16.660 / 16.853 / ESD.62J Introduction to Lean Six Sigma Methods
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Lean Supply Chain Basics
“Only 7% of companies today are effectively managing their supply chain. However, these companies are 73% more profitable than other manufacturers.”

Deloitte & Touche Study, October 2003
Learning Objectives

At the end of the module, you will be able to:

• Recognize the importance of suppliers in the enterprise

• Describe key attributes of a lean supply chain
  1. Alignment of supply chain design with product characteristics
  2. Supplier participation in material flow and logistics
  3. Supplier involvement in design and development
  4. Seamless information flow

• Discuss methods for the improvement of existing supply chains
Suppliers Are Critical In The Value Chain

Value Specified

Customer

Value Delivered

Product Development

Production

Value Created

Prodicable Design Meeting Value Expectations

Early Involvement

Suppliers as Partners

Supplier Network

Typically, 60-80% of Value Added by Suppliers
What Does a Supply Chain Look Like?

As you move down the supply chain, each successive tier represents a smaller percentage of the Prime’s main business base than the previous tiers.
Communications across the supply chain is like tossing orders over a brick wall!
Lean Supply Chain Exercise

1. Gather your team around easel paper or a chart.
2. Discuss each concept on the list below.
3. On your chart, write a prioritized list of concepts that would best create a lean supply chain.

- Collaboration
- Efficient supply chain with little flexibility
- Limited communication
- Localized focus on continuous improvement
- Responsive and agile
- Based on product characteristics
- Enterprise approach
- Long lead times
- One supply chain for all products
- Supplier commitment to long term relationship
- Internal corporate focus
- Build to order
- Visibility of demand
- Continuous improvement activities that include suppliers & customers
Key Attributes of a Lean Supply Chain

1. Alignment of supply chain design with product characteristics
2. Supplier participation in material flow and logistics
3. Supplier involvement in design and development
4. Seamless information flow
“Push” supply chain is focused on efficiency for meeting predictable demand at lowest cost.

- Typically for long product lifecycle and mature or commodity items

“Pull” supply chain is focused on responsiveness for unpredictable demand to avoid inventory & stock outs.

- Typically for shorter product life cycle, custom items

The reality is that a given product may have components of both the efficient and responsive supply chain designs. This approach has been labeled the Hybrid Supply Chain.
Different supply chain designs require different practices

- **Just-in-time deliveries**
  Eliminates inventory - but parts *must* show up on time!

- **Kitting for point-of-use**
  Eliminates unpacking, looking for parts - requires supplier involvement in production system design

- **Vendor-Managed Inventory**
  Vendor owns it, keeps track of it, until it is used

- **Third Party Logistics**
  Have FedEx handle these?
### Atlas V Launcher Supplier Kitting and Direct Delivery

<table>
<thead>
<tr>
<th>Category</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory Carrying Cost</td>
<td>$35,000 per ship-set</td>
</tr>
<tr>
<td>Internal Handling Cost</td>
<td>$12,000 per ship-set</td>
</tr>
<tr>
<td>Cycle-Time</td>
<td>20 weeks to 14 weeks</td>
</tr>
</tbody>
</table>

Source: Lockheed Martin Missiles and Space Systems

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3 - Supplier Involvement in Design and Development

- JDAM
- Tail Kit
- Container
- Launch Lugs
- Wire Harness Cover
- Strakes
- Mk-84 Warhead

Courtesy of Boeing. Used with permission.

Early Supplier Integration

SUPPLIER VALUE CREATION
- Major modification to system architecture
  - From “partitioned architecture” to “integrated architecture”
- Reduced Wiring / Connectors
  - Reduced unit cost
  - Improved reliability
- Re-allocated “Work Share”

SUPPLIER INTEGRATION
- Part of proposal team
- Understood project goals - GOAL CONGRUENCY
- Understood requirement for low cost, seamless assembly

PRODUCT VALUE CREATION
- Original cost est. - $68+ K
- Final actual cost - $15 K
- Unit costs reduced > 75%
- Total savings > $2.9 B

Ref: Lean Enterprise Value, pp 138-140, 206-207
4 - Seamless Information Flow
Requires communication on many levels

Customer
- Enterprise Management
  - Program Management
  - Procurement & Contracts
  - Engineering
  - Manufacturing Operations

Supplier
- Enterprise Management
  - Program Management
  - Procurement & Contracts
  - Engineering
  - Manufacturing Operations

Integrated Information Technology Environment

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EXOSTAR Facilitates Supply Chain Management Streamlining

At Rolls-Royce the eProcurement implementation has produced a number of quantitative and qualitative benefits, including:

• Rationalizing the direct supplier base from more than 5,000 to several hundred
• Reduction in cost of goods of up to 20%;
• Reduction in inventory value levels as much as 80%;
• Reduction in errors due to the elimination of manual re-keying of buying data;
• Reduced cycle time, in some cases by up to 80%;
• Near-elimination of paper and fax processes.
• Improved relations with suppliers, who have benefited from reduced transaction costs and improved efficiency.
Improving Supply Chains

**Prime Contractor Owns The Vision**

- Education & Orientation
  - Critical Path
  - Cost
  - Quality
  - Cycle Time
  - Delivery
  - Compelling Interests
  - Building the Relationship
  - Understanding Context
  - Commitment to Go Forward

**Lean Strategy & Deployment Plan**
- Enterprise-Level Analysis
- Product-Level Analysis
- Basis for Improvement Plans
- Common Objectives
- Common Metrics
- Plans of Action
- Timelines

**Lean Engagements**
- Improvement Workshops
- Additional Training

**Work Outstanding Issues**

**Lean Academy**

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Example: Hicksville Machine Works Corp.

- Supplier worked with prime to implement lean
- Prime (Boeing) provided expertise and training for 5S, Statistical Process Control, and Set-up Time Reduction
- Savings shared, plus many additional benefits:

  “... a good example of what good team work between a vendor and sincere Boeing personnel, ... can do. ... my Company is much more competitive than ever before. Following are some of parts we were able to reduce the unit prices on:

<table>
<thead>
<tr>
<th>P/N</th>
<th>Previous Unit Price</th>
<th>New Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>17P2A5224-1NC</td>
<td>$1815.00</td>
<td>$751.68</td>
</tr>
<tr>
<td>17P2A5821-1</td>
<td>$1992.00</td>
<td>$639.33</td>
</tr>
<tr>
<td>17P2A5829-1NC</td>
<td>$2531.72</td>
<td>$1024.00</td>
</tr>
</tbody>
</table>

These types of savings will apply to all parts we manufacture.”

-Jack Spezio, President

Courtesy of Boeing. Used with permission.
Supply Base Stratification
- Five Levels

- Strategic Alliance
  - Certified
    - Gold, Silver, Bronze, Probation
  - Strategically Important
- Core
  - High Performing, Standard, Potential, Legacy
- Disengaged

Courtesy of Boeing. Used with permission.
Future State in Lean Relationships

“Old” Approach
Rigid vertical interfaces and control

Customer

Prime

Subcontractor

“Current” Lean
Collaborative with rigid organizational interfaces

Customer

Prime

Subcontractor

“Emerging” Lean
Virtual Team without boundaries enabling continuous innovation

Customer

Prime

Subcontractor

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Lean Supply Chain Wrap Up

- Suppliers are critical to lean enterprise success
- Supply chains need to be understood and designed to meet the needs of the product enterprise needs
- Legacy supply chains can be improved through win-win customer-supplier teamwork.

Supply Chain Management is a lean enterprise core competency
Exercise

• What aspects of a Lean Supply Chain can you implement today to improve your enterprise’s performance?

• Spend the remaining time capturing these on an easel chart for your team’s use.
Reading List


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