Innovative Supply Chain Practices: What Leading Aerospace and Industrials Are Implementing

4th Annual NASA Supply Chain Quality Assurance Conference

Deloitte Consulting LLP

October 20, 2010

“No I can’t be bothered to learn from my suppliers, — we’re busy trying to beat our competition!”
# Five Leading Practices

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Multi-tier supply chain or Value Grid management is an emerging practice

Transactional Purchasing: Early 80s to late 90s
Center-led Commodity Team: Late 90s
Multi-tier Supply Chain Management: Late 2000s

Emphasis
Low price and transaction efficiency
Total landed cost and supply base rationalization
Value Stream Management by leveraging supply chain capacity, capabilities, and network spend to manage critical materials

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Value Grid Management Has Multi-dimensional Opportunities for Collaboration and Improvement

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<th>Value Grid</th>
<th>Opportunities</th>
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### Managing the Horizontal
- Minimizing demand variation/schedule churn to increase network capacity and OTD performance
- Provide financing/tolling opportunities for weaker tier 1s

### Managing the Vertical
- Adjust spend across the tier to free capacity and improve mix
- Manage Outside Service Providers for each tier for cycle time improvements
- Share test equipment and tooling

### Managing the Diagonal
- Leverage raw materials across the grid
- Use of underutilized assets from adjacent players/create emergency response options

### Managing the Bottlenecks
- Buy capacity options/employ hedging strategies
- Deploy Joint Process Improvement Teams/Shop assist
Going one level down in the supply chain isn’t sufficient; problems often originate deep in the extended supply chain

- Metal mining
- Metal forming
- Casting

- Metal forming / cutting
- Metal distribution
- Machining

- Cutting
- Milling

- Machining
- Inspection

- In-house special processing / testing
- Assembly / kitting

- Receive and inspect
- Final assembly and test

**Tier 3 / 4: Raw Materials / Casting**

- Machine shops spot buy from service centers – susceptible to volatile / unpredictable pricing and lead times
- Supply shortages of specialty metals (titanium, nickel, aerospace aluminum) and fasteners are major lead time contributors

**Tier 2: Special Processors**

- Ultra-precision machining
- Heat treatment
- Anodizing, Plating, Painting, Chem Film
- NDT / X-ray

**Tier 2: Sub-tier / 3rd-party Suppliers**

- No formal corrective action process for arbitrating conflicts (e.g. quality, delivery, configuration changes) between supply chain partners
- Machine shops constrained by certified 3rd-party sources – captive customers of special processors

**Tier 2: Hardware / Details**

- Fasteners (screws, nuts, bolts, rivets, nut plates)
- Specialty metal components

**OEM can leverage its size and gain its fair share of capacity and mind-share with large sub-tier suppliers, share forecasts and business plans, and create a special processing supplier pod for quick response processing**
Five Leading Practices

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Tier 1 ecosystem partners capabilities will need to evolve or they will become Tier 2/3 suppliers

Primary Focus of Commodities

- Consolidate number of suppliers
- Pool volume across sites
- Redistribute volume among suppliers
- Combine volume from different categories
- Compare “total” costs
- Model “should-costs”
- Renegotiate prices
- Unbundle pricing
- Expand geographic supply base
- Develop new suppliers
- Profit from global supply / demand imbalances

Primary Focus of Tier 1s and Major Subcontractors

- Conduct product value analysis and engineering
- Standardize parts and Substitute materials
- Optimize life cycle costs
- Reengineer joint processes
- Share productivity gains
- Integrate logistics
- Support supplier operations improvement
- Vendor Managed Inventory
- Examine strategic make versus buy
- Lead integrated Product Engineering & Development teams as a key member of the OEM’s system of systems team
- Develop Product Lifecycle Aftermarket Services for both own products and those of 3rd party alliance partners
- Reinforce robust Commercial Management practices such as value based pricing and risk sharing
- Develop & deploy Collaborative Infrastructures to facilitate virtual project working across geographies, customers and supply partners
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The Supply Chain Leverage Index incorporates systems engineering, design and supply chain capabilities early in a staged-gate review.

Example of the SCLI framework applied to a Program

- **System (Program Level)**
- **Module (IPTs)**
- **Sub-systems**
- **Building blocks**

**Color Code**
- Blue—Off-the-shelf Building Block: Building block that can be re-used without modification from superior supplier.
- Green—Program Family Building Block: Building block that has been modified (e.g., morphed or scaled) from an off-the-shelf building block using common supplier.
- Yellow—Adapted Building Block: Design incorporating relaxed specification with new supplier to improve cost/schedule/quality performance or new design using demonstrated technology with existing core supplier to improve features or capabilities.
- Orange—Watch Building Block: Building Block that has been used before but for which there are significant open issues with the supplier (delivery or quality performance).
- Red—New Design Building Block: Building block that requires significant Engineering or Supply Chain effort to support new design or qualify supplier.
As a program manager which of these designs will keep you up at night?

Gate #1

- Serial Electronic Unit (SEU)
  - Servo CCA’s
  - Power Supply
  - Chassis
  - Video PMC
  - CCA
  - Motherboard
  - Power PC

- Software
  - Display Software
  - PIM Coding

Gate #3

- Serial Electronic Unit (SEU)
  - Servo CCA’s
  - Power Supply
  - Chassis
  - Video PMC
  - CCA
  - Motherboard
  - Power PC

- Software
  - Display Software
  - PIM Coding

Client Example – Defense Electronics

**Turret**

- BAE List
- Laser Pointer
- TFU Motherboard
- MISC Machine Assemblies
- ALSFT
- ELRF
- Imager (IOT ECLAN)
- Gimbal (IOT RTSC)
- Optics (IOT ECLAN)
- CCA’s
- Laser Designator

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**BAE List**

- Ball i2TV (Note-proposed with and without)

**CCIHarnesses**

- CCA’s

**Imager (IOT ECLAN)**

- Detector (IOT RVS)

**Gimbal (IOT RTSC)**

- Afocal (IOT ECLAN)
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R&D is a non-linear network game whose value increases with the number of participants—it is not a simple pipeline.

New England Aerospace Network of 254 companies

Network of New England Inventors

Legend
- Node/Color: Inventor/Org
- Size of Node: Importance of Invention
- Link: Collaboration Tie

Tier 1 | Tier 2 | Tier 3 | OSP | Logistics
--- | --- | --- | --- | ---
15% | 44% | 10% | 29% | 2%

Source: © 2004 HBS associate professor Lee Fleming; United Technologies; Deloitte Analysis
Integrative networks can combine reuse libraries, technology bookshelves and knowledge-based product definitions for fast creation.

Reuse Knowledge Management

- Architectures
- Hardware
- Software
- Tooling
- Data Analysis
- Processes/Practices
- COTS

Technology “Bookshelf” Investment

- Application Ready Models and Tooling
- Pre-Certified Assemblies

OEM | Network Partners

Knowledge-Based Product Definition

High Velocity/LEAN Creation Process

- Conceptual Design
- Generic Configurations
- Final Configuration
- Phase-Gated Process
- Design and Development Process

Network Knowledge/
Lessons Learned

COTS

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Leading Manufacturers are optimizing their footprint and network flexibility

Firms are optimizing their manufacturing and logistics footprint....

As Is Supply Chain

CASTdpm / LogicTools

To be Supply Chain

..... While enhancing their flexibility

Currency Hedge
Low Cost Labor
Low Cost Supply Chain/Sourcing
Capacity and Planned Redundancy
Cycle Time/lead Time Reduction