Building the Lean Extended Enterprise through Adaptive Supply Chain Networks

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• Agenda
  • A&D Lean transformation issues
  • Supplier issues
  • Supply chain network management issues
  • An IT architecture for supply network integration and management---illustrative example
  • SAP Netweaver application platform
  • A&D Netweaver application example- Bombardier
  • Summary
• A&D Lean Transformation Issues
  
  • Low level of supplier network Lean Transformation (15%) severely limits overall industry from gains seen at Rockwell, Boeing IDS and Lockheed.(1)

  • Under appreciation of role of enterprise IT systems as enabler of institutionalizing, stabilizing & sustaining gains from process improvements (1)

Evolution of Business Solutions

Portal Infrastructure
- User-centric collaboration
- Unification of underlying sources for seamless navigation
- Device independent presentation technology

Web Application Server
- Web services provision
- Open standards-based connectivity through native Web technology
- Platform independent infrastructure

Exchange Infrastructure
- Process-centric collaboration
- Common business process semantics for seamless integration
- Application-independent business process collaboration

Courtesy of SAP America
Two extremes in major IS implementations

Integrated vs. Best of Breed

**Integrated**
Ferrari Dealership

2004 Ferrari Roadster
- 385hp Engine
- Tiptronic Transmission
- Multi Link Transaxle
- Motronic Fuel Injection
- Ferrari Designed Pirelli Tires
  *(all components specifically designed to Ferrari specifications)*

**Best of Breed**
Big Al’s Auto Nirvana

2004 Best of Breed Ferrari Roadster
- Corvette 5.0 Liter Engine
- BMW M3 Transmission
- Porsche Transaxle
- Maserati Fuel Injection System
- Mercedes Designed Michelin Tires
Program Costs are committed early in Life Cycle

Source: Andersen Consulting
• **A&D Industry Supplier Issues**
  
  • Limited financial and skilled human resources to react to and respond to multiple customer requests for quotations and to address scope of contract requirements (particularly flow down requirements).
  
  • Varied contract requirements from different business areas and programs of same company and frequently same business area.
  
  • Limited access to Research & Development funding from government or other customers.
  
  • Non-uniform methods of access to prime contractor or higher tier customer technical and manufacturing data.
• **A&D Supplier Network Management Issues**
  
  • Limited number of lean functional assets, for orientation, training and surveillance.
  
  • Lower tier (level 3 & 4) suppliers frequently provide critical items to both higher level & primes, exposing program critical path to supplier quality, schedule & performance.
  
  • Greater international involvement in major US platform programs (JSF, etc) require 24/7 supplier management.
  
  • Lack of real time integration, interoperable enterprise IT systems substantially increases risk of critical shortages.
  
  • Lack of real time process information flow unacceptable in environment requiring real time/near real time threat response products and systems.
The Lean Transformation

Lean Manufacturing

Lean Enterprise

Lean Extended Enterprise

Lean Adaptive Enterprise

Continuous Improvement

Technology Advancements

- Adaptive Manufacturing
- MRP2
- ERP, PLM, CRM, SRM
- SCM
- NetWeaver, Adaptive SCM

Plant

Sales/Purch/Eng

Partners

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• **Salient Lean Entities of Lean Transformation**
  
  • Lean transformation characteristics: those process attributes that summarize the focus, priorities, and mind set for the Lean Transformation Journey.
  
  • Lean transformation capabilities: those functional attributes that summarize the scope, agility and output of the journey along the transformation path.
  
  • Lean transformation actions: those management attributes and actions which result in an industry leading position by institutionalizing Lean Principles & Practices.
  
  • Lean transformation enablers: those integrated attributes which sustain and promote the company’s Lean initiatives.
The principles remain the same… but extended

Wright Flyer

FALCON 2000
The Lean Transformation - Characteristics

Lean Manufacturing
Operational Focus
Kaizan Events
Single Process Value Stream
MRP2
Manufacturing KPI's

Lean Enterprise
Integrated Operations Focus
Six Sigma Events
Multi Process Value Stream Analysis
ERP
Enterprise KPI's

Lean Extended Enterprise
Supply Chain Interoperability
Lean Network Events
Integrated Value Stream Analysis
Coordinated ERP Interfaces
Network KPI's

Lean Adaptive Enterprise
Real Time Decision Focus
Decision Modelling and Simulation
Adaptive Supply Chain
Decision System Metrics and KPI's

Technology Advancements
Adaptive Manufacturing
MRP2
ERP, PLM,
CRM, SRM
SCM
NetWeaver,
Adaptive SCM

Continuous Improvement

Sales/Purch/Eng

Plant

Partners
The Lean Transformation - Capabilities

Lean Manufacturing
- Repetitive Product High Quality
- Manufacturing Cost Optimized
- Rapid Response for "Standard" Products
- Recognized Industry Reputation

Lean Enterprise
- Engineer-to-order Product Quality
- Engineered product value optimized
- Rapid response for new products

Lean Extended Enterprise
- Network Products High Quality
- Network Products/Service Value Optimized
- Predictable Response to New Orders
- Broad Range of Products and Service
- Consistent and Repeatable Order Performance

Lean Adaptive Enterprise
- High Quality Alternate Sources
- Broad Range of Products and Service
- Highly Agile and Efficient Network Management
- Product Offerings Value Optimized Rapid and Predictable Response to New Orders

Technology Advancements
- Adaptive Manufacturing: MRP2
- ERP, PLM, CRM, SRM
- SCM
- NetWeaver, Adaptive SCM

Continuous Improvement

Sales/Purch/Eng

Plant

Partners

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The Lean Transformation - Actions

Lean Adaptive Enterprise
- Coordinate Collaborative Adaptive Vision and Objectives
- Require Network Lean Assessment (Internal/External)
- Establish Network Lean Requirements Capability
- Select Primary and Alternate Network Entities
- Implement Collaborative Adaptive System Architecture and Systems

Lean Extended Enterprise
- Collaborative Strategic Vision and Objectives
- Conduct/Lead Unbiased Collaborative Assessment (Internal/External)
- Perform Network Gap Analysis
- Select Network Constituency
- Conduct Collaborative Education and Training
- Prioritize Lean Actions
- Implement Collaborative IT Systems Architecture

Lean Enterprise
- Formulate Strategic Vision and Objectives
- Conduct Unbiased Assessment (Internal/External)
- Perform Gap Analysis
- Conduct Lean Education/Training
- Prioritize Lean Actions
- Implement ERP System Backbone

Lean Manufacturing
- Develop Operations Vision and Objectives
- Conduct Unbiased Assessment (Internal/External)
- Perform Gap Analysis
- Conduct Lean Education/Training
- Prioritize Lean Actions
- Embed Lean in Manufacturing Systems

Adaptive Manufacturing
- MRP2

ERP, PLM, CRM, SRM

SCM

NetWeaver, Adaptive SCM
The Lean Transformation - Enablers

- Lean Adaptive Enterprise
  - Validated Lean Network Entity
  - Network Node IT Proficiency
  - Agile and Qualified Network Entities
  - Broad Capacity Range of Network Entities (Flexible Outsourcing)
  - Collaborative and Adaptive IT Architecture and Systems

- Lean Extended Enterprise
  - Lean Qualified and Validated
  - Network Staffs
  - Network Node Interface Value Stream Analysis
  - Collaborative IT System Architecture and Systems

- Lean Enterprise
  - Lean Educated and Trained Staff
  - Enterprise Processes Value Stream Analyses
  - Kaizen and Six Sigma Mindset
  - IT System Architecture and Systems

- Lean Manufacturing
  - Lean Educated and Trained Staff
  - (Green and Black Belts)
  - Process Value Stream Analyses
  - Kaizen Mindset
  - IT Technology Framework and Systems

- Technology Advancements
  - Adaptive Manufacturing
  - MRP2
  - ERP, PLM, CRM, SRM
  - SCM
  - NetWeaver, Adaptive SCM

- Continuous Improvement
- Partners
- Sales/Purch/Eng
- Plant

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• Integrated business layer, ERP, factory & supply chain
  • Engineering & Manufacturing must be able to detect a change in part performance &/or availability & promulgate a response throughout the supply chain—must have visibility into every engineering & manufacturing process.
  • IT users have multiple systems & information needs to be reconciled among them for real time decision making—a la “dashboard type” displays.
  • Suppliers, particularly tier 3 & 4 must have consistent product interfaces to avoid multiple systems support & minimize transaction errors.
• Integrated business layer (continued)....
  • Current solution from SAP includes the Netweaver integration platform which provides the ability to connect applications & leverage standards such as XML & web server. The core of Netweaver is SAP Xi (exchange infrastructure) which contains the standard mapping to data between the automation layer (MES) & ERP layer.

• Key layer: automation layer—Lighthouse, among others.

• Key standards: B:95, B2MML, XML.
The principles remain the same… but extended
SAP NetWeaver™
Turning the Enterprise Services Architecture Vision Into Reality

- The open integration and application platform for TCO reduction
  - Integrate people, information and processes...
  - Enterprise-scale Java and ABAP application platform
  - .NET and WebSphere interoperability and extensibility

SAP NetWeaver™

PEOPLE INTEGRATION
- Multi channel access
- Portal Collaboration

INFORMATION INTEGRATION
- Bus. Intelligence Knowledge Mgmt
- Master Data Mgmt

PROCESS INTEGRATION
- Integration Broker Business Process Mgmt

APPLICATION PLATFORM
- J2EE ABAP
- DB and OS Abstraction
SAP NetWeaver™
Access through any device

- SAP Mobile Infrastructure
  - Enables mobile apps to run disconnected or connected
  - Built for handheld devices (Pocket PC, EPOC, Linux…)
  - Browser or native front-end
  - Multiple-backend connectivity.
  - Various mobile business applications available
• SAP Enterprise Portal
  • Platform independence
  • Any source/audience, role-based
  • Team collaboration (both real-time & asynchronous)
  • Authoring, Versioning, Indexing, Searching, … for unstructured information
  • 1700 installations
**SAP NetWeaver™**

**A Way to Meet Business Intelligence Needs**

**SAP Business Intelligence**

- End-to-end solution for enterprise-wide BI
- Business content for rapid deployment
- Fully integrated with portal
- Open architecture (Crystal, Ascential)
- 6410 installations
- 95% extract non-SAP data
SAP NetWeaver™
Unique Master Data Management Capabilities

- SAP Master Data Mgmt
  - Information integrity across the business network
  - Services and support to consolidate content, harmonize and centrally manage master data, e.g. product data, customer data
  - MDM supports an incremental approach to a cohesive Master Data Management
SAP NetWeaver™
High Performance and Flexibility in Business Process Integration

• SAP Exchange Infrastructure
  • For both internal and external process integration (with SAP and non-SAP)
  • Prepackaged collaboration knowledge
  • Ecosystem of non-SAP collaboration content

PEOPLE INTEGRATION
- Multi channel access
- Portal
- Collaboration

INFORMATION INTEGRATION
- Bus. Intelligence
- Knowledge Mgmt
- Master Data Mgmt

PROCESS INTEGRATION
- Integration
- Broker
- Business
- Process Mgmt

APPLICATION PLATFORM
- J2EE
- ABAP
- DB and OS Abstraction
SAP NetWeaver™
Protecting Investments and Enterprise-Scale Java

- **SAP Web Application Server**
  - J2EE compliant Java and ABAP side by side
  - Zero footprint UI (Browser)
  - Model-driven UI, patterns
  - Highly scalable and reliable, advanced caching
  - OS and DB independent
  - Native Web services
  - 1500+ installations

**SAP NetWeaver™**

**PEOPLE INTEGRATION**
- Multi channel access
- Portal
  - Collaboration

**INFORMATION INTEGRATION**
- Bus. Intelligence
- Knowledge Mgmt
- Master Data Mgmt

**PROCESS INTEGRATION**
- Integration Broker
- Business Process Mgmt

**APPLICATION PLATFORM**
- J2EE
- ABAP
- DB and OS Abstraction
## SAP’s Business Technology Platform Map

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Web Browser</th>
<th>Java</th>
<th>MS Windows</th>
<th>Mobile Devices</th>
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<tbody>
<tr>
<td>Communication</td>
<td>Web Services (UDDI / HTTP / XML / SOAP)</td>
<td>.Net</td>
<td>J2EE</td>
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<tr>
<td>Operating System</td>
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<tr>
<td>Architecture/ System</td>
<td></td>
<td></td>
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<td>Database</td>
<td>IBM DB2 UDB for UNIX &amp; Windows OS/390 and z/OS iSeries</td>
<td>Informix</td>
<td>Microsoft SQL-Server</td>
<td>Oracle</td>
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<tr>
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<td>Linux</td>
<td>Compaq Tru64 Unix</td>
<td>IBM AIX</td>
<td>HP UX</td>
</tr>
<tr>
<td>Architecture/ System</td>
<td>Intel / zSeries</td>
<td>Alpha</td>
<td>pSeries</td>
<td>PA</td>
</tr>
</tbody>
</table>
Bombardier Aerospace

- A&D Netweaver Platform Example-Bombardier Aerospace
  - 11.4B sales of CRJ700 & CRJ800 regional jet aircraft & related equipment; 24,000 employees
  - Strategic Focus—Supplier management process
    - Order placement & management
    - Order status & corrective action
    - Quality Performance
    - All electronic
    - Real time decisions
Bombardier Aerospace

- **Supplier management Infrastructure based on Portals**
  
  - Signify corporate commitment to leverage & focus information technology investment
  
  - Enhance collaboration with external portals
  
  - Access decision support information
Bombardier Aerospace

- Bombardier approach to building electronic supplier management functionality
  - Pilot vendor portal—as proposed supplier management infrastructure
  - Netweaver as integration platform; implemented in three and one half months from design to use by suppliers—all electronic
  - PO’s approved electronically on back-end systems, held in electronic PDF format in Documentum archive, accessible to all users
  - BAPI and SAP web application server (SAP AS) connect the systems that underpin procurement, acknowledgement, shipping & auditing
• Summary

• IT technology innovative architectures & emerging data capture standards provides the basis for fully integrated, adaptable supply chain infrastructures, scalable to companies of all sizes.

• Currently, SAP’s Enterprise Services Architecture, which includes Netweaver as the key application platform provides a robust solution to supply chain data integration problems.

• Serious supplier issues such as the wide range & variation in flow down requirements, non-uniform order entry, status, quality & corrective action procedures & templates exist; AIA Supplier Management Council pushing hard to achieve improved level of standardization.

• Progress is being made but serious gaps still exist on what the industry can achieve via Lean transformation vs. current status