DIGITAL ENTERPRISE TRANSFORMATION

USING THE OPEN INDUSTRIAL INTEROPERABILITY ECOSYSTEM (OIIE)

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JUNE 3, 2019

2019 NIST CONFERENCE
PROBLEM – ENTERPRISE DATA IS COMPLEX
STAKEHOLDERS CAN’T EASILY ACCESS, FIND DATA
THE CHALLENGES FACED BY CORPORATIONS ARE....
IS THIS THE NEW NORMAL?

Many corporate systems are repetitive, redundant and siloed
• The intellectual capacity of workers is wasted, growth opportunities lost

Companies must reduce costs, while improving delivery and quality
• Benefits must enable next generation flexibility, but also scale

The need to change is “blinking red”, i.e. critical now
• Digital customers are driving the need to move faster

Growth and agility for business is an ongoing requirement
• Change is constant and accelerating
COMPANIES WANT TO IMPROVE... MOVING FROM *

<table>
<thead>
<tr>
<th>‘OLD’</th>
<th>‘NEW’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proprietary</td>
<td>Open Architecture</td>
</tr>
<tr>
<td>Manual Processes</td>
<td>Continuous Monitoring</td>
</tr>
<tr>
<td>Scheduled Maintenance</td>
<td>Prescriptive Maintenance</td>
</tr>
<tr>
<td>Human “Databases”</td>
<td>Intelligent Advisors</td>
</tr>
<tr>
<td>Limited Visibility</td>
<td>Advanced Sensors</td>
</tr>
<tr>
<td>Calculations</td>
<td>Simulations</td>
</tr>
</tbody>
</table>

* = Defined this change in the OIIE (Industrie4.0)
WHAT IF I TOLD YOU...
THE ART OF THE POSSIBLE ALREADY EXISTS?

IT’S A NON-PROPRIETARY APPROACH USING INDUSTRY STANDARDS TO INTEGRATE DATA AND BUSINESS PROCESSES TOGETHER...

USING THE MIMOSA OIIIE OGI PILOT FOR INTEROPERABILITY...
THE INDUSTRIAL INTERNET OF THINGS (IIOT)
BASIC COMPONENTS

(Open**) Enterprise-Wide Data Foundation

** = want to choose systems of record with option for open integration
REQUIREMENTS FOR THE OPEN INDUSTRIAL INTEROPERABILITY ECOSYSTEM (OIIE)

* = defined/aligned with Industrie4.0
** = want to choose systems of record with option for open integration

OIIE Specification
- OIIE OGI PILOT via

OIIE Ecosystem (OIIE)*:
(Open Industrial Interoperability Ecosystem)
- Standard Industry Use Cases:
  - Standard Scenarios and Event Definitions
  - Technology Specifications (SOAP, REST, ...)
- Standard APIs
- Standard Information Model
- Standard Ecosystem Administration

OIIE OGI Pilot:
- Cloned OIIE instance with O&G specific asset classes
- Standard process unit (fractionating tower)

Supported Standards:
- ISO 18101,15926, 14224,18435, 55000
- ISA 95 / 88
- MIMOSA CCOM
- OPENO&M ISBM
- MESA B2MML
- USPI CFIHOS
- POSC/Caesar ILAP
- CII (Constructn. Industry Inst.) / Fiatech
- Energistics PRODML/WITSML
- OPC/UA, API
- CIEAM

(Open*) Enterprise-Wide Data Foundation

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TRANSFORMING THE O&G INDUSTRY USING THE OIIE
A PRAGMATIC SOLUTION FOR INDUSTRIAL DIGITALIZATION

Custom Integration

- Custom development
- Specific data adapters
- Owner/operator responsible for sustainment
- High Development and Sustainment Costs
- Inflexible and Fragile
- No practical basis for industry transformation

Open Industrial Digital Ecosystem

- Defined by supplier-neutral standards
- Lower switching costs, reduces supplier lock-in and large supplier control
- Enables innovation from SMEs
- Configuration rather than development
- Suppliers build and maintain standard adaptors with commercial support model
- Higher quality with lower costs and risks
- Adaptable and Evolutionary
- Practical Basis for industry transformation

Open Industrial Digital Ecosystem (OIIE)
ISO 18101

Industry Standard Digital Ecosystem:
- Supplier Neutral – Open Source and COTS
- Standard shared set of standards
- Standard use case architecture
- Standard use cases, scenarios & events
- Standard APIs and services definitions
- Standard information payloads
- Standard adaptors
- Standard reference data - ISDDs
- Standard ecosystem administration
- Standard piloting testbed

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THE OIIE INTEGRATES KEY DISCIPLINES TO ALIGN INFORMATION TO CREATE ‘ONE VERSION OF THE TRUTH’ FOR OPERATIONS

THE OIIE FEATURES:
- Supplier-neutral systems & networks
- Collections of components
- Connectivity with digital business Ecosystems

THE OIIE INCLUDES:
- Industry 4.0 Workflows
- Uses Purdue Enterprise Reference Architecture (PERA)
- Includes Software and RDL Configuration Management
- Includes Digital Twin, Supply Chain Mgt, IIOT and Cloud
- Network-centric vs. hub-centric

ENGINEERING, PROCUREMENT AND CONSTRUCTION (EPC) COMPANIES

ORIGINAL EQUIPMENT MANUFACTURERS (OEMs)

PLANT/FACILITY OWNER / OPERATORS

Cloud to Cloud and Network to Network Interoperability
THE OIIE ENABLES DIGITAL ASSET LIFECYCLE MANAGEMENT

Completion, Commission and Startup

Continuous Improvement Feedback Loops

Operate & Maintain (O&M)

End of Life

Product Design
Product MFG
Process Engineer Simulate
Engineer Design
Procure
Construct

Device/Equip Manufacturing
Capital Project Platform & Data Integration
Handover
Owner/Operator Work Execution Systems

Component / Data / System of Systems / Analytics / Platforms Integration

Derived from ISO TC 184 - Manufacturing Asset Management Integration Task Force Final Report
Use Cases

- Define Scope using Scenarios plus Actors, Triggers and Workflow
- Events plus Configuration and Reference Data links.
- Individual Messages

Scenarios

- User Stories
  - High-level
  - Pictographic

Events

- Specific Data Content
- Required data processing
- Expected Response Event
- Implemented by CCOM BODS and possibly others

User Stories
OIIE STANDARD USE CASE LIST
DERIVED FROM OPENO&M STANDARD USE CASE LIST – CIRCA 2007

**Bold face identifies scope of the current OIIE OGI Pilot phase**

- OIIE Use Case 1 – Information Handover from EPC to O/O
- OIIE Use Case 2 – Engineering Updates
- OIIE Use Case 3 – Field Changes to Plant/Facility Engineering
- OIIE Use Case 4 – Online Product Data Library Management
- **OIIE Use Case 5 – Asset Installation/Removal Updates**
- OIIE Use Case 6 – Preventive Maintenance Triggering
- **OIIE Use Case 7 – Condition-Based Maintenance Triggering**
- OIIE Use Case 8 – Early Warning Notifications
- OIIE Use Case 9 – Incident Management/Accountability
- OIIE Use Case 10 – Information Provisioning of O&M Systems
- OIIE Use Case 11 – Enterprise Reference Data Library Management
- **OIIE Use Case 12 – RFI and RFI Response for Models Meeting Requirements (Greenfield & Brownfield)**
- OIIE Use Case 13 – Lockout-Tagout
- **OIIE Use Case 14 – Condition-Based Maintenance Data Acquisition**
- OIIE Use Case 15 – Capital Project Asset Installation
THE CHALLENGE...
INDUSTRY LEADERS HAVE 2 PATHS; THEY CAN...

CHANGE...
...adjust, respond, adapt, modify, tweak, increase, decrease, modulate, capitulatate, PROOFS ON CONCEPTS

TRANSFORM
...reimagine, predict, evolve, grow, innovate,, transcend, conquer, disrupt, AUTOMATION AT SCALE

Just to compete

To Win!

ESTIMATED VALUE IMPACT:

$1-10 Million benefits

$50-200 Million benefits
BY TRANSFORMING KEY INDUSTRIES, WE CAN ...

CHANGE...
...adjust, respond, adapt, modify, tweak, increase, decrease, modulate, capitulate, PROOFS ON CONCEPTS

TRANSFORM
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ESTIMATED VALUE IMPACT:

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DRIVE B$$ IN PROCESS SAVINGS...
ENTERPRISE STAKEHOLDERS WANT VISIBILITY AND MEASURABLE PROOF OF BUSINESS VALUE

Isolated, Siloed = LIMITED VALUE

Interoperability = INCREASING VALUE
OVERALL APPROACH: IMPLEMENT THE OIIE FRAMEWORK, RUN THE PROOF OF CONCEPT, SCALE / RUN FOR THE ENTERPRISE

DISCOVER
The opportunity
✓ Fit and Need
✓ High order numbers

PROVE
The concept
✓ See it in action
✓ Outline the future

ENGAGE
The leaders
✓ Quantify opportunity
✓ Paint holistic future
✓ Align leader goals

MOBILIZE
A focused team
✓ Focus with A players
✓ Provide clear direction
✓ Build early success

SCALE/RUN
To achieve the goals
✓ Create virtuous loop
✓ Build on success
✓ Plan for big picture
✓ Operate for value realization

Success is evaluated at each key stage with Change and Journey management

COMMUNICATE AND EDUCATE STAKEHOLDERS
LEVERAGE ENTERPRISE PLATFORM INVESTMENTS TO REDUCE COMPLEXITY AND IMPROVE EFFICIENCY

SUPPORT SMART MANUFACTURING AND CRITICAL INFRASTRUCTURE WITH STANDARDS BASED INTEROPERABILITY

Sensor Models
Device Models
Enterprise Risk & Financial Models
ERP Process Models
System Models
Industrial Process Models
Supply Chain / Logistics Integration

Access to Networked Ecosystems

Enterprise Business Systems

MOM Processes-Joint Collaboration
OpenO&M, IEC, ISO, NIST

OAGi Focus
Analytics / Decision Support
Trusted Systems
IIOT Sensors

MIMOSA Focus

LEVERAGE ENTERPRISE PLATFORM INVESTMENTS TO REDUCE COMPLEXITY AND IMPROVE EFFICIENCY
CHALLENGE YOUR CORPORATION...

- Join MIMOSA, learn more about using standards to enable interoperability
- Track the OIIE / OGI Pilot
- Transform your company for next-generation success!

BE THE CHANGE AGENT FOR YOUR COMPANY...