Buying Common: Executing Platform Strategies in Supply Chain and Procurement Organizations

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It Ain’t Easy Being Common

- Rail platform
  - Launch product produced alone but at large volume
  - Several additional downstream variants expected

- Strategy: Lock-in 20% price leverage, available on future orders

Expected Contract Volumes

- Result
  - Family buying volume is 2x first variant volume
  - Bulk purchasing benefit was not achieved.
**Commonality Concept**

**Revenue Benefits**
- Deploy new technologies
- Enter Niche Markets
- Reduced Time to Market

**Cost Savings**
- Shared Development Cost
- Common Testing Procedures
- Production Economies of Scale
- Bulk Purchasing
- Reduced Inventory

**Reduced Risk**
- Lower technology risk
- Higher quality production
- Reduced downtime from sparing

**(Robertson 1998)**

**Cost Savings**
(15-50% savings over individual products)
Potential Savings from Platforms

Source: 3DSE and McKinsey Survey
We have worked on over 30 platforms

Honeywell

NASA
Business Jets
Automotive
Rail Equipment
Communication Satellites
Commercial Aircraft
Heavy Equipment
Semiconductor Manufacturing
MIT Commonality Study

- Commonality is a *strategy*, not an outcome
  - Not universally applicable, dependent on execution

- Most product platforms realize less commonality than intended
  - Divergence caused commonality to fall from 80% to 40% on the JSF

- Family variants are offset – they are not built concurrently
  - Uncertainty around future variants, multiple product lifecycles

- Commonality requires up front investment for downstream benefits
  - First variant will cost up to 50% extra
Divergence: Platforms realize less commonality

- **Strategy**: 80-90% parts commonality
- **Cost**: $233B Dev

- **Realized**: 30-40% parts commonality
- **Cost**: $350B Dev (150%)

- Phenomena is widespread across industries
- Most development programs were offset, lead variant tended to skew the platform’s needs
- Has significant consequences for investment return
Internal Criteria for Commonality

Technically Feasible

Financially Beneficial

Strong Commonality Strategies

Organizationally Possible
Financially Beneficial: Price-Volume Curve

Very few procurement organizations actively track price-volume curves!
Knowing Your Suppliers: Exhausting Economies of Scale?

Land of the corporate giants
Economies of scale run out at a certain point. The largest firms in America may be beyond it
The Economist, November 3

• Studies on firms over-estimating the efficiencies in mergers by > 25%!

480 containers (1950)
15,000 containers (2006)

312m tall (1931)
823m tall (2007)
- Fixed cost of land / office space
+ Wind loading = power fcn(height)
+ Construction cost as fcn (height)
Financially Beneficial: Family Perspective

Platform Perspective:
- Reduced Engineering
- Bulk Purchasing
- Spread fixed costs
- Non-Recurring Engineering
- Non-Recurring Supplier
- Platform Management

Variant Perspective:
- Low: Recurring cost too expensive or over-designed
- Medium: Family may lock-in, inability to make new variants
- High: Insufficiently responsive, high performance supply chain

Minimum cost at a variant level is not the right metric
## Organizationally Possible: Supportive Dynamics

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<th>Platform Level</th>
<th>Strategy</th>
<th>Incentives</th>
<th>Decision Making and Control</th>
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<td>Commonality as a Cost Strategy</td>
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<td>Platform Cost Structure</td>
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<td>Dynamic Evolution of Commonality</td>
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<td>Manufacturing</td>
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<td>Distribution</td>
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When platform success hinges on bulk purchasing benefit, purchasing and supply chain must be *stakeholders*, not *supporters*
# Strategies for Commonality

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<td><strong>Technical</strong></td>
<td>Commonality Metrics</td>
<td>Risk valuation analysis</td>
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<td>Tagging intended common</td>
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<td>Supplier Engineering</td>
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<tr>
<td><strong>Financial</strong></td>
<td>Variant Impact Matrix</td>
<td>New part introduction cost</td>
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<td>Investment evaluation</td>
<td>Taxing non-common parts</td>
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<td>Development cost allocation</td>
<td>Transfer pricing</td>
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<td>Variety costs in supply chain</td>
<td>Investment pool for common parts</td>
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<td>Production cost allocation</td>
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<td>Mandatory co-investment</td>
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<td><strong>Organizational</strong></td>
<td>Commonality owners</td>
<td>Variant ordering by volume</td>
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<td>Tiered parts control strategy</td>
<td><strong>Contract strategy</strong></td>
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<td>Participation in design reviews</td>
<td><strong>Contract strategy</strong></td>
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<td>PnL aggregation</td>
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<td>Pooled funding</td>
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Tiered Parts Control Strategy

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<th>Example</th>
<th>Strategy</th>
<th>Control</th>
<th>Authorization</th>
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<tr>
<td>True Commodities</td>
<td>Wiper Motors</td>
<td>Very flat price volume curves</td>
<td>Options</td>
</tr>
<tr>
<td>Configurable Commodities</td>
<td>Steering Wheels</td>
<td>50% of parts are non-differentiating</td>
<td>Building blocks</td>
</tr>
<tr>
<td>Commodity Inputs</td>
<td>Steel Fenders</td>
<td>Differentiation is important</td>
<td>Raw materials, treatments</td>
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Supplier Engineering – What are the Levers?

- Supplier collaboration and co-investment necessary in many platforms
- **Needs to be paired with platform capability of the local supplier structure**

Supplier engineering: Single variant investment, or scope of future parts covered?

**Lifecycle Cost for Lead Variant**

- Common Design Penalty
- Reuse Integration
- Tooling Investment
- Shared Recurring

Scope of non-recurring investment payment?

Agreed purchase volumes, price-volume curves, or options contracts?
Supplier Engineering – Best Practices

**Firm**

Specify range of performance / variants
Supplier collaboration engineers

Shift engineering process into / out of the firm

**Suppliers**

Costs of variety in supply chain?
Delay final contract spec
Bringing the parts together in Everett

From ESD.931 Supply Chain strategy: Evaluation and Improvement. Prof. Mahender Pal Singh. Fall 2009
Three Commonality Strategies

Credit: Anthony Wicht
## Contracting Structure Results (1of2)

<table>
<thead>
<tr>
<th>System Acquisition Strategy</th>
<th>Acquisition Support (from Figure 6)</th>
<th>Effect of Acquisition Structure on Commonality Process</th>
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<tr>
<td><strong>Fully Competitive</strong></td>
<td>Good</td>
<td>Reactive Reuse: Medium: No-guarantee winner of competition will have developed previous variants and have access to existing designs for reuse. Building Block: Poor: If each variant is recompeted, there is no incentive for first contractor to meet the needs of the second contractor. Therefore, no incentive to develop building block. Widespread Forward Commonality: Poor: Lack of incentive to consider other systems or future development because the future development may be won by a competitor.</td>
</tr>
<tr>
<td><strong>Joint Venture</strong></td>
<td>Medium</td>
<td>Reactive Reuse: Good: Assumes JV includes companies with previous expertise; JV can investigate and evaluate reuse opportunities. Building Block: Poor: No major advantage in having a JV develop the building block over a single corporation. Widespread Forward Commonality: Poor: No major advantage in having a JV develop widespread commonality over a single corporation.</td>
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<td><strong>Directed Contractor</strong></td>
<td>Medium</td>
<td>Reactive Reuse: Good: Directed contractor will be selected based on experience developing previous systems; gives expertise to reuse. Building Block: Poor: Difficulty incentivizing contractor to develop for future, because at the time of the first variant the directed contractor had no expectation it would be chosen in future and so behaved as if fully competitive. Widespread Forward Commonality: Poor: Difficulty incentivizing contractor to develop for future, because the directed contractor has no expectation it will be chosen in future.</td>
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Credit: Anthony Wicht
# Contracting Structure Results (2of2)

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<td>Long-term Supplier</td>
<td>Poor</td>
<td>Reactive Reuse: Good; long-term supplier will be selected based on experience building previous systems; gives expertise to reuse. Building Block: Good; same contractor works on all variants of the building block. Therefore, possible to incentivize up-front investment for future payoff. Widespread Forward Commonality: Medium; the contractor is able to invest up-front in future benefits. Commonality across the supplier’s boundaries with other suppliers is still not possible.</td>
</tr>
<tr>
<td>Build-to-Print</td>
<td>Good</td>
<td>Reactive Reuse: Medium; places onus of investigating and evaluating commonality on government. Government (as customer) may not have insight into details of previous engineering decisions. Building Block: Good; government could develop ongoing building block as long as the design is well known at the outset and divergence is minor and well managed. Government is responsible for additional up-front cost and is well placed to trade up-front cost against life-cycle affordability. Widespread Forward Commonality: Poor; structure is not responsive to divergence because the design and manufacturing organizations are separate. Also difficult to set up and manage each time a new commonality opportunity appears.</td>
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<tr>
<td>GFE</td>
<td>Medium</td>
<td>Reactive Reuse: Poor; places onus of investigating and evaluating commonality on GFE contractor that does not have previous expertise (if it does, effectively it is a directed contractor). Building Block: Good; GFE supplier could develop good building block so long as design is well known at time GFE contract is let. Can tolerate more divergence than Build-to-Print because GFE contractor remains responsible for design and can evaluate economic case for divergence. Widespread Forward Commonality: Poor; structure is not adaptable because there is a firm boundary between GFE and non-GFE. Commonality opportunities across this boundary will not be implemented.</td>
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Credit: Anthony Wicht
## Contracting Clauses (1of2)

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<td>Fixed-price contract to encourage reuse. Add incentive fees if life-cycle cost savings from commonality are expected. Improve contractor knowledge of reuse opportunities through a domain-wide knowledge base and strong government intellectual property on previous projects.</td>
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<td>Good government insight into previous designs. Strong government negotiation of IP on previous projects so government has technology to reuse. Good government core engineering skills.</td>
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<tr>
<td>GFE</td>
<td>Cost-plus contracts to encourage identification of commonality opportunities. Add incentive fees if life-cycle cost savings from commonality are expected. Firm requirements across existing and future systems. Need to deal with liability and programmatic responsibility for GFE.</td>
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Credit: Anthony Wicht
Case: Joint Tactical Radio

- JTRS: Software defined radio, enabling savings across the military

Enforcing Layers through Contracts

- Lead Hardware = Boeing, Lead for Waveform = Boeing
- Divergence: Schedule pressure causes coupling: Waveform to Set
  - Different waveforms depending on FPGA or DSP processors
- Learning:
  - Separate waveform vs. set teams would not have been able to create coupling – contractual separation of layers can be beneficial.
  - SCA teams were incentivized to differentiate (awarded work per variant!)
Additional Topics in Platform Supply Chain

- How you calculate the reduction in safety stock due to demand aggregation?
  - Rarely costed in common parts business cases
  - Propagating agreed inventory costs for engineering decision-making

- Commonality part reporting
  - Identical parts with different parts numbers due to use cases
  - Supercession rules for line parts – Identical vs. Form Fit Function
  - Real opportunity to understand the future benefits

- Implications of common parts use in after-market pricing
  - How to value the pricing upside from proliferation?
Conclusion: Balance is Required

What is the key trade-off?

- Economies of scale vs. supplier power (‘eggs in one basket’)
- Costs of variety visibility vs. product control
- Core capability vs. sourcing
- Product innovation vs. standardization

Fine & Whitney, “Is the Make/Buy Decision Process a Core Competence?”