Competitive Advantage through Commonality

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Background

- Complex product offerings, leveraging designs across markets and pricing ranges, have become commonplace

- Complexity cost is indirect, difficult to identify, and sizeable
  - P&G valued unnecessary complexity at $3Billion
  - Motorola valued unnecessary complexity at $2.4Billion direct, $1.4Billion inventory

- Platforming has become an important means of cost-sharing across industrial products:
  - Volkswagen's A platform – VW Jetta, Audi TT, and Seat Toledo
  - Joint Strike Fighter program (variants for the Air Force, Marines, and Navy)
  - Black and Decker's electric hand tools

Platforming ROI?

2012 MQB Platform

<u>Platform Strategy</u>
Scalable vehicle base
Fixed design reference
Modular engine design

<u>Common Elements:</u>
Engine layout
Drive architecture
Information systems
Suspension setup

<u>Differentiation</u>
Brands
Markets
Styling
Option codes
Etc.

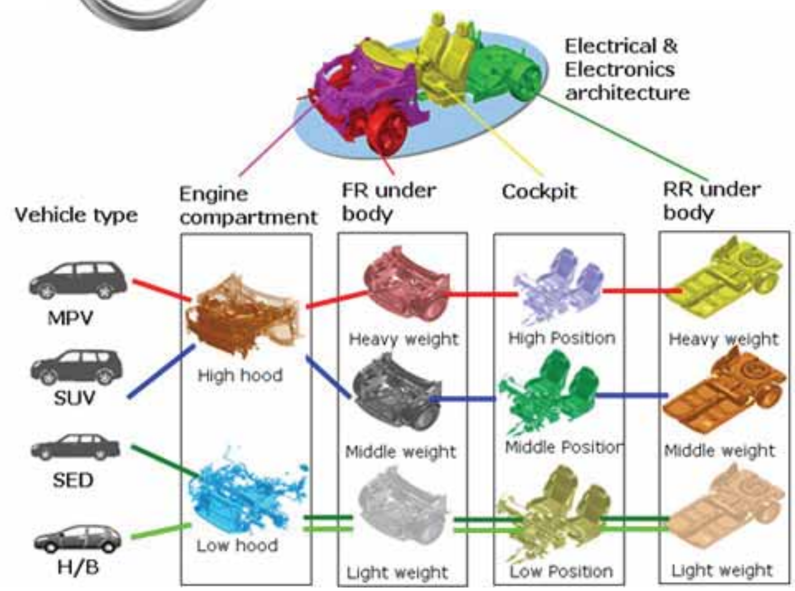
50% reduction in time to market
30% cost savings over previous platforms
Deploy engine technology and information platforms

Competitive Advantage

2012 MQB Platform

Leaked Feb 1 2012, Der Spiegel Feb 21 2012

Common Module Family (CMF)



Nissan Global Feb 27 2012

Very different system architectures
VW has many more brands under management
Time-to-market creates strong advantages

Commonality Benefits

Commonality: Sharing components or processes across products (Robertson 1998)

- Enter Markets
- Cost Savings
- Reduced Risk

Revenue Benefits

- Deploy new technologies
- Enter Niche Markets
- Reduced Time to Market

Risk Benefits

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

Cost Savings (15-50% savings over individual products)

- Shared Development Cost
- Common Testing Procedures
- Production Economies of Scale
- Amortized Fixed Costs
- Reduced Inventory

We have worked on over 30 platforms

NASA

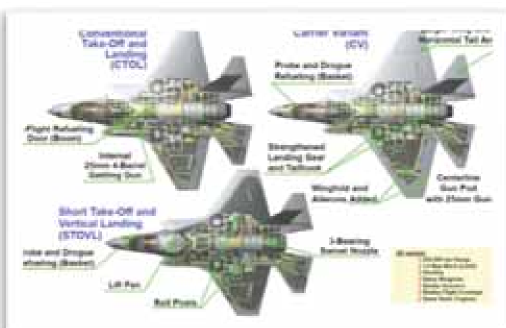
Business Jets

Honeywell

Automotive

Rail Equipment

Communication Satellites



Commercial Aircraft

Heavy Equipment

Semiconductor Manufacturing

LOCKHEED MARTIN

Market Variables

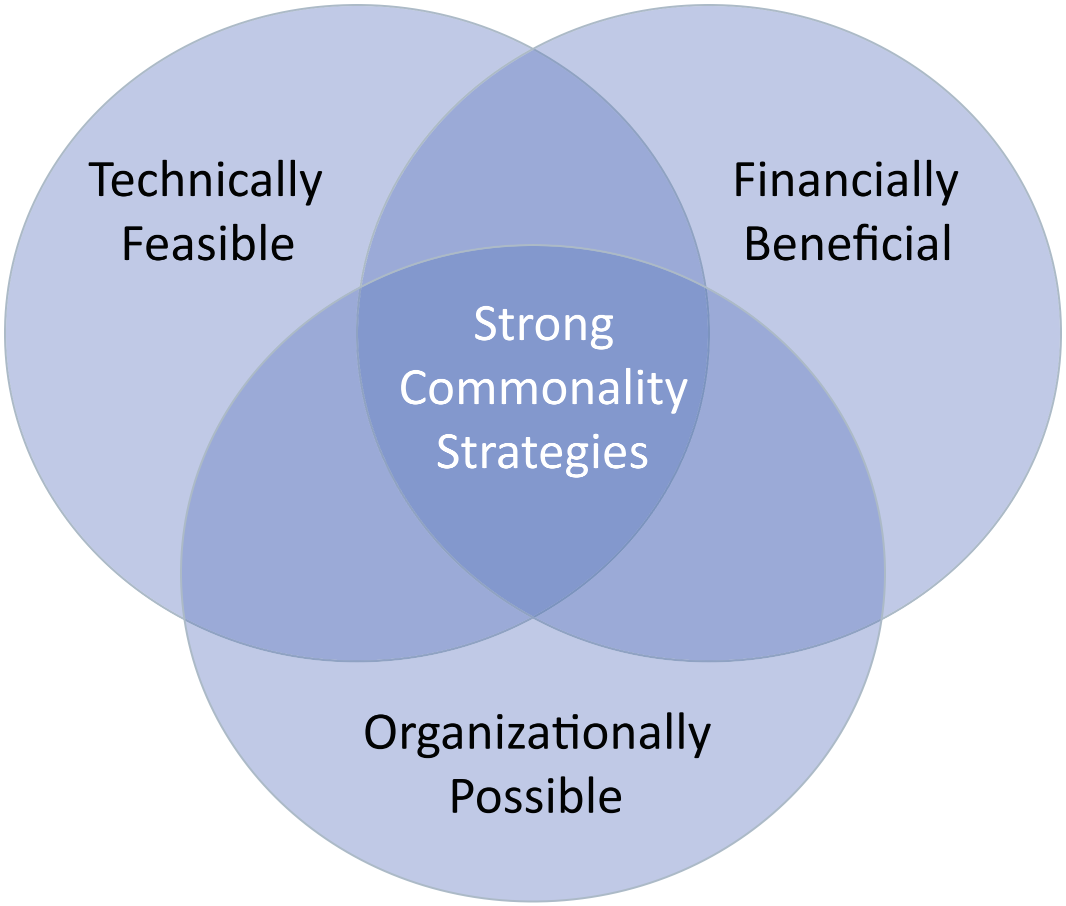
Stable - Rail	**Stability of Architecture**	Changing – High Tech
Plan for Commonality		Difficulty Planning

Low - Mining	**Competition**	High - Automotive
Difficulty Justifying		Higher Rewards

Customized - Rail	**Customer Preferences**	Stock – White Goods
Challenging		Easier Forecast

Low – Heavy Industry	**Vertical Coordination**	High - Automotive
Missing Visibility		

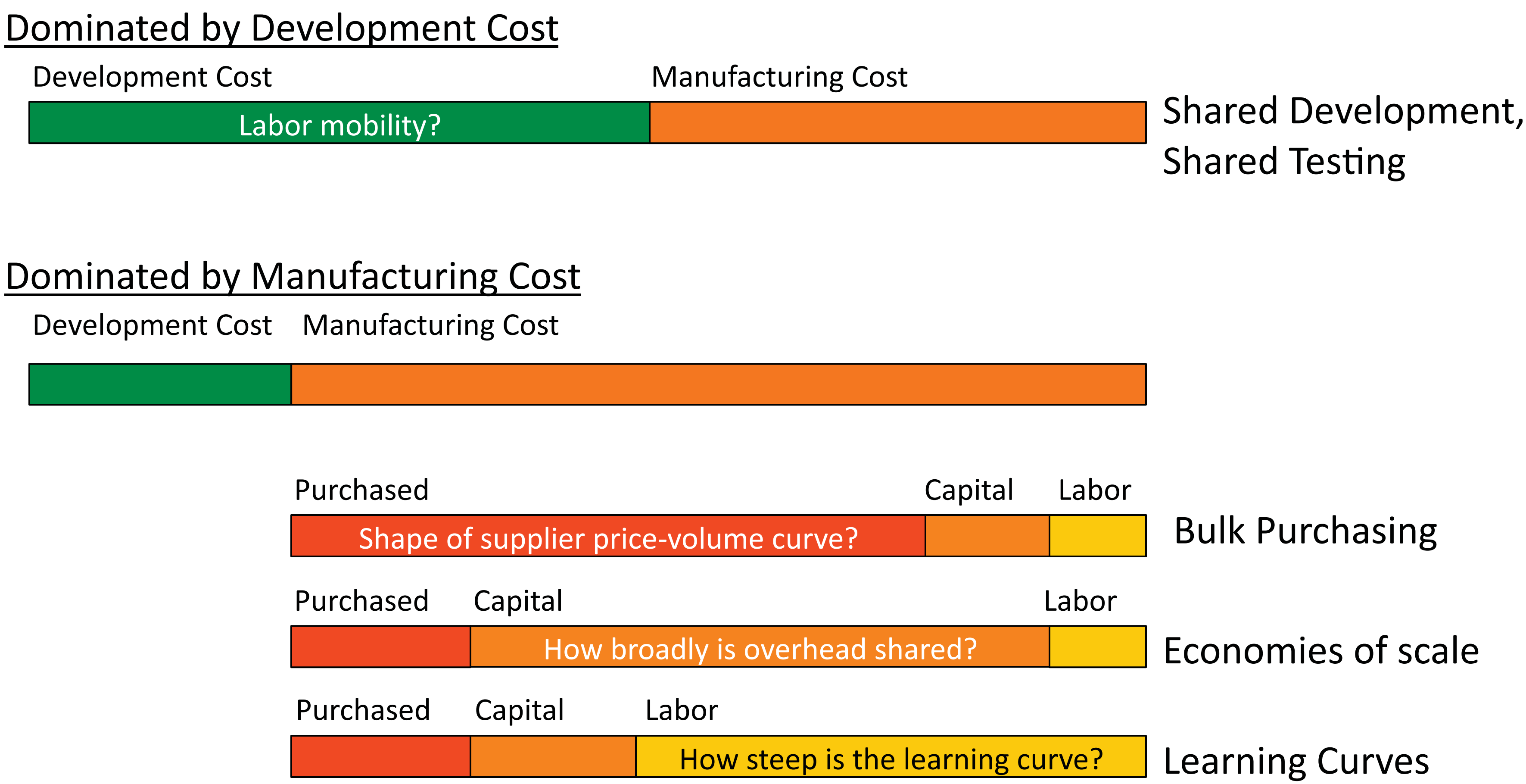
Internal Criteria for Commonality



Management *Capabilities* for Commonality

	Capability
Technical	Choose a design strategy Define the variants Enable over-functionality and performance compromises
Financial	***Forecast commonality savings*** ***Protect commonality premiums*** Cost new variants
Organizational	Exclude segments in the market Multi-product management Realize savings across departments

Which benefit is the largest?



Commonality Investments

Commonality Premium = Additional cost today, enabling other variants, above unique design cost

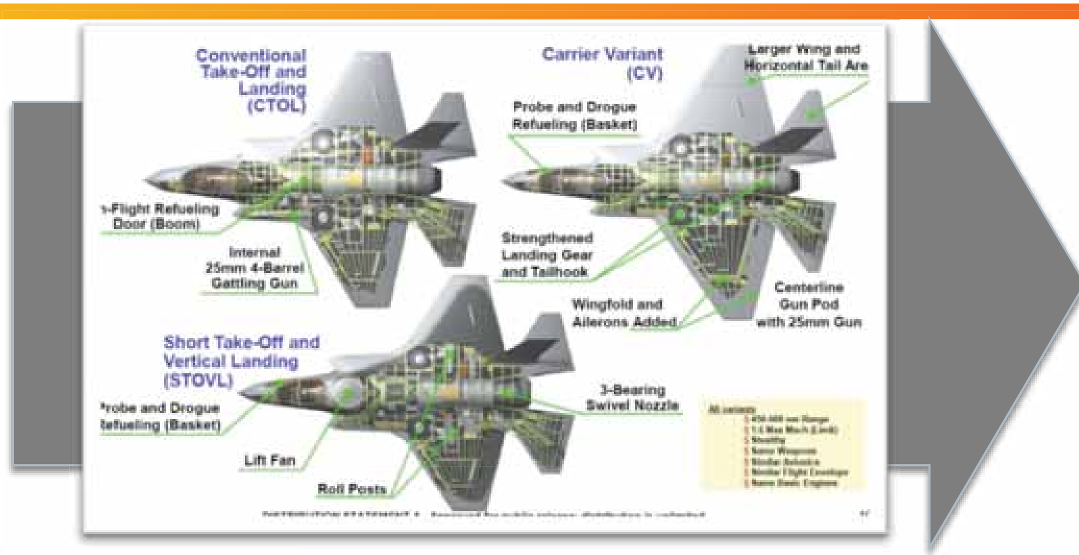
Platform	Premium	Max. Subsystem Premium	Variants
Heavy Equipment	25-50% ($1-2M)	50%	4 (6-12% / variant)
Rail Equipment	29% ($X.6M)	100% (Software)	1-25 (?)
Vehicle Manufacturer	12% ($10M)	200% (Electrical)	4 (3% / variant)

- Premiums are large
  - Organization has to be able to “take” this premium
- Creating stable, multi-product investment funding is a competence.

Divergence: Platforms realize less commonality

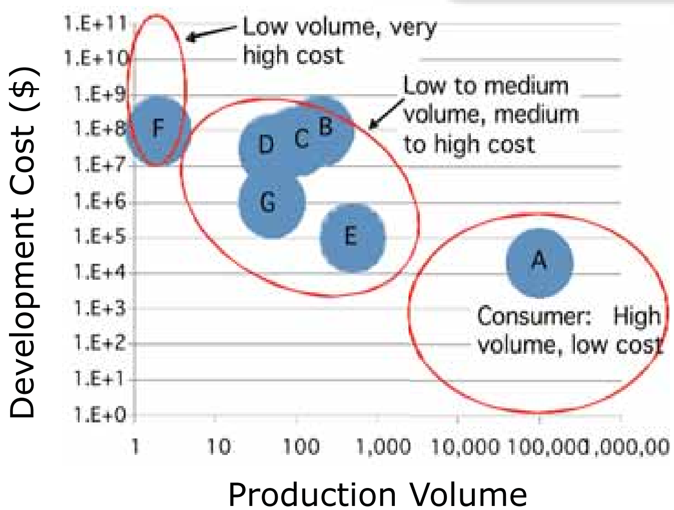
Strategy
80-90% parts commonality

Cost
$233B Dev



Realized
30-40% parts commonality

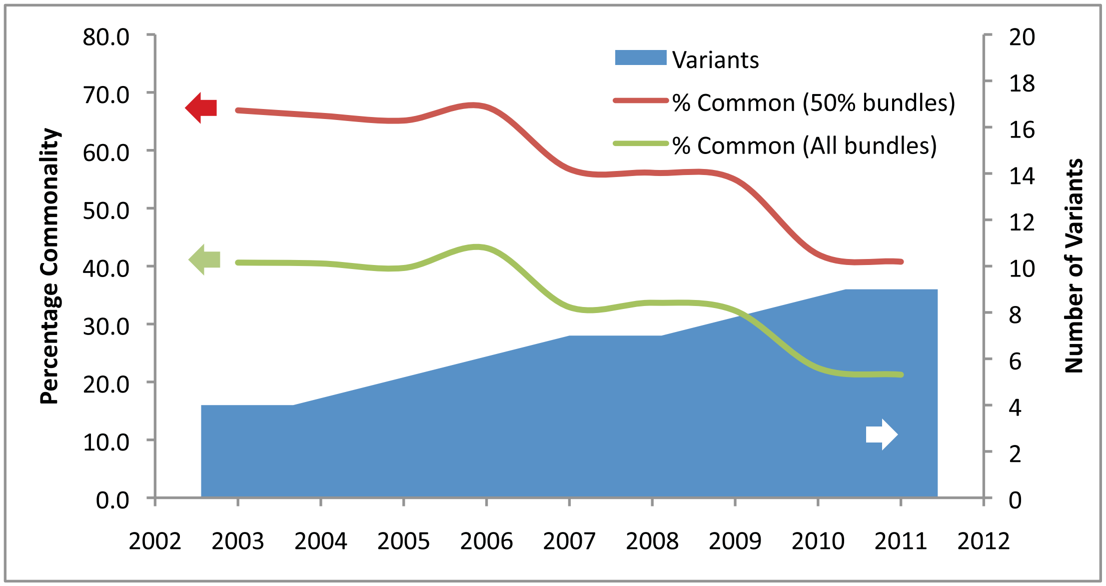
Cost
$350B Dev
(150%)



- 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

Divergence Occurs, Has Costs

Example: Heavy Equipment Platform



Total Impact:
2-5% of margin

- Divergence caused by variant addition
- Growth in purchased parts:
  - Materials cost grows by 2% (but compose ~80% of product cost)
  - Inventory cost grows by $2.7M

Shared Development Cost

Shared Tooling Cost

Economies of Scale

Bulk Purchasing

Learning Curves in Manufacturing

Lower Quality Expense

Reduced Raw and WIP Inventory

Legend

Direct Impact

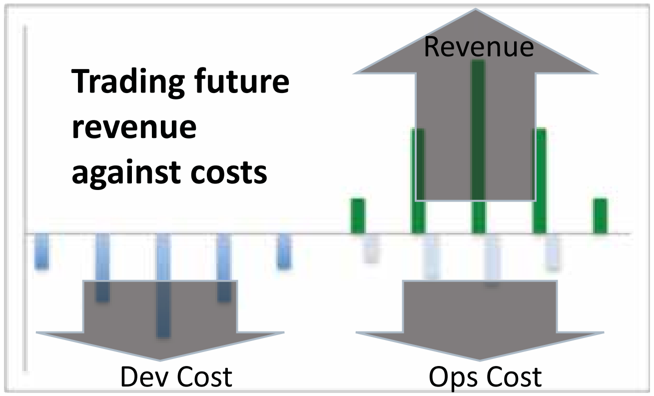
Indirect Impact

No Impact

Why does Divergence happen?

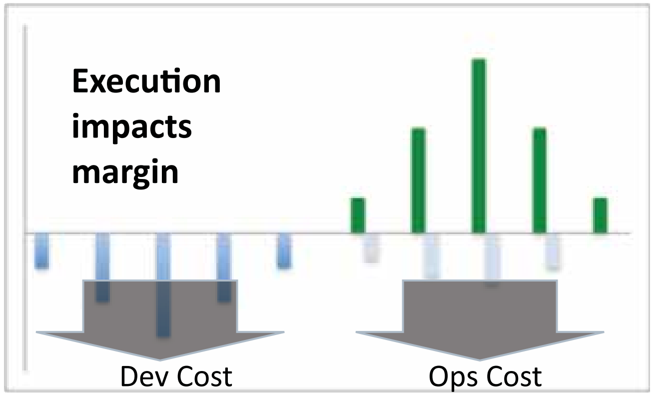
Acceptable Reasons

- Market changed
- Technology progressed
- Learning during development



Unacceptable Reasons

- Failure to invest & define
- Variant sub-optimization
- Failure to see lifecycle benefit
- Intentional pursuit of uniqueness



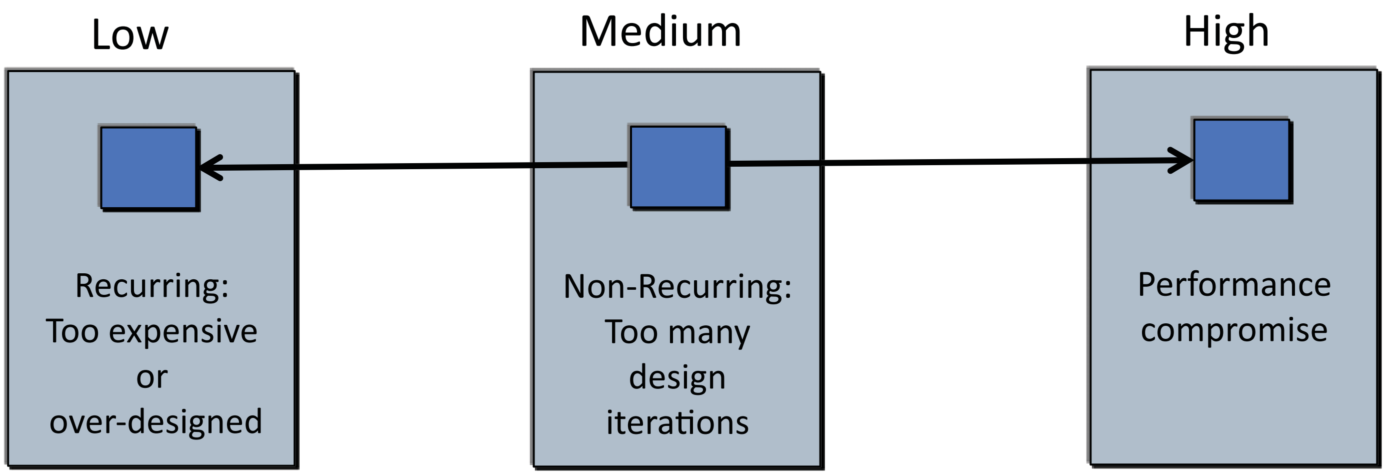
Variant Sub-Optimization

Platform Perspective

Reduced Engineering | Bulk Purchasing | Spread fixed costs

Non-Recurring Engineering | Non-Recurring Supplier | Platform Management

Variant Perspective



Management Levers?

Low	Medium	High
Financial transfers among variants	R&D Cost Allocation	Designation of platform authority

Strategies for Commonality

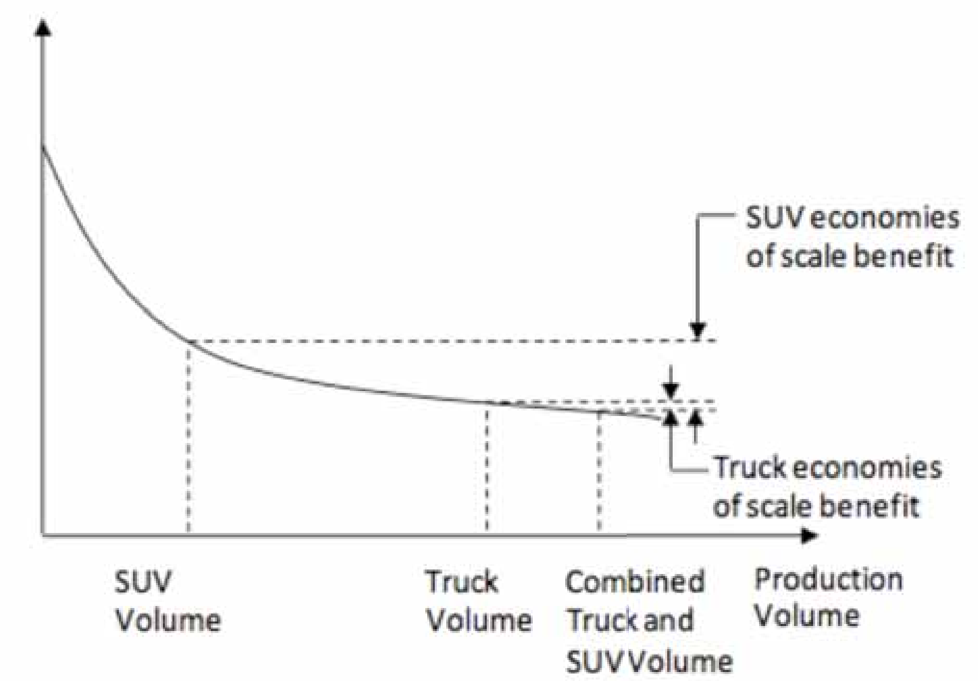
	Control	Incentives
Technical	Commonality Metrics Tagging intended common	Risk valuation analysis
Financial	***Variant Impact Matrix*** Investment evaluation Development cost allocation Transparent cost supply chain Production cost allocation Mandatory co-investment	New part introduction cost Taxing non-common parts Transfer pricing Investment pool for common parts
Organizational	Commonality owners Tiered parts control strategy Participation in design reviews	***Variant ordering by volume*** Contract strategy PnL aggregation Pooled funding

Variant Impact Matrix

Product Lifecycle Phase	Variant 1	Variant 2	Variant 3
Performance Impact	Positive	Positive	No change
Development	More expensive ($0.5m)	More expensive ($0.5m)	More expensive ($1.2m)
Manufacture	Cheaper ($0.2m)	Cheaper ($0.2m)	More expensive ($2.0m)
Operations	Cheaper ($4.0m)	Cheaper ($3.2m)	More expensive ($10.0m)
Total cost impact	**+$3.7m**	**+$2.9m**	**-$13.2m**

This framework was rigorously executed at Lockheed Martin
The list of firms that have failed to bring this perspective is long

Ordering of Variants - Automotive



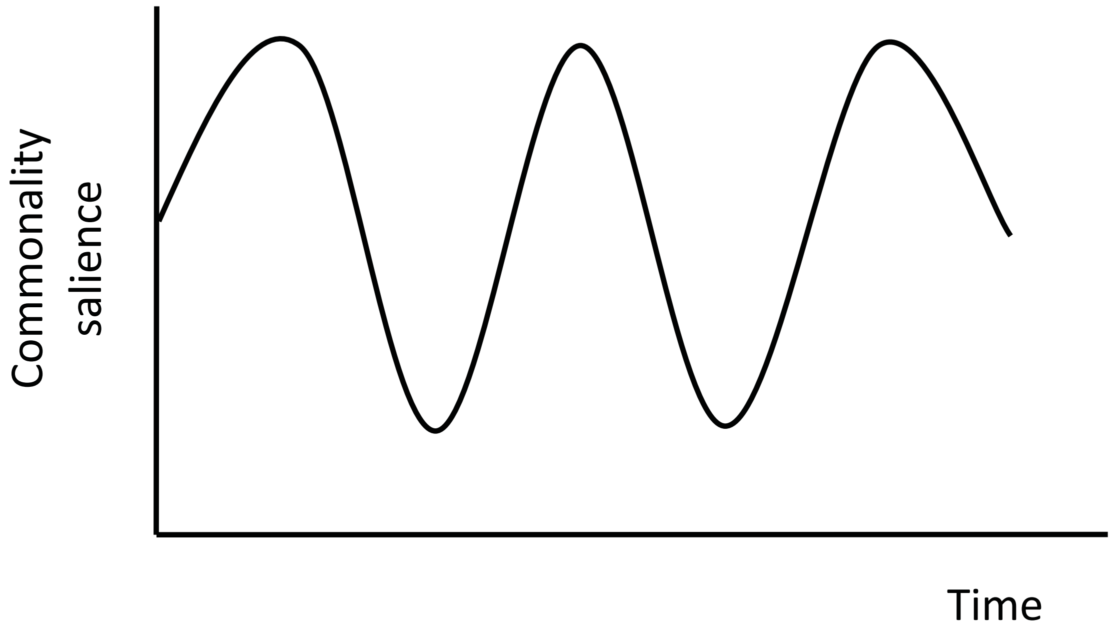
Key Outcomes

Platform decisions were weighted towards SUV given greater analysis fidelity / larger teams

Platform Manager re-tasked after SUV Program design

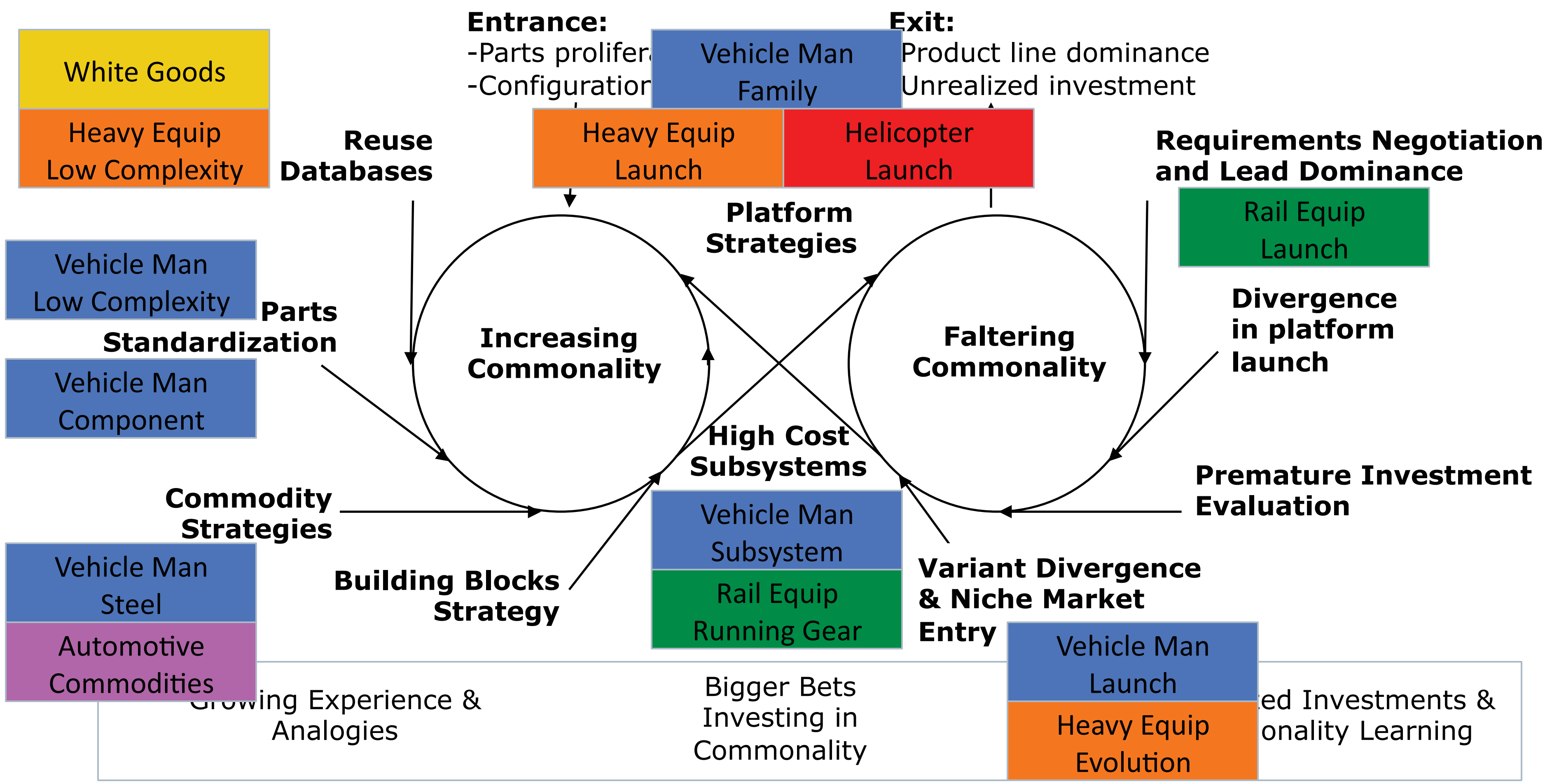
Truck program allowed to 'variant suboptimize'

Firms Oscillate on Commonality



Ford is a known example of alternation between:
"heavyweight" programs
and "world-car" attempts

Platform Strategy Progression



Commonality Management

- Platforming can be a source of competitive advantage
  - Results from firm-wide capabilities
- Management of commonality is a dynamic process throughout the product lifecycle
  - Divergence will occur and will need to be managed
- Successful commonality managers:
  - Create central responsibility for commonality
  - Understand the implications of platform cost structure
  - Make platform, not variant, decisions
  - Manage to commonality benefits, not to commonality percentages