



Enterprise Design for Dynamic Complexity: Enterprise Product Strategy

Ted Piepenbrock

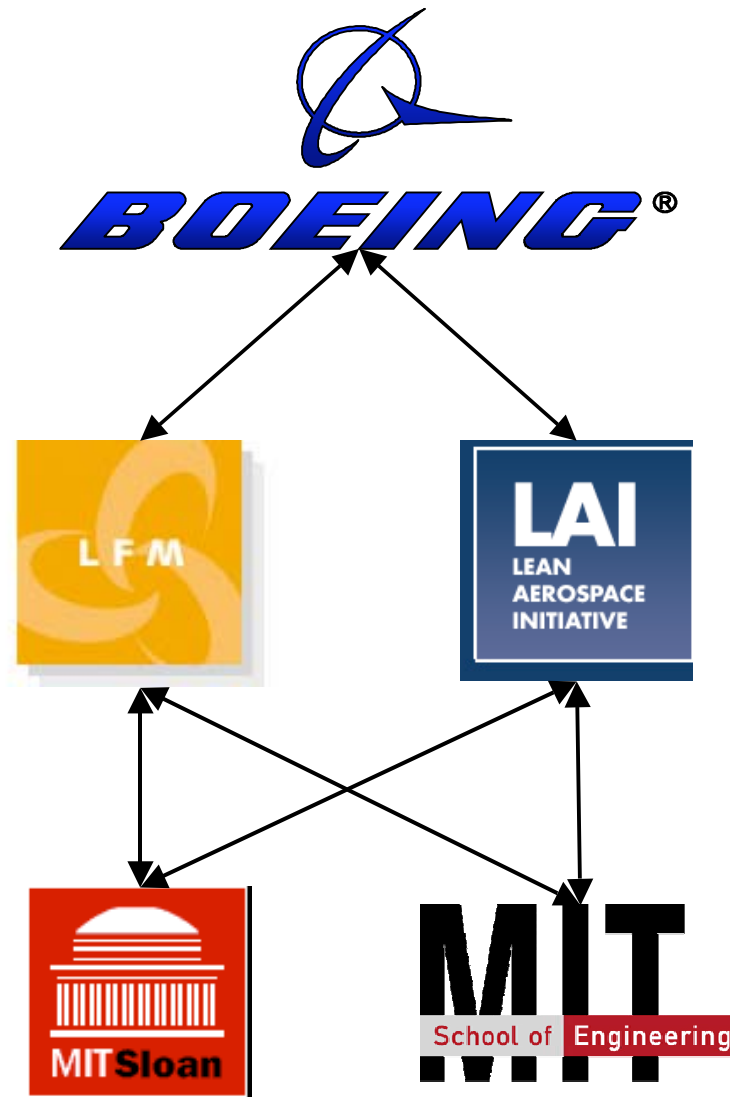
October 2003

Research Partnership Structure

Industry
Sponsor

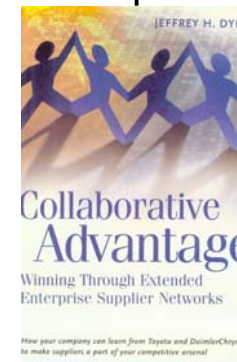
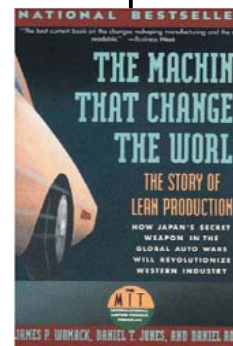
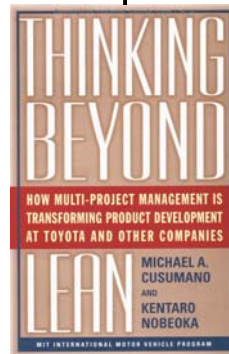
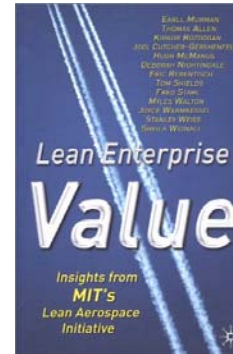
Intermediary
Research
Vehicles

Academic
Partners



MIT's Research on Lean 3-Dimensional Concurrent Engineering

Enterprise



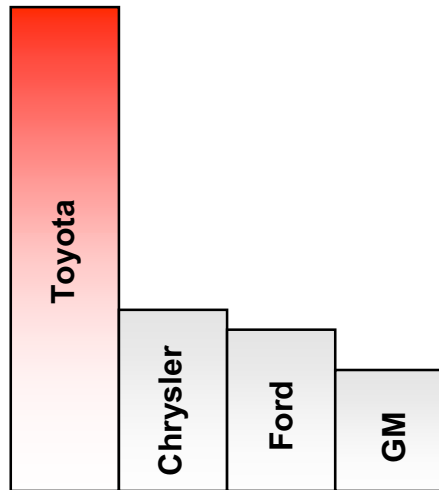
Product

Production System

Supply Chain

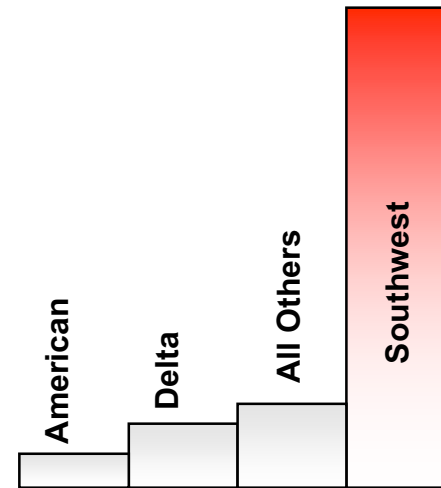
World Class Lean Enterprises

Manufacturing
Example:



Market Capitalization
1998-2001

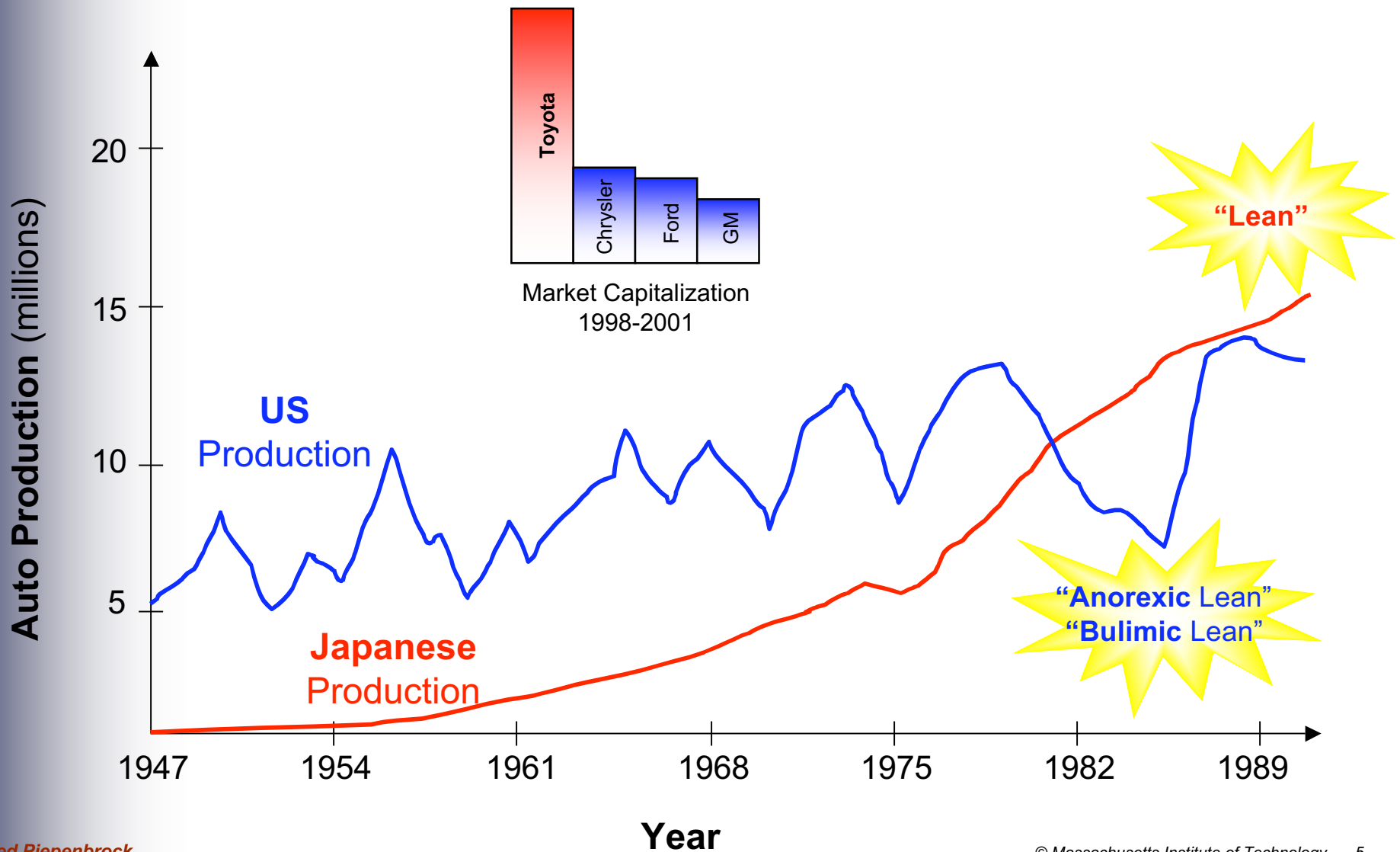
Service
Example:



Market Capitalization
2002

Corporate “Eating Disorders”

(data from *The Machine That Changed the World*)



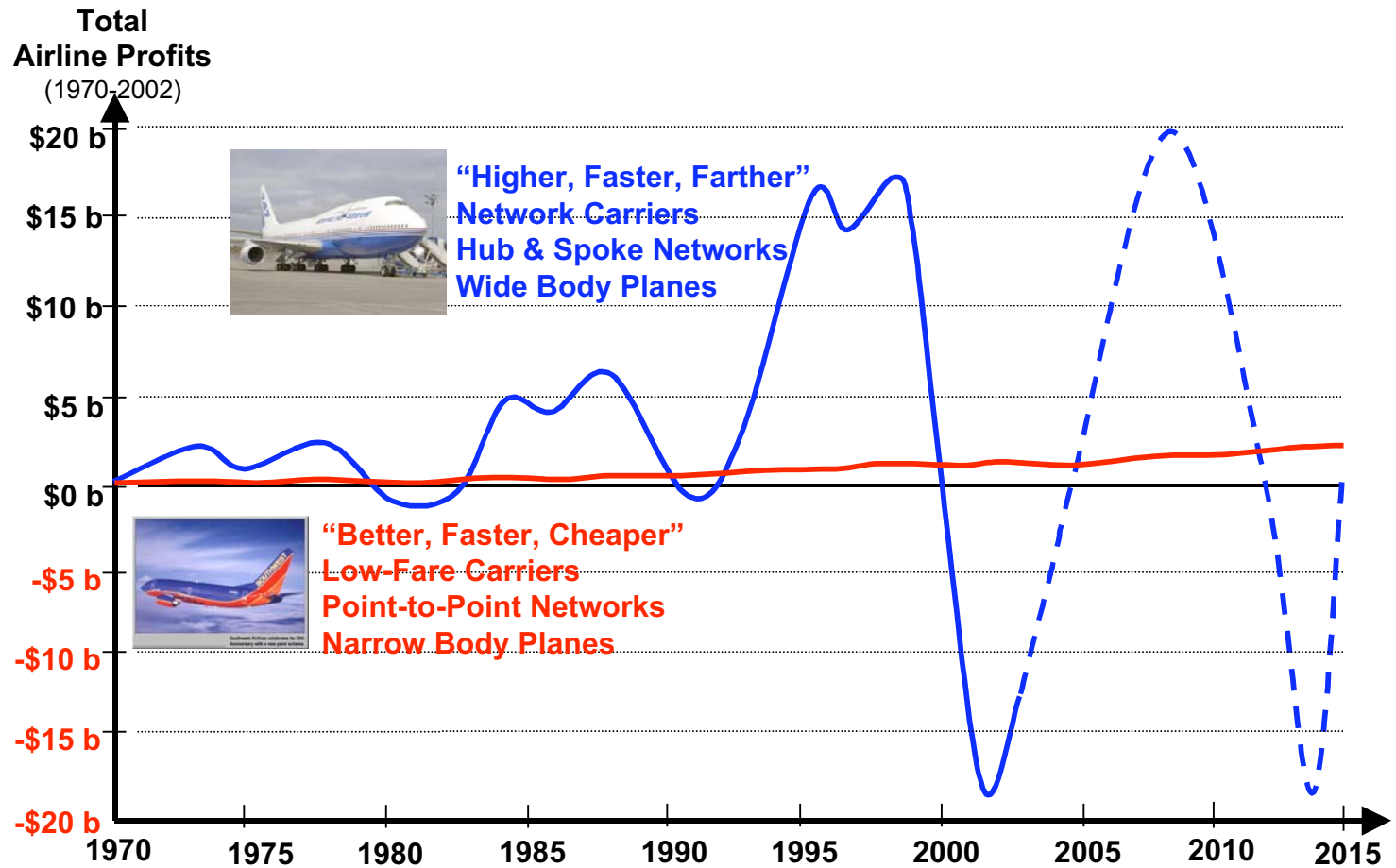
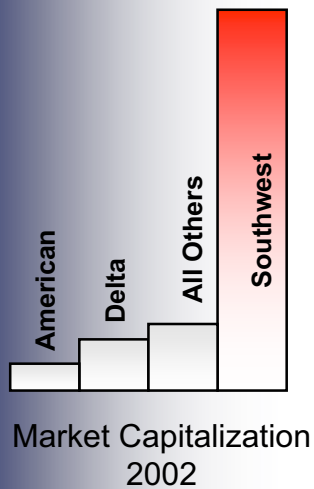
“The World’s Worst Industry”

“There is no worse business of size that I can think of than the airline business. Since it began in 1903, the industry has had an overall net loss... If there was a capitalist on Kitty Hawk, he would have shot the plane down.”



Warren Buffet
“World’s Most Successful Investor”

“The World’s Worst Industry”



Commercial Aircraft

% Market Share
in Commercial
Airplane Deliveries

100%

US

*B.F.C.
Enterprise*

50%

EU

*H.F.F.
Corporation*

1970

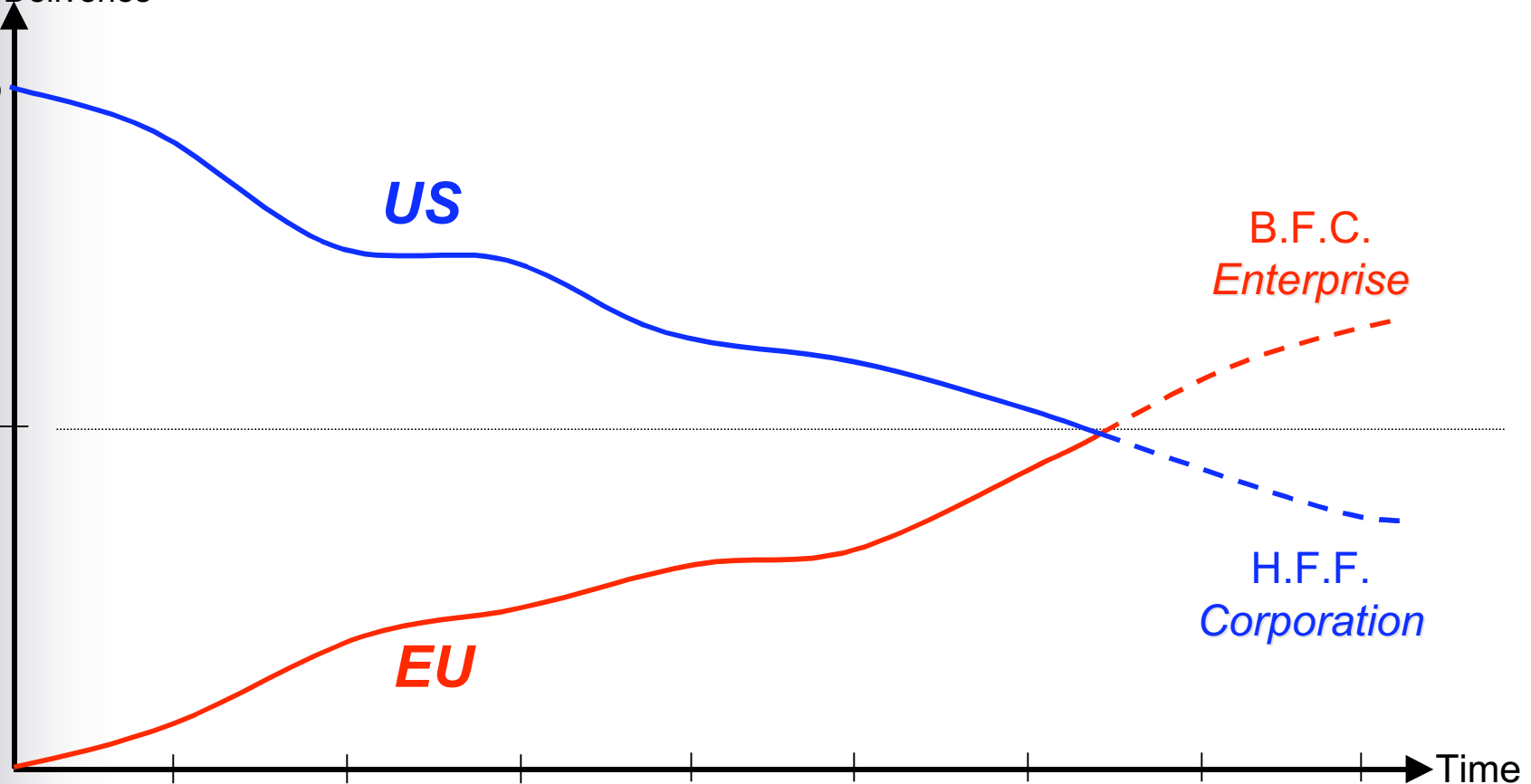
1980

1990

2000

2010

Time





Agenda

- Product Development & the “*Lean Heavyweights*”
- Enterprise Design for *Dynamic Complexity*
- *Technology & Industry Roadmapping*
- “*Lean*” Revisited



Product Development & the “Lean Heavyweights”

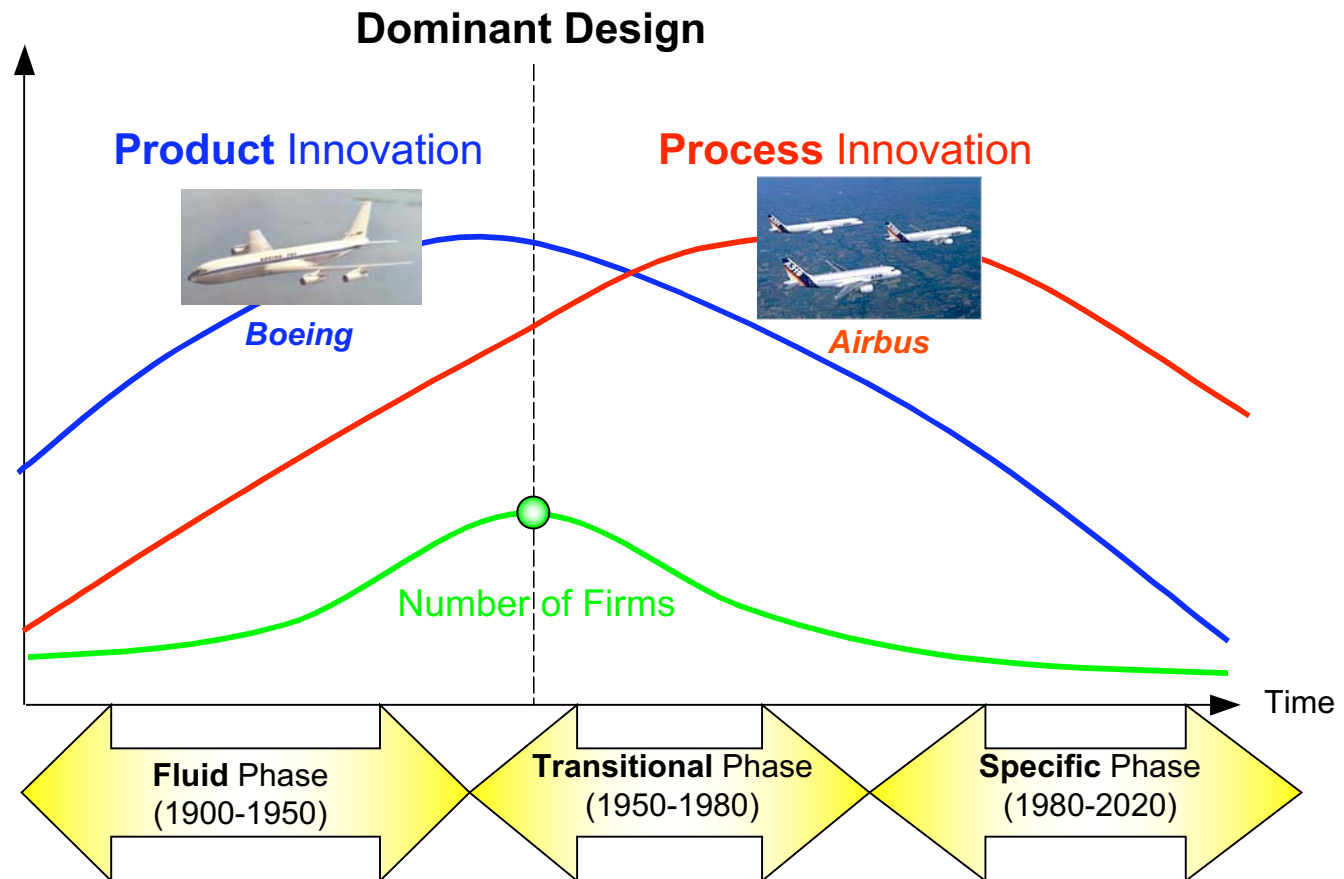
Aerospace *Industrial Evolution*

Higher, Faster, Farther

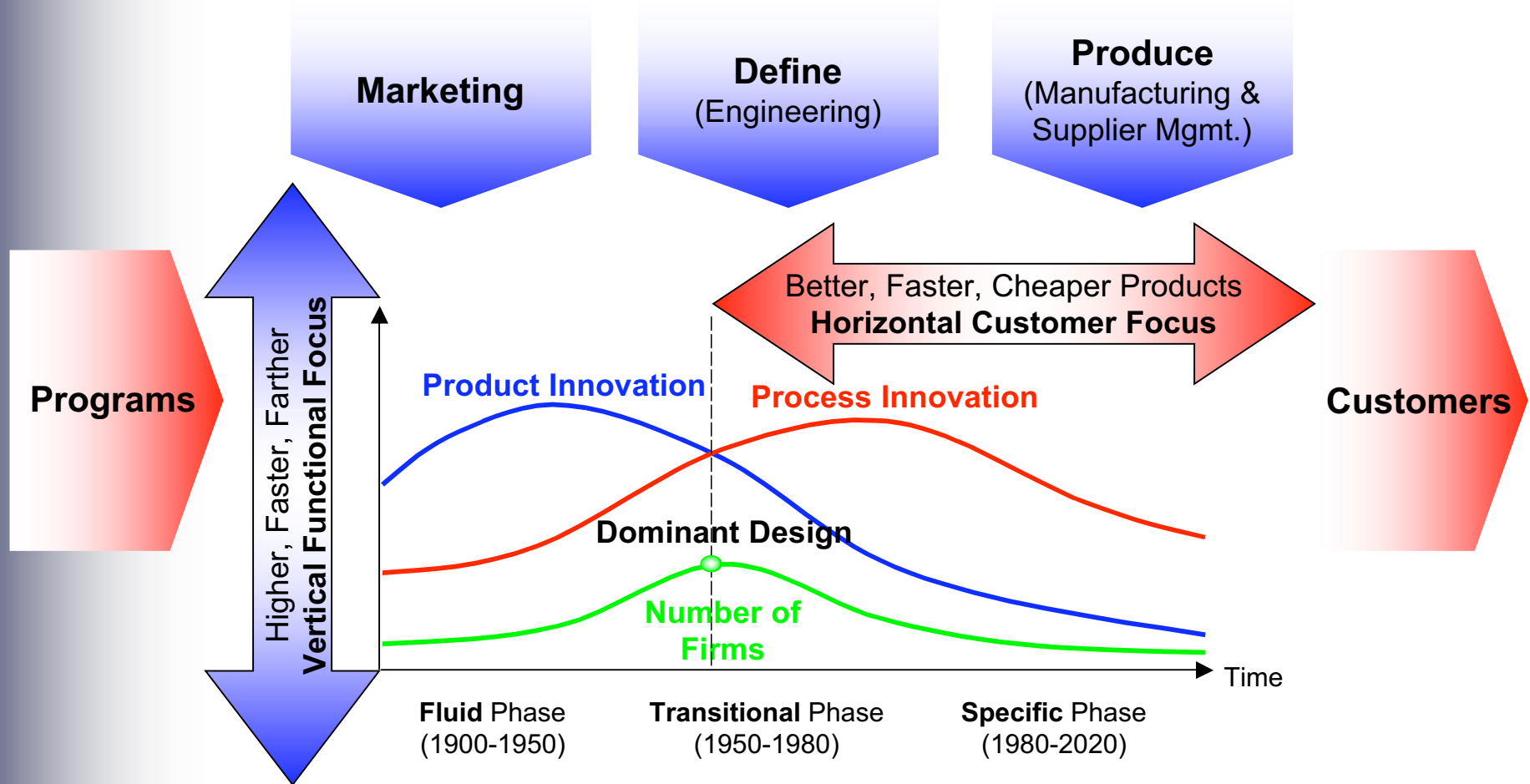
(Integral Product &
Supply Chain Architecture)

Better, Faster, Cheaper

(Modular Product &
Supply Chain Architecture)



Organizational Re-Architecture



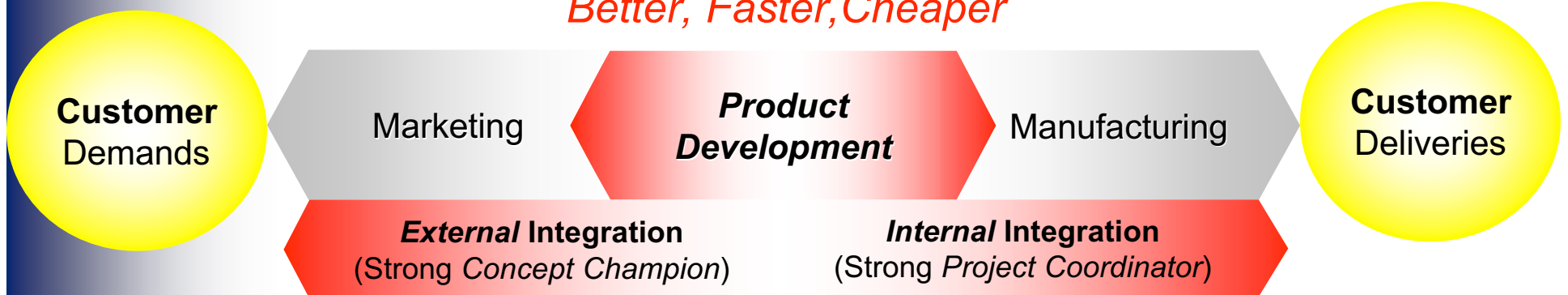
The “Lean Heavyweight”

Higher, Faster, Farther



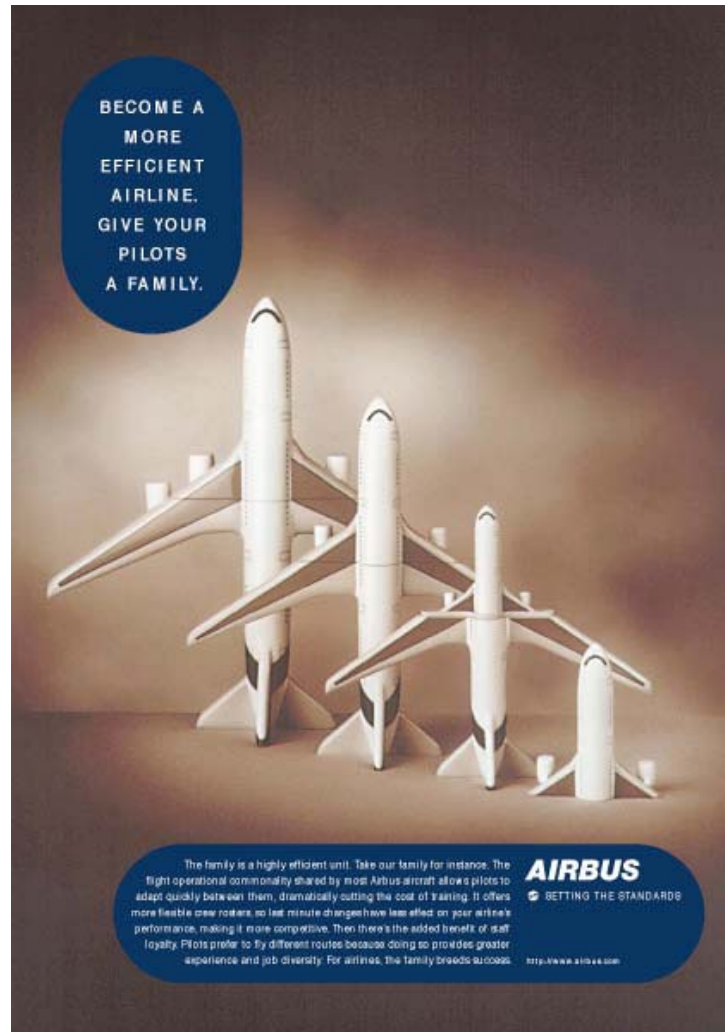
Lightweight Project Manager

Better, Faster, Cheaper

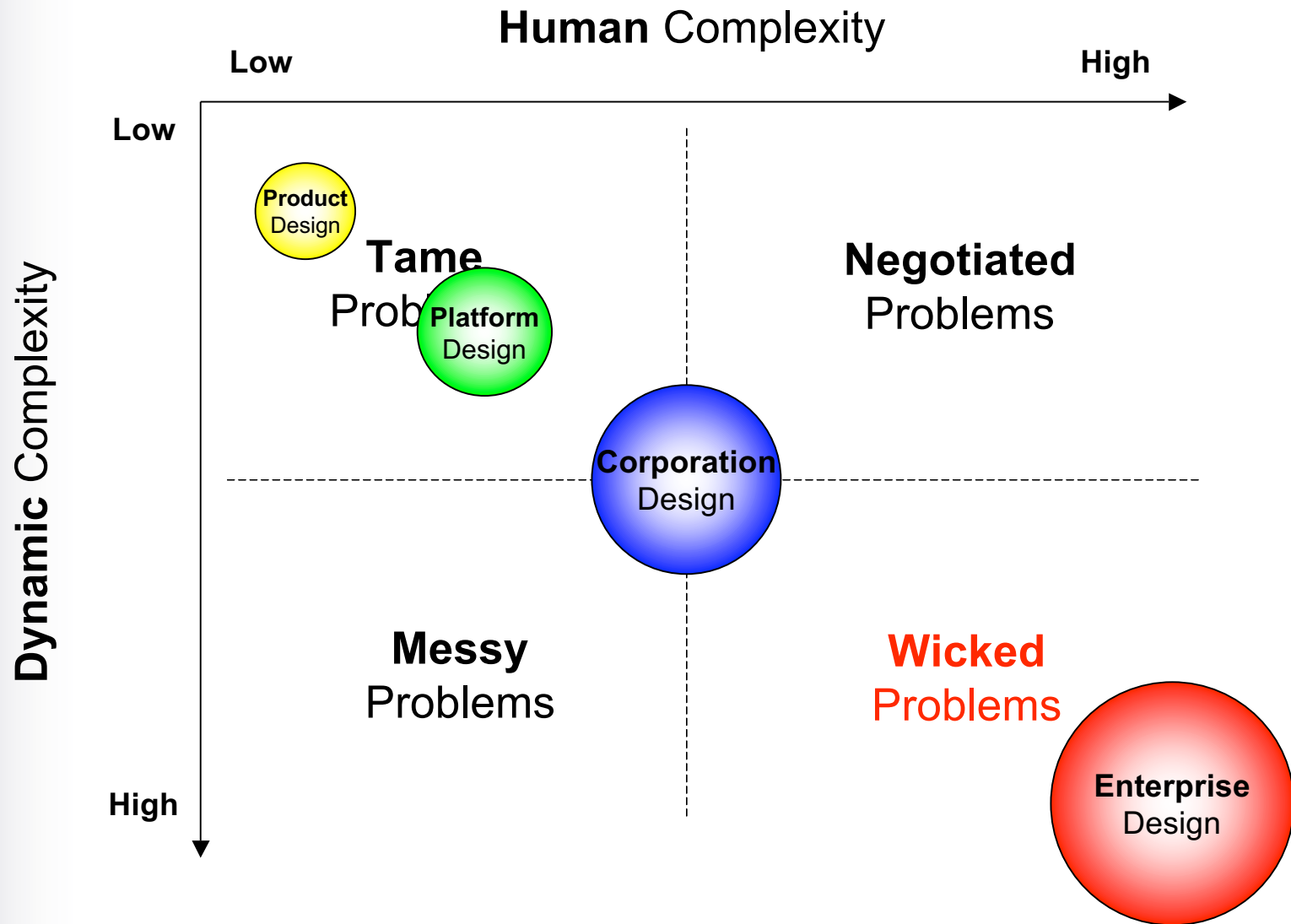


Heavyweight Project Manager
(“Shusa”)

Enterprise Development is Large-Scale *Product Development*



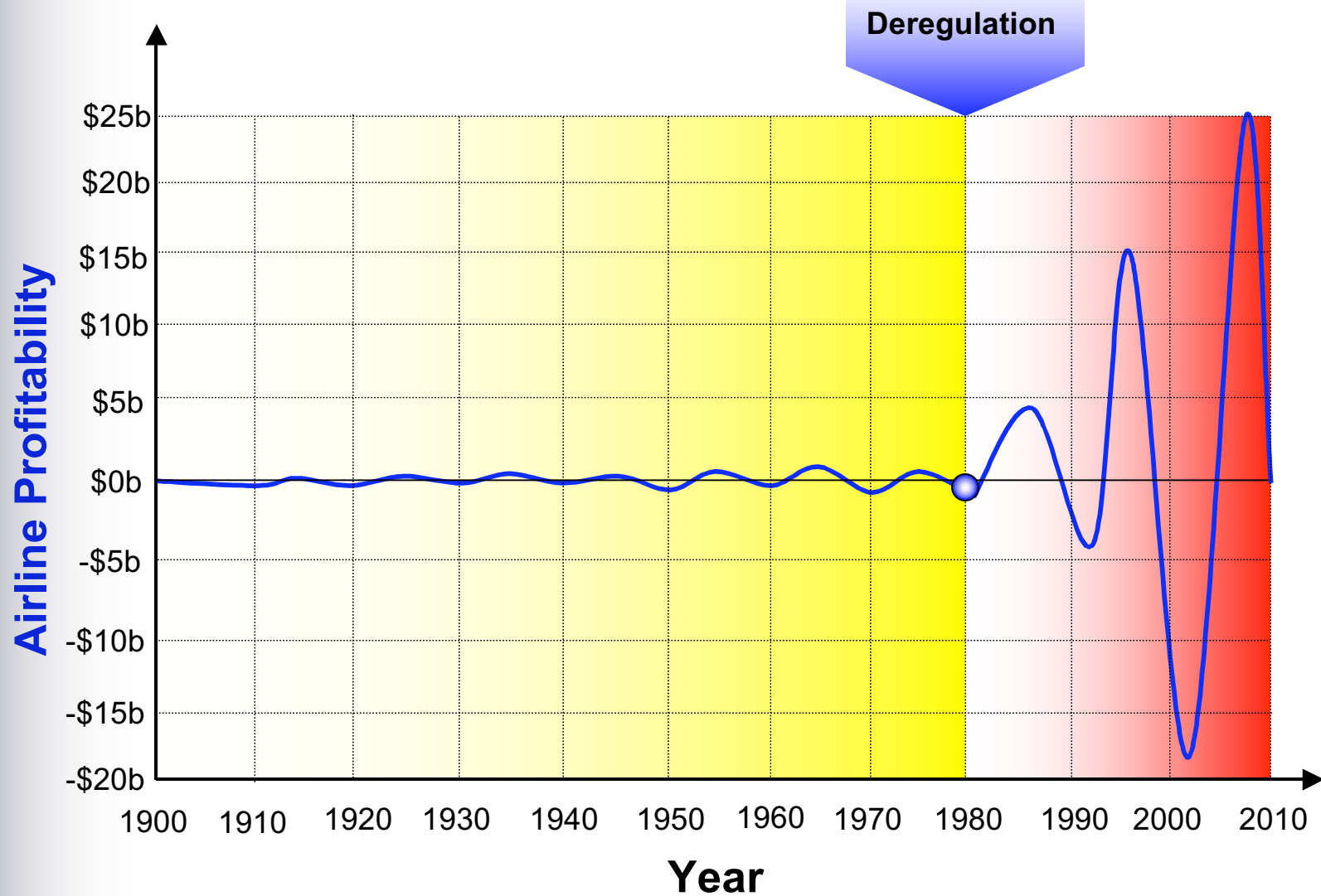
Mastery of *Dynamic Complexity*



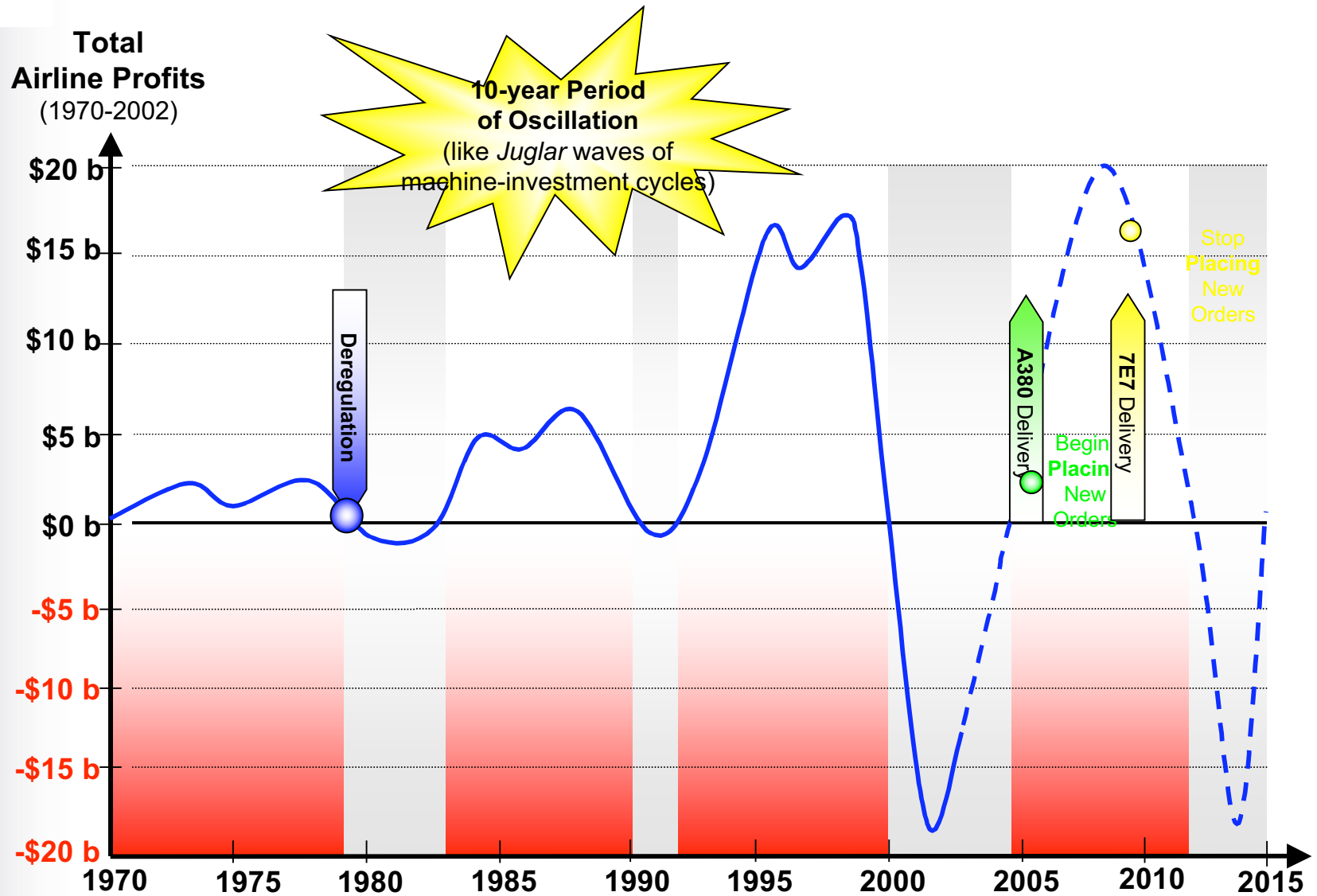


Enterprise *Dynamics*

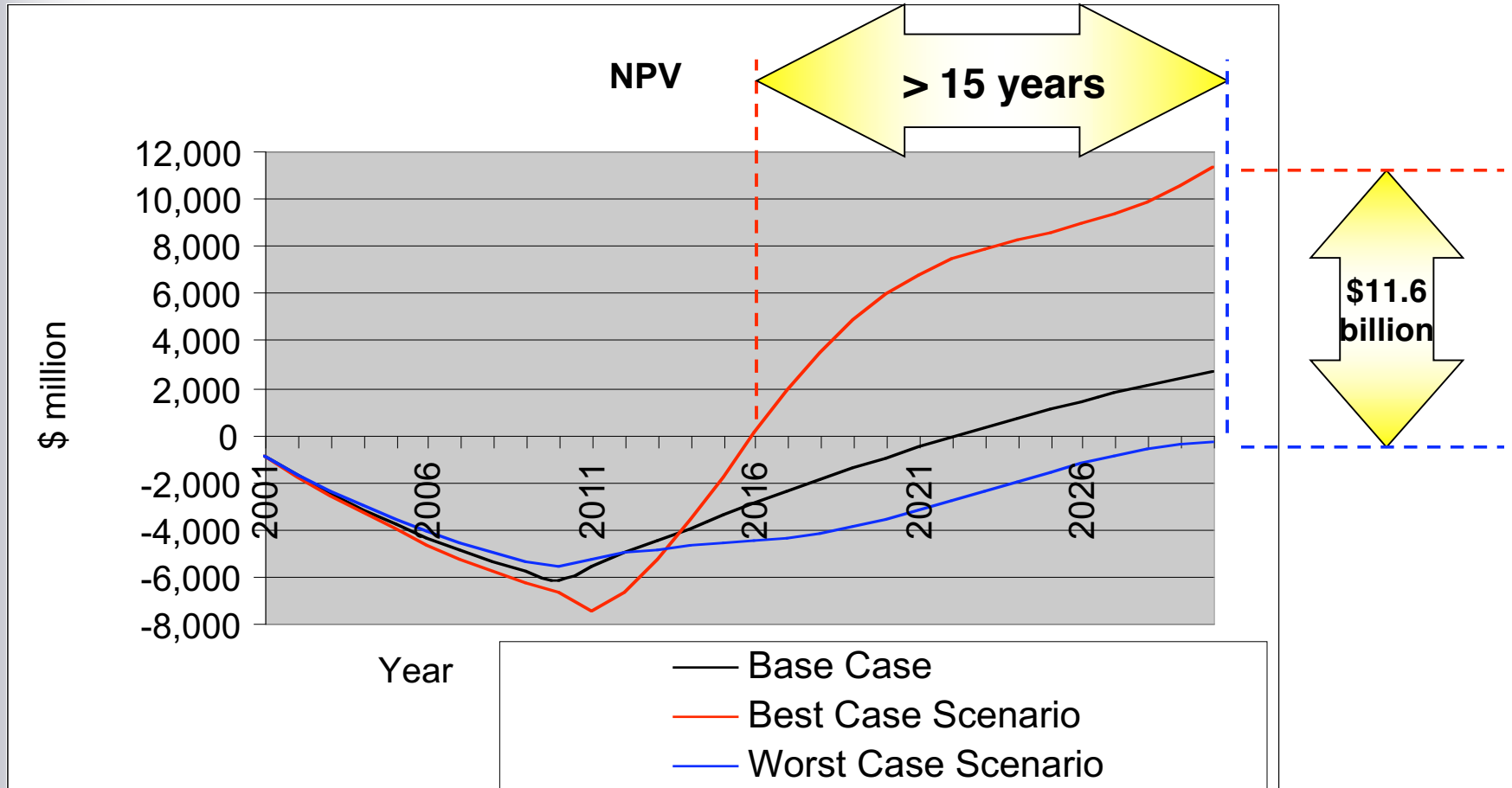
Airline Profitability Dynamics



Airline Profitability Dynamics

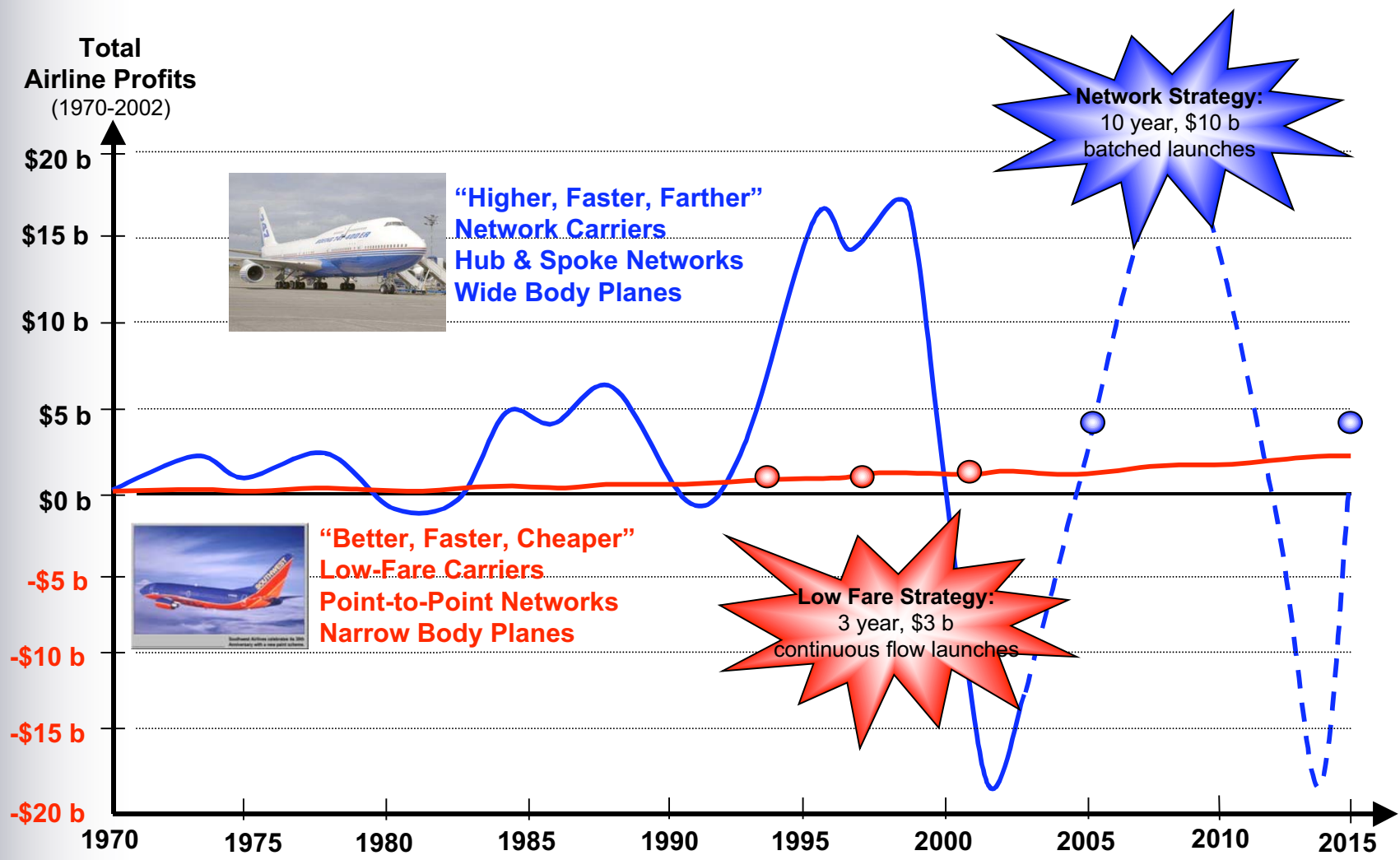


Closing the Business Case



Lean Segmentation of Market

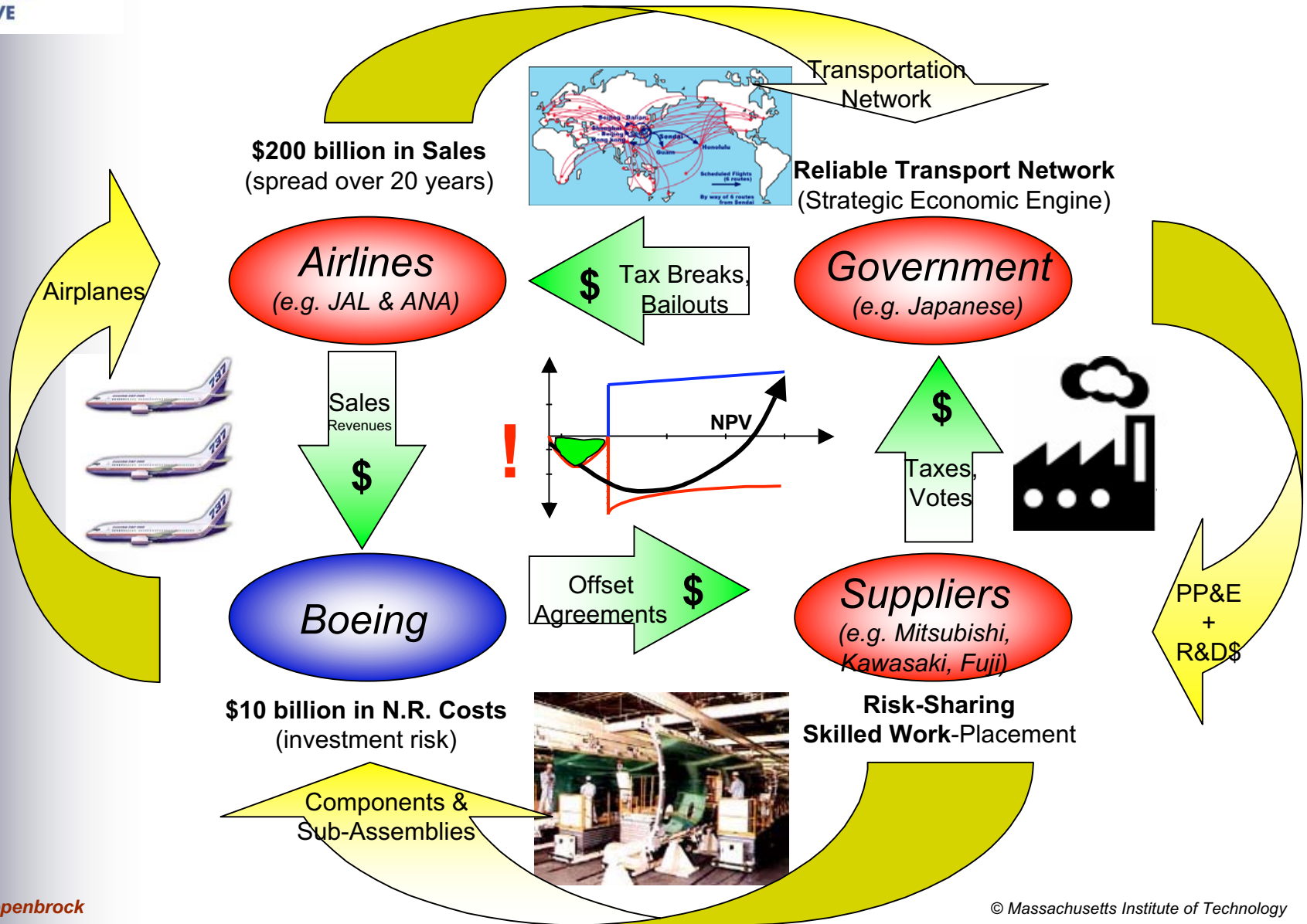
(Notional)



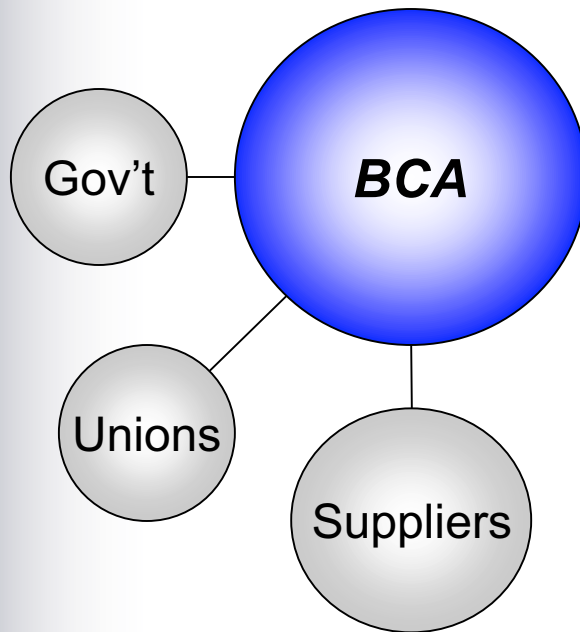


Enterprise *Complexity*

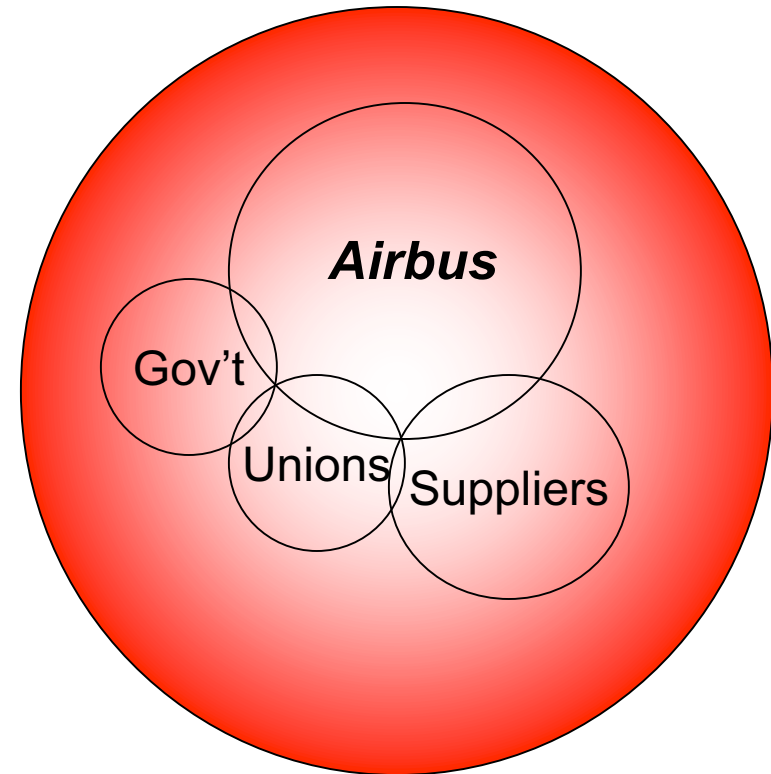
Commercial Airplane Enterprise



Enterprise Boundaries



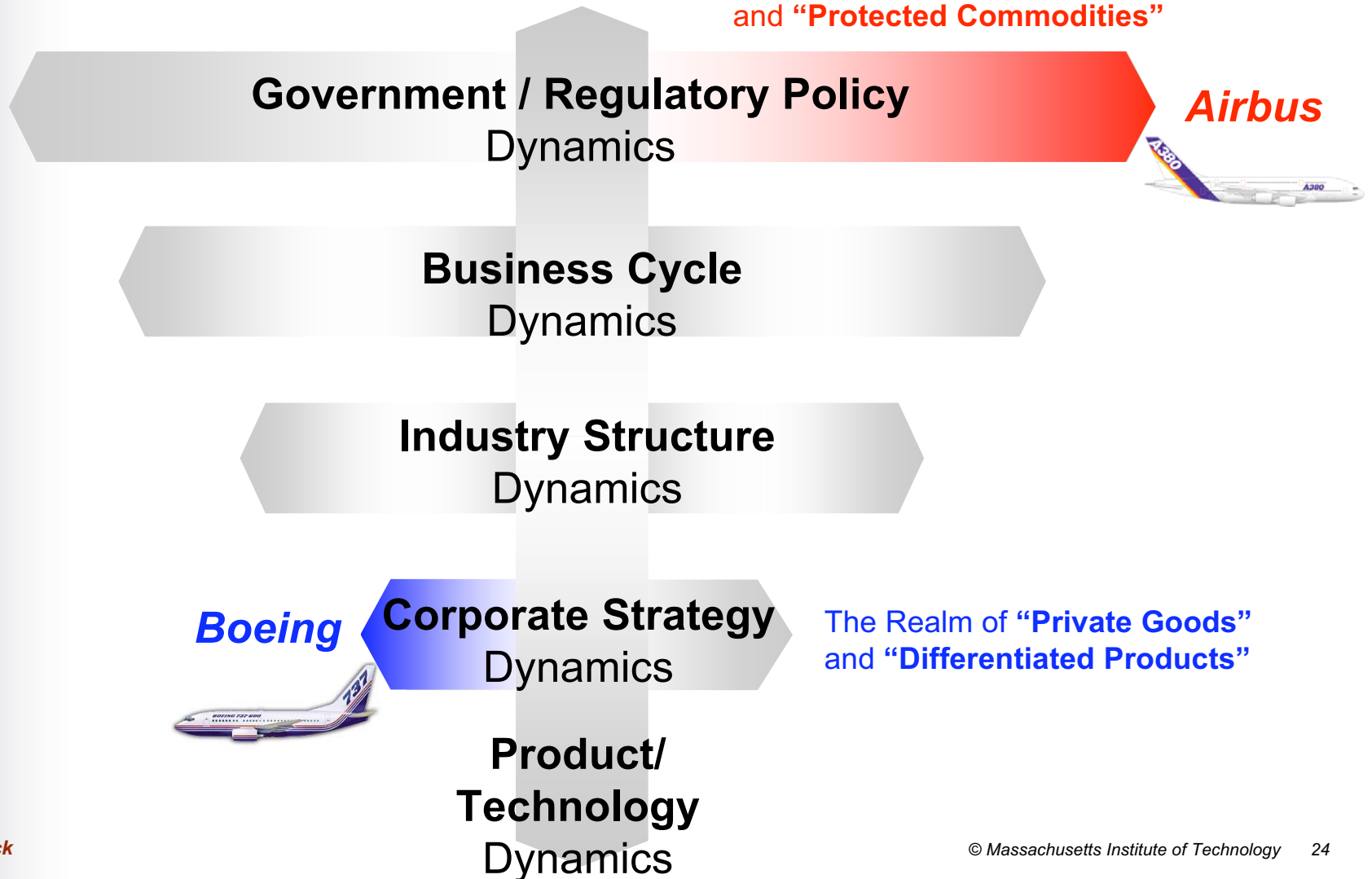
World-Class
Aerospace **Company**



World-Class
Aerospace **Enterprise**

Strategic Architecture

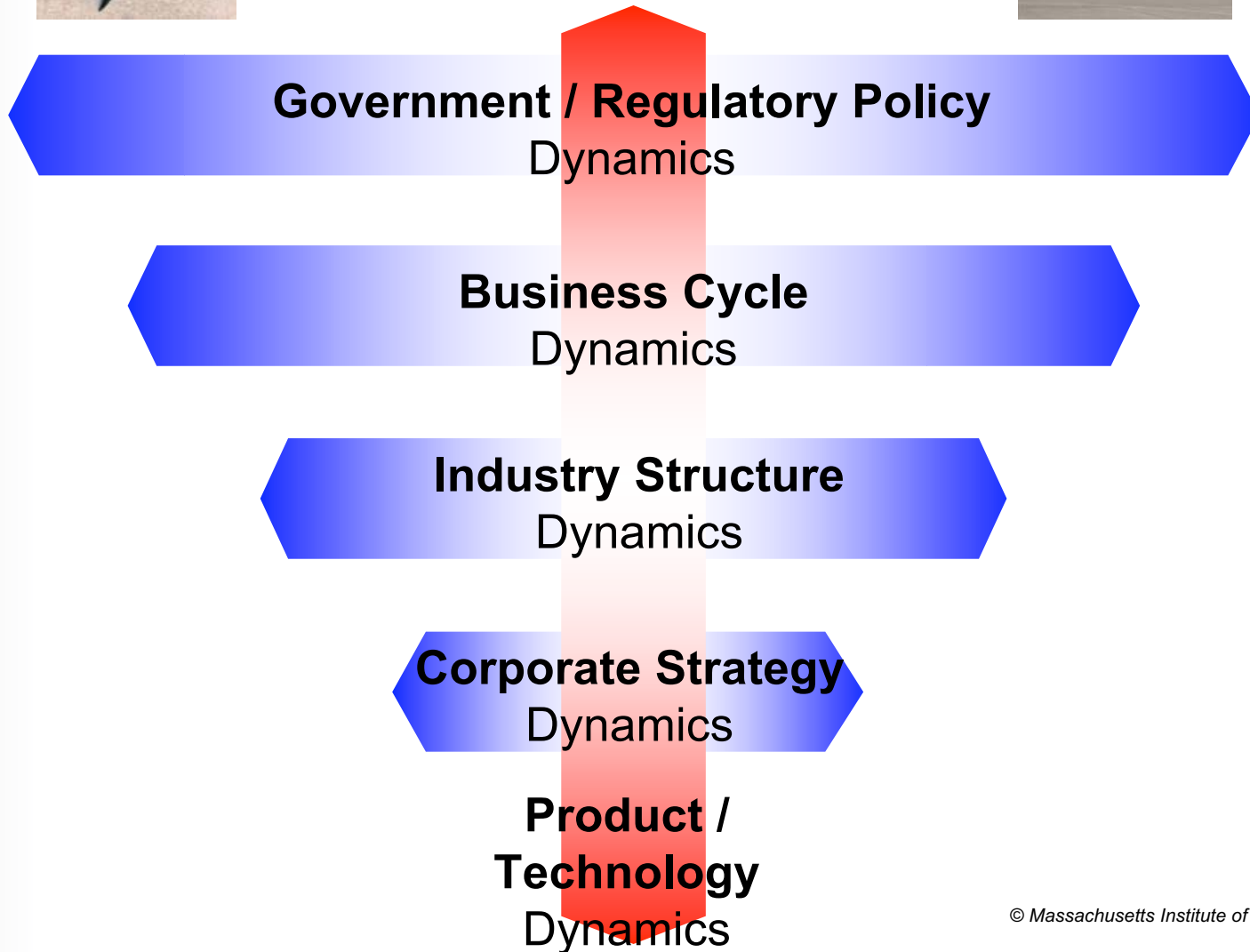
The Realm of “Public Goods”
and “Protected Commodities”



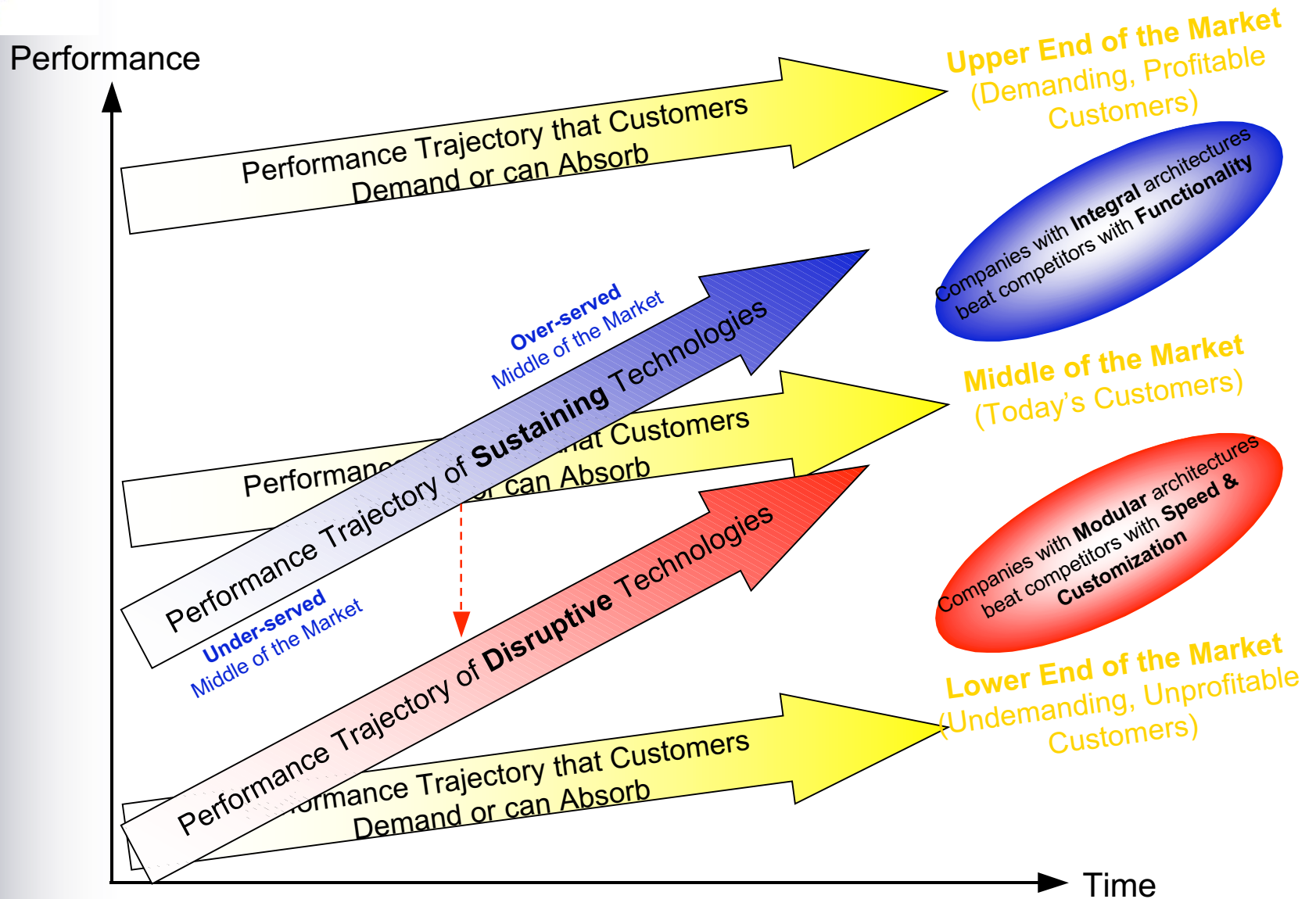


Technology & Industry Roadmapping

Industrial Dynamics



Disruptive & Sustaining Technologies



Products for “Unprofitable” Customers

Targeting “**Profitable**” Customers



Concorde

Targeting “**Unprofitable**” Customers



The Disruptor and the Disrupted



The Evolution of Disruption



500 seat
Wide Body
Commercial Jet



100 seat
Narrow Body
Commercial Jet



50 seat
Regional Jet

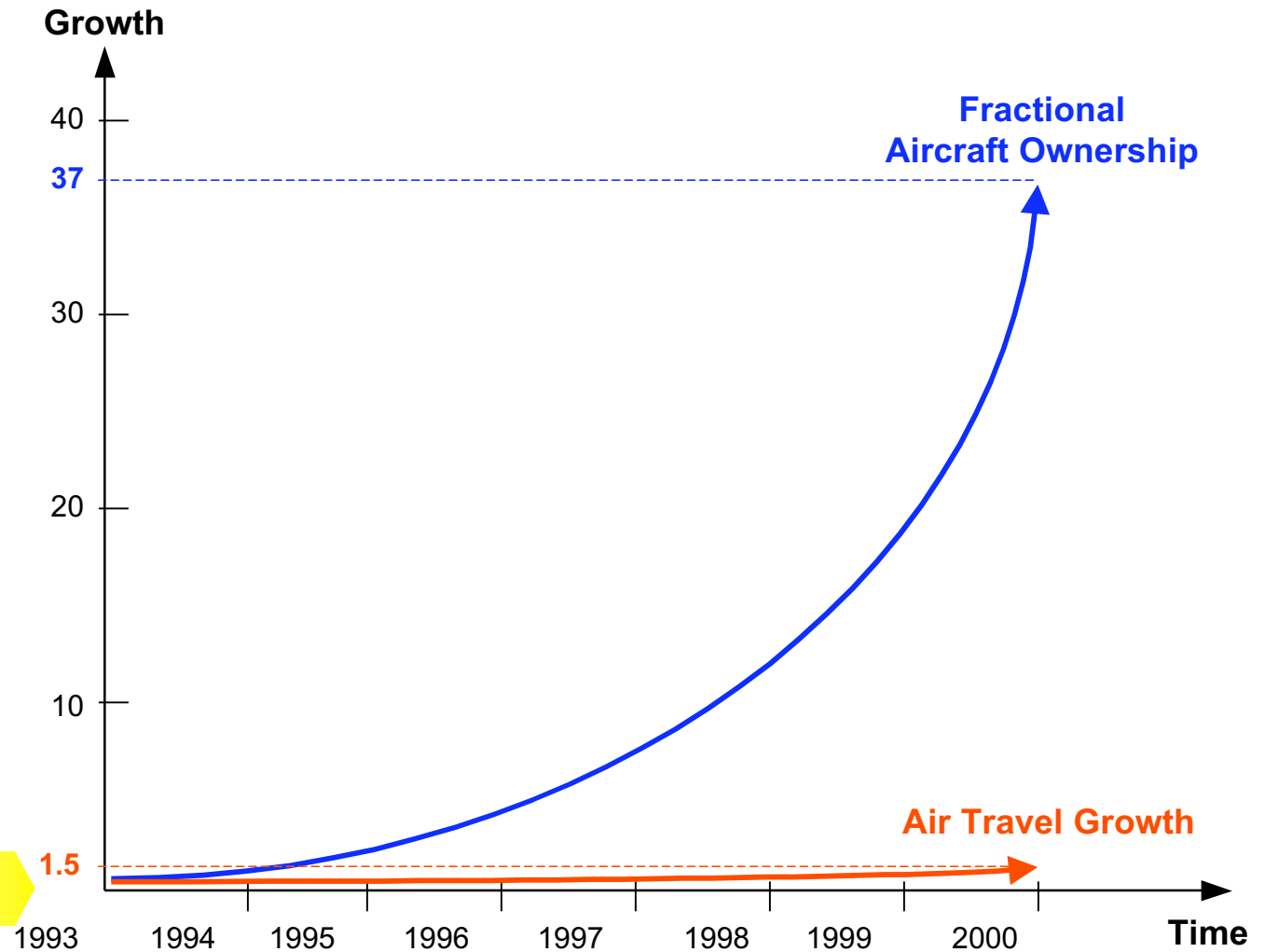


5 seat
Eclipse
Air Taxi



1 seat
Aeromobile

The Evolution of Disruption





Lean Revisited

Capturing Value



Traditional “Mass” Enterprise:

- In a rapidly **growing homogenous** market, with large customer in-flows...
- Construct a **large, expensive, inflexible** monument to capture value, but...
- **Poor integration** creates holes through which value leaks out (**waste!**)

Integrated “Lean” Enterprise:

- In **mature/saturated** markets, with **reduced/variable** customer in-flows...
- Construct a **right-sized, integrated, flexible** enterprise to capture value so that...
- Waste is **eliminated** and **flexibility** is maximized.

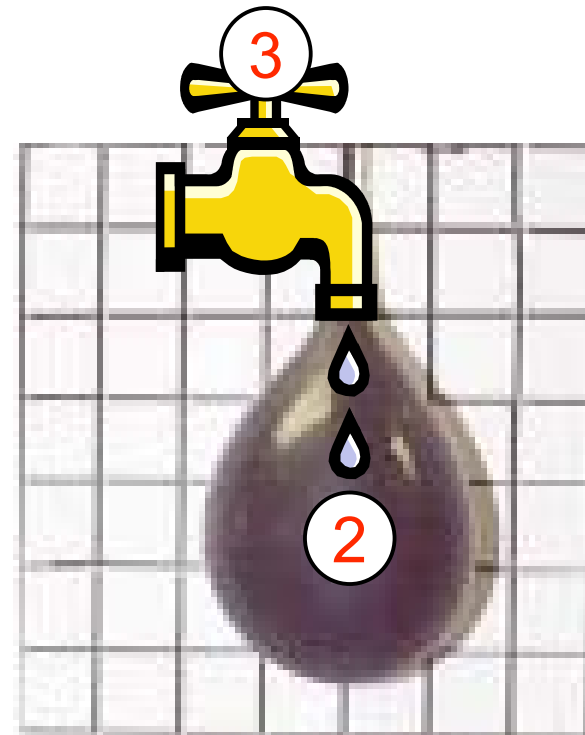


Architecture of a Lean Enterprise



1. Remove **Waste (Muda)**

3. Control **Variability** of Input (**Mura**)



2. Make Enterprise **Flexible (Muri)**