Service Supply Chain Customer Value Delivery: Optimization, Performance Incentives & Implementation

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Agenda

1. Strategic Impact of Service Support
2. Resource Management in the Service Supply Chain
3. Incentives, Contracting and Performance Based Logistics (PBL)
4. MCA’s Planning Support System – Lessons Learned from Implementation
What is common in these examples?

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco Systems</td>
<td>Routers</td>
<td>NASDAQ</td>
</tr>
<tr>
<td>KLA-Tencor</td>
<td>Semiconductor Equipment</td>
<td>Intel</td>
</tr>
<tr>
<td>Boeing</td>
<td>Aircraft Systems</td>
<td>Department of the Navy</td>
</tr>
</tbody>
</table>
Value generation from the product is key

- Product is used to deliver significant value to customers.
  - Loss of availability of product is very EXPENSIVE
    - e.g., cost of line down for Intel > $100,000/hour

- Customers define value differently in each case
  - KLA: value = wafer start throughput
  - Cisco: value = connectivity
  - Boeing Defense: value = winning the war

- Value varies with customer and with time
  - e.g., plane down during a training exercise vs plane down during a war

So, what are the implications -- for product manufacturers, distributors, retailers and service providers?
Implications

- Viewing product as a source of value generation, rather than as property to be acquired by customers, presents an incredible competitive opportunity
  - In fact, product ownership may not even be necessary for value generation
  - Convert products to services ("SERVICIZATION")
  - Deliver product PERFORMANCE

- Sell Solutions (repairs, upgrades, reconditioning, maintenance, technical support, consulting, training) whose demand is driven by product use

- Competing by selling products is tough
  - Demand growth is slow
  - Competition is increasing
  - Margins are lower
Recent Benchmarking Data

- Service Revenue 26%
- Profit from Services 46%
- Market Share (installed base): 40% / 70% (Services/Parts)
- Inventory Turns 6.75*
- Customer Service (First Time Fill Rate) 82.8%

(2005 Deloitte)

Questions:
- ✓ Non material cash flows included in turnover?
- ✓ Inventory depreciation, write-off and costing assumptions
- ✓ Service Metric -- Part Fill rate vs. Up-time of Installed Base
- ✓ Variation in performance (daily, time average, confidence interval)
- ✓ Segmentation leads to differentiated service and resource rationing
- ✓ Actual performance vs. promised?

* In a Wharton study of about 10 years ago we observed turnovers of 1.0 - 3.5 for service parts. In a 2007 US defense service study MCA observed a turnover of 0.5
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How to implement an effective service strategy

1. Select portfolio of products to be supported
2. Deliver service products for maximum profit
3. Understand and adjust business model
4. Design organization & incentives to support service strategy
5. Design service supply chain and optimize resource management decisions
6. Continuous benchmarking and monitoring

Service Supply Network Management Challenges

- **Conflicting Objectives**: Position resources throughout multi-echelon, multi-indenture network to meet Availability targets, satisfy budget constraints, reduce customer cost of ownership and increase supplier profit.

- **Dynamic and Uncertain Environment**: Intermittent demand that is difficult to forecast, changing projected weapon system usage, evolving reliability, engineering changes and product re-design.

- **Structural Change**: Shifting ownership of assets and planning responsibility.
Planning Must Incorporate Multiple Hierarchies

- Product
- Major Module (e.g. FRU/LRU)
- Sub-Module (e.g. SRU, SSRU)
- Piece Part

- Central Warehouse
- Local Warehouse
- Field Engineer/Repair Loc.
- Customer

Optimize

SERVICE PERFORMANCE

With Minimum Asset Investment & Operating Costs While respecting Budget Constraints

- Supplier Lead Time
- Repair, Replenish, Ship Lead Times
- Next Day Customer Response
- “x-hour’ Critical Response

- Budget Planning
- Long Term Forecast
- Inventory Positioning
- Event/Order Management

SPO
The forecasting methods found in traditional planning systems are inappropriate for most service parts.

~80% of parts with demand have average monthly demand of <=2

~70% of parts with demand have average monthly demand of <=1
PT5  

Changed animation  
Philippe Thys, 2005-9-28
As inventory holding and distribution costs $\to 0$, it is optimal to stock infinite variety:

1) it is optimal to stock infinite variety
2) demand for outliers is revealed
   e.g. records, music, books

(48% of Amazon’s revenue is from tail)
Service Parts are Different

- Shortage costs are high for service parts → response time must be low
- Holding costs are high due to modularity & complexity
- Reliability is high and demand is erratic and difficult to forecast

1) stock a subset of parts at forward locations
2) stock backup inventory at central locations
2) restrict investment to meet budget constraint
3) select / position resources to maximize product uptime
Risk Based Planning Hierarchy

STRATEGIC
- Network Design
- Budgeting
- Set Readiness Targets
- Position inventory
- Service Support, PBL Contracts

TACTICAL
- Redeploy Existing Inventory
- Allocate Scarce Resources
- New Buy & Repair Orders
- Piece Part Replenishment

EVENT
- Global search and sourcing of resources
- Automated detection, diagnosis, repair.
- Rationing, prioritization

Multi-Period Planning
Budget Constraints
Readiness Targets
Respect Business Rules and PBL Contracts
Service Support as a Real Option

Pre-Event Decisions

Budget Planning
Product design
Pricing
Outsourcing

Strategic Deployment Of Assets
Inventory investment
Technical staff
Repair capacity

Service Asset Re-Deployment
Inventory investment
Technical staff
Repair capacity

Environmental Events
Installed base changes
NPI/EOL
Regulatory changes
Structural opportunities

Supply Chain Events
Material Movements
Supplier Commitments
Customer Requirements

Pre-emptive Repair, Replace

Service Events
Product Failures,
Maintenance Events
Upgrades

Post-Event Decisions

Service Demand Fulfillment
Demand Transfer,
Fulfill Delay,
Substitution,Rationing
Incentives

Performance Assessment

Provider Profit

Customer Value

Customer Consequences
Product restore time
Opportunity costs

Provider Consequences
Provider costs & revenue
Expected vs Risk Value of Availability

\[ P\{\text{Avail} > \alpha \} > x \]

Examples
- peacetime vs. war time surge
- new product launch
- new customers and contracts
- response to competitor push
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Commercial antecedents to PBL over the last 20 years:
- GE, Rolls Royce jet engines
- Honeywell, Rockwell Collins avionics
- Lucas Aerospace landing gear
- Garrett auxiliary power units.

“The essence of PBL is buying performance outcomes, not the individual parts and repair actions ... Instead of buying set levels of spares, repairs, tools, and data, the new focus is on buying a predetermined level of availability to meet the [buyer’s] objectives.”
Defense Acquisition Guidebook Section 5.3

“”DoD 5000.1, the Defense Acquisition System, requires program managers to develop and implement PBL strategies that optimize total system availability while minimizing cost ... The preferred PBL contracting approach is the use of long-term contracts with incentives tied to performance.”
The Undersecretary of Defense, August 16, 2004
F-35 Joint Strike Fighter (JSF) project
Incentive problem in a typical PBL supply chain

Customer (DoD)

Prime

CONTRACTS

Supplier 1
Avionic system

Supplier 2
Engine

Supplier 3
Weapons

Supplier 4
Mechanical

Supplier 5
Landing gear
Elements of Incentive Contracting

- Decentralized decision making:
  - Suppliers invest into spare parts inventories, repair capacities, product reliability and optimize their supply chains to maximize their profits.
  - The Prime wishes to induce desired actions from suppliers using contracts and wishes to achieve certain product availability for the Customer.

- Outcome with respect to both total supply chain cost and up-time performance is uncertain:
  - Suppliers may act opportunistically and get away with little effort.
  - Contracting parties are averse to risk.
## Incentive Contracting in Defense Procurement: Fixed Price vs. Cost Plus vs. PBL contracts

<table>
<thead>
<tr>
<th>Contract Type</th>
<th>Maximum Risk on Suppliers</th>
<th>Greatest Incentives to Reduce Costs</th>
<th>No Performance Incentives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Price Contract</td>
<td>Maximum risk</td>
<td>Greatest incentives to reduce costs.</td>
<td>No performance incentives.</td>
</tr>
<tr>
<td>Cost Plus Contract</td>
<td>Reduced risk</td>
<td>Least incentives to reduce costs.</td>
<td>No performance incentives.</td>
</tr>
<tr>
<td>Performance Contract</td>
<td>Maximum risk</td>
<td>Moderate incentives to reduce costs.</td>
<td>High performance incentives.</td>
</tr>
</tbody>
</table>
Insight #1: The optimal contract with suppliers

- Fixed Payment: To allocate profits
- Cost Sharing: To share risks
- PBL: To ensure performance

Insight #2: Contract terms should evolve over time

<table>
<thead>
<tr>
<th></th>
<th>Small performance incentive</th>
<th>Large performance incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited cost sharing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Fixed Price)</td>
<td></td>
<td>Product maturity</td>
</tr>
<tr>
<td>Extensive cost sharing</td>
<td>Product deployment</td>
<td></td>
</tr>
<tr>
<td>(Cost Plus)</td>
<td></td>
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</tr>
</tbody>
</table>

Uncertainty in support cost

Volume of use

Cost-plus contracts

Fixed-price contracts

Timeline

PBL
Insight #3: Does PBL induce reliability improvement?

Supply chain performs best under PBL with supplier asset ownership.
<table>
<thead>
<tr>
<th>Navy Program</th>
<th>Pre-PBL</th>
<th>Post-PBL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F-14 LANTIRN</td>
<td>73%</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>F/A-18</td>
<td>62%</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td>H-60 Avionics</td>
<td>71%</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td>F/A-18 Stores Mgmt System (SMS)</td>
<td>65%</td>
<td>98%</td>
<td></td>
</tr>
<tr>
<td>Tires</td>
<td>70%</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td>APU</td>
<td>65%</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>AEGIS</td>
<td>65%</td>
<td>95%</td>
<td></td>
</tr>
</tbody>
</table>

Material Availability increased an average of 30%-40% through PBL

Aircraft and Equipment Logistics Response Times (LRTs) decreased an average of 70%-80% through PBL
Wharton Empirical Study: Drivers of PBL Contract Success

PBL Structure
- Contract terms (length, incentive)
- Ownership/control structure
- Output targets
- Program scope

Managerial Decisions
- Stocking level at each base/depot
- Repair capacity/capability
- Supply chain structure design
- Specification of contractual terms
- Product re-design

Exogenous Factors
- Product complexity
- Part reliability
- Product cost
- Demand profile

Performance Outcomes
- Availability
- Cost of Ownership
- Reliability
- Response time
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MCA’s Positioning in Service Decision Support

Multi-Period/What-If Network Optimization PBL

How will customer asset management and support services increase sales and profit?

Strategy

How much to invest in service resources?

Where to position those resources?

Tactics

How to utilize current resource deployment to provide maximum value?

How to manage priorities to match supply with demand?

SIO

How long did it take for customer’s mission critical product to be restored to effective use?

What is the up-time of customer equipment?

Long term

Service Strategy

Deploy/Position Resources

Short term

Re-Deploy & Balance Resources

Real-Time

Event Management Execution

Deploy/Position Resources

Re-Deploy & Balance Resources
MCA’s Complete Solution For Managing The Service Supply Chain Supports This Framework

### Network Optimization
- Flexible “What-if” Environment for service business design
- Ability to simulate a wide range of business scenarios
- Common data model across solution modules
- Flexible data interfaces and integration paths

### Composite Forecasting
- Google Maps interface for network modeling/optimization
- Advanced set covering and assignment functionality
- Joint inventory/transportation cost optimization

### Inventory Optimization
- Bottoms-up forecasting designed for a service environment
- Utilizes historical demand, installed base, and causal factors
- Advanced best-fit capability for seasonality and trends

### Tactical Optimization
- Complex Multi-Echelon/Multi-Indenture Modeling
- Fill-Rate and Availability Based Optimization
- Budget and Service Level Constraints

### Business Impact
- Significant reduction in service inventory and supply chain costs with higher service levels
- Network design and planning capabilities aligned with your business requirements
- Ability to define and deliver to differentiated service levels
- Improved planner productivity
Real World Challenges for PBL/SCM

PBL contract negotiations require integrated decision support systems
- Identification and analysis of performance metrics
- Determination of risk allocation across suppliers
- Combining contract terms to balance risk across service life cycle

PBL contract management requires optimal resource planning and intelligent execution control systems
- Resource deployment within budget constraints
- Coordination of supplier asset control
- Tight integration between planning and execution systems
Closing the Gap on PBL Impact

Supplier’s Profitability

Customer’s Cost of Ownership

Prior to MCA | After MCA
---|---
PBL Profit Objectives | PBL Profit Actuals

Prior to MCA | After MCA
---|---
PBL Cost of Ownership Objectives | PBL Cost of Ownership Actuals
Conclusions

- Delivery of services to enable value creation through product use is a source of revenue growth, profit margin, customer satisfaction and competitive advantage.
- Effective delivery of such services requires optimized management of service supply chain resources.
- Current service support management systems often lack the ability to account for incentive effects created by the PBL contracts.
- Our economic models indicate that:
  - The optimal contract will have a mixture of PBL, cost-sharing and fixed payment terms.
  - Over time, the contract will evolve from more cost-sharing to more performance-based.
  - PBL contract stimulates reliability improvement but works best when supplier owns assets.
- There is a lack of empirical evidence on what makes PBL contracts successful, companies generally do not keep adequate data.
- There is an urgent need to apply decision support systems to help with negotiating and executing PBL contracts.
- Implementation of effective service decision support systems is based on the appropriate mix of incentives, optimization models & algorithms, and software systems.

Sources:

mca solutions