
- Maximise shipping rates cost-effectively
- Improve brand value and after sales support recommendations
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Evolution of predictive analytics for quality management

In the beginning there was six sigma

Six Sigma where quality problems resolved analysis of historical data

Microprocessor evolution opened door to predictive analytics but use remained reactive

The future of analytics is focus on prevention rather than correction
Breakthroughs in microprocessors enabled collection of data that defined the operating parameters and condition of production and manufacturing assets.

Predictive maintenance, introduced in 1980 and the focus of predictive analytics—in its simplest form—was touted as the panacea for poor quality.

- Vibration alone is not enough.

- Forward-thinkers added process parameters that define the operating dynamics of systems, and began shifting focus to prevention.
Early attempts to use predictive analytics limited

Reliable input data is the Achilles heel of predictive analytics.

- Fragmented by the siloed functions and cost-accounting
- Non-standard data collective
- Human interpretation and induced data errors
- Enterprise information management systems not configured to effective use big data or analytics
Predictive analytics as a quality management tool

- Focus on prevention not as a problem-solving
- Apply analytics across the supply chain, not just in your factories
- Forcing functions, e.g. variations in process, that directly or indirectly influence product quality must be known
Automotive application of predictive analytics

Variation in surface tension caused light refraction changes and “zebra strip” effect

Bearing wear and tension control during rolling process identified as source

Deviation not measurable but becomes visible when finish gel coat is applied

Applying predictive analytics upstream eliminated the problem

Applying predictive analytics across supply chain provides optimum results
A manufacture of precision electronics faced several potentially crippling issues:

- Expensive procured components and sub-assemblies
- Long manufacturing cycle time
- Low manufacturing volumes

**The solution:**

- Extend predictive analytics upstream
- Implement analytics models that compensate for manufacturing cycle
- Focus on prevention
A manufacturer of precision electronics faced several potentially crippling issues:

A global diagnostic device manufacturer experienced gross margin pressure and multiple product recalls.

- Customer information was siloed across direct and distributor channels

- Problem magnified by internal inconsistencies in products and hierarchies
Benefits of predictive analytics in quality management

Reduce product quality issues:
- Incoming off-spec.
- Scrap, losses & waste
- Warranty & returns

Improve yield:
- Minimum instability & variability
- Optimum asset utilization & performance
Benefits go well beyond quality management

Yes, application of predictive analytics will improve product quality. But there are many other benefits

- Optimum OEE and AU
- Maximum return on assets (ROA)
- Lowest cost of goods sold (COGS)
- Optimum total cost of ownership (TCO)
- Assured regulatory compliance
- Lowest CapEx cost
Predictive analytics enables transformation to stable, predictable operations

But it may not be easy to change

- Big data enterprise information management system
- Effective data acquisition
- Analytics that convert “big data” into definitive action
- Organizational culture that effectively acts upon knowledge
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- The *Evolution* of Predictive Quality and *how it works?*
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- How to *succeed* with Predictive Quality

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Predictive Quality Cycle

1. Collect and integrate data
   - Structured and unstructured, streaming and at rest

2. Generate predictive and statistical models

3. Attain analytical insights

4. Display alerts and recommend actions

5. Act upon insights

Asset performance

Process integration
How Predictive Quality works?

**Data**
- Procurement & Supply Chain
- Sensors
- GIS
- Data Historian
- Asset Management
- Maintenance Management
- Other Sources

**Predictive Models - Insights**
- Predictive Algorithms for Quality and Warranties Issues
- Diagnostic Analysis & Root Cause/Anomaly Detection

**Actions (Early Warnings)**
- Recommendations and decision support
  - What should be done next?
- Prioritisation
  - What to attend to first depending on fault severity?
- Evaluate impact

**Real Time**

**Automation**

**Change Management**
Predictive Maintenance

What does it look like?
Predictive Maintenance

What does it look like?
Predictive Maintenance
What does it look like?
Predictive Quality detected a problem in warranty claims data 39 months earlier than existing systems.

By the time the client’s systems detected the problem, an additional 172,099 vehicles had been sold, and an additional 1,525 warranty claims had been made.
Results: Defect Factors

- 80% reduction in scrap in 10 weeks
- 50% reduction in defects in 12 weeks
Identifies **97% of fault** patterns automatically, saving hundreds of thousands of dollars per year.

Have **saved over $38M** in quality related costs since deployment.
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Thank you

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