Building a More Connected Manufacturing Enterprise
A Practical Way to Align & Accelerate Strategic Initiatives for Manufacturing & I.T.

John Dyck
Chairman of the Board, MESA Int.
Director, Software Business Development, Rockwell Automation
Agenda

- Introduction to MESA International
- Manufacturing Operations - The Final Frontier
  - Real Challenges
  - Exciting Opportunities
- Toyota – a Case Study in Manufacturing Intelligence
- MG Bryan – a Case Study in Asset Performance Mgmt
Introduction to MESA International

MESA is...

…engaging practitioners (manufacturers/ producers, systems integrators, software providers, and consultants) of all sizes, industries and geographies.

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Introduction to MESA International

MESA knows…

…your company’s business drivers and strategic initiatives have a direct impact on production operations
Introduction to MESA International

MESA knows…

…….successfully connecting your plants to the enterprise can bring significant financial and operational gains
MESA knows...

...far too few companies know where to start, and how to maintain, a strategy of leveraging IT in production operations.
GEP Information...

- Content created and taught by some of the world’s foremost MES/MOM experts
  - 3 from North America; 3 from Europe; 1 from South Africa
  - 180+ combined years of experience

- Content derived from:
  - MESA Guidebooks: ROI, Metrics, SOA, Lean, Asset Performance Management, Quality & Compliance, Real-Time Enterprise, PLM
  - ISA-95 Working Group White Papers: Books 1.0, 2.0 and 3.0
MESA’s Global Education Program

GEP Value…

- **understand** and more clearly articulate the **value** of MES/MOM solutions

- **reduce** the risk, **time and costs** of implementing and supporting MES/MOM solutions by increasing the knowledge level of internal and external project teams

- reduce the costs and time in **systems selection, deployment and governance**
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Globally, Industry Executives are Trying to Balance:

- **Asset Availability**
  - Minimize unplanned outages

- **Asset Performance**
  - Manage costs
  - Maximize output
  - Optimize profitability

- **Risk**
  - Excel at process safety
  - Achieve mechanical integrity
  - Ensure compliance
The Vision
Integrated, Demand-driven Supply Chains

- Customers “pushing” demands
- Flexible production of smaller volumes of custom products
- Less vertically integrated
- More information driven & automated

Efficiency Metrics
- Change from output/input productivity measures to efficiency metrics such as customer responsiveness, flexibility, energy and environmental performance
Why is This Important?

1. Generate more revenue
2. Reducing your costs
3. Working capital improvements

Finance Departments have robust strategies and sophisticated tools to manage cash assets…

Companies fail to manage corporate equipment asset strategies!

[Image of a bucket with potential profit and losses, with items like poor quality, excessive inventory, lost customer loyalty, and delayed product launches indicated by arrows.]
The Plants – Source of Value Creation, BUT…

VP, R & D
Design View

Innovation
Management

Portfolio
Management

New Prod Dev

VP, Supply Chain
Supply Chain View

Sales & Marketing
Supply Planning
Sourcing

Manufacturing
Information Black Hole

Delivery Logistics
After Sales Service
Demand Sensing

VP, Operations
Operations View

Contract Mfg’ers
Suppliers

Outsourcers

Internal Plants

Plant Manager
Internal Plant View
Historic Distinctions Between IT & Operations

Unique motivations & incentives

**Corporate**
- Consolidate disparate systems
- Elimination of Shadow IT
- Integration with Enterprise Systems
- Compliance
- Security
- Integrate Acquisitions

**Plant**
- System Integration
- Infrastructure Support
- Standards Compliance

**IT**
- Increase Plant Utilization
- Best In Class Quality
- Manufacturing Agility
- Cost improvements
- Leverage Global Footprint
- Promote Best Practices

**MFG**
- Exceed Quality, Production, and Cost targets; Supply Chain Opt.

**Plant Manager**
- New Prod Launch Mgr

**Customer Service**
- Operations/Mfg

**Quality**
- CI/BPI
- Lean Six Sigma

**Maintenance Mgr**
Current State: A Highly Fragmented ‘MESS’ in the Plants

The majority of plant floor systems are custom, stand-alone applications.
Islands of Information within Islands of Information

Plant AND Corporate Productivity Initiatives Severely Constrained
The Opportunity
Integrated, Demand-driven Supply Chains

- Simulate / Advanced Control
- Mechatronics
- Autonomous Control
- Prognostics

Optimized with Business Risk Mgmt
- Track/Trace
- Analytics / Reporting
- Key Process Indicators
- Batch Records

Flexible: Faster Time to Market

Higher Productivity / Lower Total Cost of Ownership
- Software Integration
- Safety / Security
- Wireless

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Manufacturing Operations Management
Building a Better Enterprise

- Control and visibility to all aspects of production for all plants globally
- Use common KPIs to benchmark plants to drive performance improvement & productivity

VP
Manufacturing

- Increase customer (plants’) satisfaction
- Application consolidation and re-plat-forming
- Integrated production environment with enterprise
- Supportable and maintainable solution
- Decrease shadow IT costs

IT Team
(Plant & Corp)

- Control and visibility to all aspects of production environment
- Increase collaboration between departments
- Reduce and better control of costs (mfg, labor, maintenance, & inventory)

Plant
Management

- Objective data and Decision Support to invest in & prioritize high ROI CAP X projects
- Measure results of CAP X projects

Finance
Controller

- Use MTTR & MTBF to improve operations
- Top ten hitter report on demand
- Foundation for TPM initiatives

Maintenance

- Production & Quality reporting by shift and crew
- Production & process data

Production and Line Supervisors

- Reduce & track scrap thru early warning
- Selectively handle quarantine of finished goods thru multilevel genealogy access
- Prioritize and execute CI projects

Lean 6 Sigma & Quality
The power of knowing what MESAKNOWS

The Connected Enterprise
Embrace & Extend Existing Investments in Your Plant Systems

- User Interaction
  - Real Time Data & Operations Content
  - Drill Down
  - Real BI Analytics

- EMI
  - Connect Systems
  - Contextualize
  - Expose Content

- Plant Systems
  - Disparate Apps
  - Costly to Sustain
  - Unique DB’s/UI’s

- Low Cost, High Impact Strategy:
  1. Enable your Operations Excellence Initiatives
  2. Extend your Plant Systems’ Lifecycle
  3. Reduce Shadow IT Expense and Risk

VantagePoint Unified Production Model

Dashboards
Visualization & Reports
OLAP

Microsoft Dynamics
Oracle
Cognos
maximo

Enterprise Systems

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Operations Intelligence Scenarios

VP Operations | Lean/6 Sigma | Plant Manager | Quality | Maintenance | Production | Sustainability | Finance
--- | --- | --- | --- | --- | --- | --- | ---

**Enterprise Perf Mgmt**
Harmonized prod reporting & decision support across multiple sites, identifying losses and true constraints

**Enterprise Reporting**
A federated, standardized set of manufacturing views, reports and analytics at both the plant and enterprise level

**Continuous Improvement**
Enable your Lean Six Sigma CI teams with a much more complete, real time and historical data set to drive decisions

**Operations & Finance**
Understand in real time (and predict) when disruptive events in the plants will impact your supply chain; “Close the books”

**Quality Management**
Standardized Quality Reporting by integrating quality with production and equipment performance

**Inventory Management**
Optimize inventory levels and buffers through a real time and historical view of inventory wrt production effectiveness

**Maintenance Management**
Leverage real production and equipment data to drive maintenance actions (EAM) and strategy development

**Energy Management**
Establish manufacturing energy costs in real time, by part produced and include it as a part of the B.O.M.

The power of knowing what MESA KNOWS

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Operations Intelligence
Structured & Unstructured Content; Collaboration; Best Practices

Standard ‘Scorecard with drill-down for root cause analysis; (representing 6 sys)

Role-based assignment of ‘Tasks’ in realtime

Context-sensitive ‘Presence’ for relevant roles

VantagePoint Content from 14 disparate systems
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Toyota - Driving Operations Excellence
Pursue previously **hidden knowledge** and **value** reflected in the “**Rubik’s Cube of Opportunity**”

1. **Pursue a high quality mindset with voice of customer perspective**

2. **Pursue the implementation of Toyota Production System principles in the parts, unit, vehicle, and IS supply chain**

3. **Mutual respect and communication between team members and company**

4. **Business profitability and appropriate contributions to society**

5. **Cross-functional and cross-geographical collaboration, effectiveness and efficiencies**

6. **Business Leadership**
   - **Mfg./Plant Operations and Support**
   - **Business Intelligence**
   - **Plant Visualization**

7. **Reliable, secure and efficient technological foundation that enables business pursuits. Enhance “technology antenna” capability for greater contribution based on the latest advances**
Plant Data Collection & Visualization

**Strategy**

- TPS principles: Line Status & Problems made visual
  - Stop to fix problems. Get quality right the first time (Principal 5)
  - Use visual control so no problems are hidden (Principal 7)

**Problem**

- No or Legacy DCV System (Bingo board)
- Lack of data for problem identification

**Countermeasure**

- Regional IS supported DCV – Rockwell FactoryTalk

**Benefit**

- “Unlocking manufacturing machine data”
- Data Collection from PLC’s (fault collection)
- Real-time screens for problem visualization
- Analytics - Historic reports & trending

**CHALLENGES**

- New IS Responsibility
- No Single Business Owner
# Toyota Case Study

Operations Intelligence Across 13 Sites

<table>
<thead>
<tr>
<th>Enterprise Perf Mgmt</th>
<th>Enterprise Reporting</th>
<th>Continuous Improvement</th>
<th>Operations &amp; Finance</th>
<th>Quality Management</th>
<th>Inventory Management</th>
<th>Maintenance Management</th>
<th>Energy Management</th>
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<td>3</td>
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</table>

- **Enterprise Perf Mgmt**: Handled down the plant and enterprise level losses and true constraints.
- **Enterprise Reporting**: Historical data set to drive decisions.
- **Continuous Improvement**: Equipment performance.
- **Operations & Finance**: Quality management.
- **Quality Management**: Error proofing, defect tracking, SPC, repair bay OI.
- **Inventory Management**: Perf Mgmt, Excel, MES.
- **Maintenance Management**: Perf Mgmt, Excel, Down Time, defect tracking, Maximo/SAP PM.
- **Energy Management**: Energy Metrics, Perf Mgmt, MES, power monitors.

*The power of knowing what MESA knows*
Example - Toyota Motor Mfg Kentucky Paint Shop

Reduce Cost & Improve Efficiency

- Reduce Personnel
- Combine Paint 1 & Paint 2 CCR
- Automate Work Order Generation (future)
- Implement fixed work order stations
- Wireless Capabilities for Maintenance
- Provide for radio annunciation
- Upgrade Paint Process Systems
- Upgrade Paint 1 & 2 PLMS
- Eliminate Black Box for EPA data collection

Business / IS Partner to deliver common tool

Recurring Business Engagement Meetings
Common Performance Mgmt across Sites
Drive Digital Andon System
Toyota Plans

- Ongoing expansion to additional sites & functions
  - Stamping
  - Body Weld
  - Paint
  - Plastics
  - Assembly
  - Facilities
  - Powertrain
  - Logistics

- Ongoing Sharepoint integration

- Mobility Strategy
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Asset Performance Management
Rockwell Automation’s Cloud Platform

Devices
Solutions
APM ‘Product’
Plants – Supply Chain
Is the Cloud Relevant to Manufacturing? Driving Productivity in Manufacturing

- We see Cloud Computing as a disruptive technology for manufacturers
- Offers creativity & differentiation for our customers
  - New support & value-added services models
- Step change in simplicity & cost of ownership for software assets
- Enable new business models for every aspect of your value stream
  - Machine Builders
  - Manufacturers
  - Supply Chain
- Simplified integration with other Enterprise Systems (ERP, EAM, SCM...)

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Why(Not) Cloud Computing?

**CIO Technologies**

<table>
<thead>
<tr>
<th>Ranking</th>
<th>2011</th>
<th>2010</th>
<th>2009</th>
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<tr>
<td>Cloud Computing</td>
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<tr>
<td>Virtualization</td>
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<td>1</td>
<td>3</td>
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<tr>
<td>Mobile Technologies</td>
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<td>6</td>
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<tr>
<td>IT Management</td>
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<tr>
<td>Networking, voice and data communications</td>
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<td>4</td>
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<td>7</td>
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<tr>
<td>Enterprise Applications</td>
<td>7</td>
<td>11</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Collaboration technologies</td>
<td>8</td>
<td>10</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>9</td>
<td>14</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Web 2.0</td>
<td>10</td>
<td>3</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

**Q: Rate the benefits commonly ascribed to the “cloud”/on-demand model**

1. Easy-fast to deploy: 63.9%
2. Pay only what you use: 61.5%
3. Less in-house IT staff, costs: 57.0%
4. Low monthly payments: 53.3%
5. Offers the latest functionality: 50.0%
6. Encourages more standard IT: 46.3%
7. Sharing systems/information simpler: 43.4%
8. It’s the way of the future: 29.1%

**Q: Rate the challenges/issues ascribed to the “cloud”/on-demand model**

1. Security: 74.6%
2. Performance: 63.1%
3. Availability: 63.1%
4. Hard to integrate with in-house IT: 61.1%
5. Not enough ability to customize: 55.8%
6. Worried on-demand will cost more: 50.4%
7. Bringing back in-house may be difficult: 50.0%
8. Regulatory requirements prohibit cloud: 49.2%
9. Not enough major suppliers yet: 44.3%
Cloud Value Prop for Manufacturing

- Scalability with no overhead – scale SIMPLY from 1 to 1,000’s of assets/users
- Better cash flow management - no upfront cash investment in IT hardware or software (CapEx to OpEx)
- Bring the domain experts (in a central location) to a much broader set of assets in distributed geographies
- Multi-tenant – OEMs, customers, supply chain can access appropriate content
- Enable new services & content-based business models based on actual, real time & historical access to the equipment, process and product data
  - More creative solution terms for OEMs – a solution lifecycle consistent with their role in supporting the equipment
- RA manages ALL system upgrades & enhancements
  - NO SW updates, no next revs, no new OS, no new patches
- RA accountable for the Solution, Security & Reliability (1 butt to kick)
- Rockwell can offer additional support & value-added capabilities
Initial Solution - Asset Performance Mgmt

Moving from traditional software deployment to Software as a Service

Remote Monitoring & Support
- Drive & System Alarms & Faults
- Event/Notification Mgmt
- Predictive & Preventive Maint

Asset Performance Management
- Performance Mgmt
- Equipment & Process
- Behavior & Optimization

Security
- Object Model
- Data Storage
- Event Detection
- Alerts & Notification
- Workflow
- Portal

Dashboards & Reports

RA Cloud Platform

Variety of Form Factors
- (wired/wireless/cell/sat/...)

Cloud Gateway
- Secure, smart efficient transfer of device data to the RA Cloud Platform

Logix CoPro, PC, Cisco, Din-Rail, Embedded

Site 1

Site 2

Site n

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Secure, Managed Access for All Stakeholders

RA Cloud Platform

Cloud Gateway
- Secure
- Scalable
- Modular Device Drivers
- Store-n-Forward
- Platform Agnostic

Rockwell Automation

Machine Bldr A
Machine Bldr B
Machine Bldr B

Supplier 1
Supplier 2

Corporate Headquarters

Customers

Distribution

Prod/Proc Designer

Utilities
OEM for oil field equipment produces trucks for frack campaigns (10 trucks per week, ramp up to 500/year, 3 - 5000 trucks in total)

- Each truck runs for 2000 hours before an engine rebuild
- Each truck consumes a variety of filters every x hours
- Need visibility into consumables on equipment in the field
- Need to drive a maintenance strategy based on actual utilization
- Have no IT infrastructure
- Not in the business of developing or maintaining software and related infrastructure
M.G. Bryan – System Requirements

A differentiated, highly flexible system that can grow with us & answer questions we don’t know to ask

- Security
- Scalability
- Multi-tenant
- Multi-platform
- Historical Access
- Global Vision
M.G. Bryan – Rockwell Solution

VantagePoint

Core Services
Application Services
Presentation Services
JSON Web Service
Extensions
Federated Security
Services

Engine, Transmission
And Process Data

Cloud Gateway
Ruggedized Windows
MicroLogix 1400
Sierra 3G Wireless
GX400 Radio

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RA Solution – Asset Performance Mgmt

- Fleet performance screen: search by truck type, name, location…
- Detail screens: match the HMIs on the control system on the truck
- Order screen: Auto-populates required parts & generates order email for the customer
- Support most mobile devices

At YE16, more than 50% of Global 1000 companies will have stored customer-sensitive data in the public cloud”

Gartner 2011
MGB – Purpose-Built Dashboards

Instant snapshot of all MGB Trucks’ Asset Performance
### Order Summary

**P.O. Number:** 555  
**Other Services:** Other service

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
<th>Unit Price</th>
<th>Quantity</th>
<th>Extended Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Oil Filter</td>
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<td>Engine Air Cleaners</td>
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<tr>
<td>Transmission Filter</td>
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<td>Pump Lube Filter</td>
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<td>Hydraulic Fan Drive Filter</td>
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<td>Coolant Filter</td>
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</tbody>
</table>

**Total:** $992.20
Leverage Ad Hoc Analytics Clients

- Trend, XY Plotter
- Excel
- Reports
APM Benefits & Value to MG Bryan

Anticipated & Achieved

- High-value, differentiated solution for MGB and their customers
- Real time visibility of truck, fracking KPI’s, & location
- Supply usage-based consumables to trucks
- Create accountability for truck maintenance
  - Ensure maintenance is done
  - Avoid over/under PM’ing
- Zero Infrastructure to maintain – scales from 1 truck to 4000 trucks
- Same solution for new trucks and for truck retrofits

Not Anticipated but Achieved

- Significant warranty savings
- New terms/warranties with key suppliers
- Remote troubleshooting
- Empowering a larger set of ‘knowledge workers with real time & historical data
  - Equipment: performance, quality, maintenance
  - Process: efficiencies
- Enabling potential new business models
- Enable the potential for RA to help improve systems & processes
Thank you!