Does Big Data and advanced analytic need MOM?

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In 2018, investment in Digital transformation = 300 b $
Digitization in the discrete manufacturing industries

Source: "Weaving the Digital Thread across Industry" Infographic, LNS Research, 2015
Compared to Digitization in the process industries
Standardization and Digitization
Path to AGILITY

- PLM as single repository for mMDM
- ERP synchronized
  - Data coherence across the enterprise
- MES in auto-adaptative mode
  - Configuration mode in event from mMDM
  - Analytics and Reports based on data model
- Quick answer to the market
MOM as a MFG IT Plattform for The Smart Manufacturing Roadmap…

SMART MANUFACTURING ROADMAP
Digitalize the main three elements

- Product
- Process
- People
Digitalization progress to a smart factory

**Companies ARE CHANGING**

1. Monitor
2. Control
3. Optimize
4. Autonomy

“The changing nature of products is disrupting value chains, forcing companies to rethink and retool nearly everything they do internally.”

*Source: Harvard Business Report, Michael E. Porter & Jim Heppelmann*
High Performance Computing
AI / Generative Design
Adoptive Manufacturing
Real Time Simulation
Industrial IOT
Digitalize the main three elements

Product

Process

People

Digitalize
• Focus on 2 topics
  – Digitizing the operations
    • Bill of material
    • Recipe
    • Process Instructions
    • Event capturing
    • Synchronization with
      – Logistic, Material Handling
      – Maintenance processes
      – Quality Processes
      – Utilities
  – Being data source for Analytics
    • Production
    • Product
    • Quality
    • Any events
Manufacturing is a Big Data generator

Manufacturing already generates more data than any other sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Annual new data stored, 2010 (Petabytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>1,812</td>
</tr>
<tr>
<td>Government</td>
<td>911</td>
</tr>
<tr>
<td>Banking</td>
<td>773</td>
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<tr>
<td>Communications and Media</td>
<td>776</td>
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<tr>
<td>Retail</td>
<td>424</td>
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<tr>
<td>Professional Services</td>
<td>397</td>
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<tr>
<td>Securities and Investment Services</td>
<td>336</td>
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<tr>
<td>Healthcare</td>
<td>375</td>
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<tr>
<td>Education</td>
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<tr>
<td>Insurance</td>
<td>273</td>
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<tr>
<td>Transportation</td>
<td>266</td>
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<tr>
<td>Wholesale</td>
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<td>Utilities</td>
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<td>Resource Industries</td>
<td>166</td>
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<tr>
<td>Consumer and Recreational Services</td>
<td>116</td>
</tr>
<tr>
<td>Construction</td>
<td>87</td>
</tr>
</tbody>
</table>

Discrete manufacturing = 1,072
Process manufacturing = 740

1 Discrete manufacturing constitutes 1,072 petabytes; Process manufacturing 740 petabytes

SOURCE: IDC; McKinsey Global Institute analysis
And the growth for time series in manufacturing is faster today

**Time Series - the Fastest Growing Database**

DB-Engines also ranks time series database management systems (Time Series DBMS) according to their popularity. Time Series Databases are the fastest growing segment of the database industry over the past year.
How do you accelerate the value of your investment

• You gathering a lot of information!
• How do you learn from your data?
• How do you mitigate risk?
• Do you understand dependencies and patterns?
HOW DO PEOPLE DO ADVANCED ANALYTICS TODAY?

• Bring on team of data scientists, a data architect and IT.
• Execute an expensive data science project
• Do it again (and again)!

WHAT IS A BETTER WAY TO LEVERAGE ADVANCED ANALYTICS?

• Simplified data cleaning
• Access to multiple model engines
• User support toolsets (software guidance)
• Fast data ingestion
• Large data management
• Smart data context/ID
• User driven presentation
• Multi-layered security

Machine Learning Algorithm Lifecycle

1. **Data** (Historian, SQL...)
2. **Training Data** (Clean & Learn & Test)
3. **Train** (ML Algorithm)
4. **Model Input** (e.g. PMML)
5. **Live Data** (e.g. Streaming)
6. **Deploy** (Pipeline)
7. **Communicate** (Visualization / Live Data)
8. **Evaluate** (Good / Bad)
9. **Prediction** (Outcome)
10. **Prediction** (Outcome)
What can I do with Machine Learning?

- Dynamic Real Time Optimization
- Prediction of
  - Maintenance
  - Failure
- Anomaly Detection
- Model Predictive Control
- Prescriptive Actions
- …..
Digitalize the main three elements

- **Product**
- **Process**
- **People**

Digitalize the main three elements

- **Product**: Digitalize
- **Process**: Digitalize
- **People**: Digitalize
Are we loosing jobs?

By 2025 3.5 Mil people will retire

By 2025 two million manufacturing jobs will go unfilled.

Deloitte.

Manufacturing Institute
How to fix this?

“Boeing commits $100M to worker training programs in North Charleston and elsewhere.”
Challenges!

Worker

Factory and Fields

Office and desk

Simple & Routine

Complex & Variable

AR (Augmented Reality)
5 sensors of Human

Taste
Smell
Touch
Hear
See -
MOM context in Augmented Reality

Analytics in Augmented Reality

Order: 63522
Shift: 3
Running time: 3:30
AR and it’s future

Visualize

- **Enhance** the user’s view of the physical world with the overlay of real-world or hypothetical information.

Instruct

- **Train or guide** users on how to perform a task through the overlay of digital instructions or real-time expert guidance.

Interact

- **Manipulate** digital graphics or extend a product through an AR interface.
Current

IIOT: Wrap and extend with a new layer of digital technology

ISA-95

- L4: Business Systems (ERP, SCM, PLM) Governance & planning
- L3: Production Execution (MES / MOM)
- L2: Process Monitoring (HMI-SCADA)
- L1: Process Sensing, Manipulating (PLC)

IIOT

- Connectivity
- AI / Analytics
- Application Enablement
- Assets Performance
- Process Performance
- Hybrid Edge/Cloud

Break-Thru Solutions

- Roles based experience
- Real-time operational visibility
- Predictive / Prescriptive
- Mobile & augmented
- Flexibility through rapid application enablement
Bridging the Digital and Physical

Control Assets & Engage People

Connect to Physical Assets & IT/OT Systems

Orchestrate Response

Understand the Context

Analyze the Digital Data

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MESA International: Building Bridges-of-Understanding from the Plant to the Enterprise

Peer-to-Peer

Points-of-View

Global Education Program

Speaking with the Voice of Industry’s Practitioners
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