The Auto Future: Round or Flat?

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The Perfect Storm

Competent New Players: China, India, ...

Benefits

Materials

Auto Industry

Tools

Hyper Competition
Auto Industry of the Future

A World of Vanishing Boundaries
Demographics

“Boomers go Boom”

- Consumer Behavior
- Socio / Political
- Health Care
- Skilled Workers
- World Issue
Competition

Relentless

Unforgiving
Industry, Highly Unstable — Not in Final Form
There is Good News & Bad News: We Have a Crisis
U.S. Automotive Capacity Utilization and Profits

1978 – 2006

Source: Federal Reserve, U.S. DOC/BEA
The Old Business Model is Broken
It’s Change or Die & Shrink to Grow
Auto Industry 2008+

- Successful manufacturers and suppliers
- Strong market
- Great products
- But—not everyone made it
The Future —

It’s not what it used to be
Foundation for Excellence

- Smarter Industry
- Platform / Component Set Rationalization
- Faster, Better Product Development
- Manufacturing Flexibility
- Stronger Processes
- Discipline
- Supplier Competence
- Lean Everything
Market Share is Nice
Profits are Essential
Cost Reduction — Survival Issue

- Low Investment
- Subsystem Optimization
- Global Sourcing
- Flexible, Lean Manufacturing
- Fast Product Development
- High Volume Platforms and Component Sets
Economies of Scale Important

♦ Platforms
♦ Component Sets
♦ Parts
♦ Production Equipment
♦ Software
Economies of Scale

- Economies of scale in software – through reuse is necessary
- New external and internal standards could help
**Old Business Model**

- Vertical Integration
- Paper
- Bureaucracy
- Linear
- Slow
- Lean
- Control
- Sequential
- Legalistic
- Individual
- Regional
- Physical Prototypes
- Job for Life
- Kings
- Competition
- Acquisitions
- Structured

**Talk**

**Vertical Integration**
Virtual Integration  
Paperless  
Fast  

Virtual Prototypes  
People Flow  
Coopetition

New Business Model

Listen  
Anti-bureaucracy  
Collaboration  
Lean  
Agile

Empowerment e-enabled  
Coaches  
Alliances  
Trust  
Team  
Parallel  
Global  
Flexible
Lean / Agile

♦ Investment
♦ Engineering
♦ Manufacturing
♦ Everything
Collaboration Driven by Resource Shortage

- Natural
- Financial
- Human
- Time
Examples: New Business Model

- Ford/GM Transmission Collaboration
- GM – DCX – BMW Hybrid Collaboration
- DCX – Toledo Plant
- GM Body Tooling
- Tool and Die Consortia
- Auto/Steel Partnership
Old Labor/Mgt Model
Is Obsolete

Confrontation → Collaboration
Knowledge

The Competitive Edge
It’s nice to be smart and rich, but smart is more important than rich.
Do what you know.
Information Technology

The Ride is Just Beginning
Comprehensive Software Strategy is Critical
Software - Everywhere

- External – Design, Manufacturing, Business Systems
- Internal/Embedded - Everywhere
Planning

Engineering

Prototypes
Test
Development

Simulation
Modeling
Analysis

Pilot Line
Production
Product Development

- 12 Months is Goal
- Real Time Collaboration
- Math Tools
Virtual Prototyping

The Savings are **HUGE** in Time and Money
1980’s mechanical engineering moved from drafting to static finite element analysis

Then from FEA to full Computer Aided Design

Finally from CAD to Product Lifecycle Management
Coding to Model-Based Design

- Embedded Systems Development has moved from machine language → to assembly language → to C/C++ → Model-Based Design
Need to continue to get more from existing resources

- Not much left to squeeze out of manufacturing ... need to turn to design to meet cost and efficiency target
60 – 80% Reduction in Physical Prototypes
Good Art Beats Bad Art

Good Science Beats Good Art
<table>
<thead>
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<th>Fast</th>
<th>Spectator</th>
<th>Have a chance</th>
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<tbody>
<tr>
<td>Slow</td>
<td>Dead</td>
<td>Parade has gone</td>
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<tr>
<td></td>
<td>Dumb</td>
<td>Smart</td>
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Fast-paced change demands leverage of all resources
Change is Tough
Not Changing is Tougher
Product Technology

At the edge of a revolution?
Future Power Plants

- Gasoline
- Diesel
- Hybrid

The Answer – ?
Technological Progress—When to Commercialize

When to Commercialize

- A: Current Technology
- B: Too early

Time

$
Future Fuels

- Petroleum
- Bio
- Hydrogen

The Answer – ?
Future Gasoline Price – $ 1.50 – $ 3.50 /gallon
2 Key Developments

- Lithium Batteries
- Cellulosic Biofuels
More Electronics

- Key Enabler

- 1970: Electronics 10% of Cost
  2010: Electronics 40% of Cost

- Cars in development queue - 10 million lines of code, projected to reach 20 million lines by 2013.

- High quality embedded systems are challenging the industry.
Success Factors

- Risk
- Obsolete Own Products
- Tough Problems
- Systems
- Knowledge
- Collaboration
- Software
World Class is a Moving Target
An Automotive Industry Tradition

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