

# *Value Creation Through Integration Workshop*

**Lean  
Aerospace  
Initiative**



**A Framework for Integration  
from the Manufacturing  
Perspective**

*January 30, 2002*

*Presented by:  
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MIT*

- **Industrial product maturity impact on manufacturing**
- **What is manufacturing system design**
- **The manufacturing system design framework**

- **Product differentiation harder to achieve**
- **Product performance enhancements best satisfied by incremental improvements**
- **Acquisition and life cycle costs predominate**
- **Insertion of process technologies has highest leverage**

**Use Manufacturing for Competitive Advantage**

# *How can Manufacturing be Used for Competitive Advantage?*

- **Product design alone is less of a discriminating factor for competitive success therefore ...**
  - **Design efforts should ensure producibility**
  - **Manufacturing inputs should carry more weight**
- **Process technology development yields most benefits**
  - **Continual introduction of new processing capabilities**
  - **Organizational elements to champion process developments**

# *Elements for a Manufacturing System Design Framework*

- A holistic view of manufacturing system design environment
- Visual depiction of “design beyond factory floor” ideas
- Manufacturing as part of the product strategy
- *Manufacturing system design is strategy driven, not product design driven*
- Combines multiple useful tools
- Provides insights into order and interactions
- Not prescriptive
- Can lead to innovative & new manufacturing system designs
- Shows the unending design cycle -- Continuous Improvement

## 1. Manufacturing system “infrastructure” design

- Manufacturing strategy
- Operating policy
- Partnerships (suppliers)
- Organization structure details

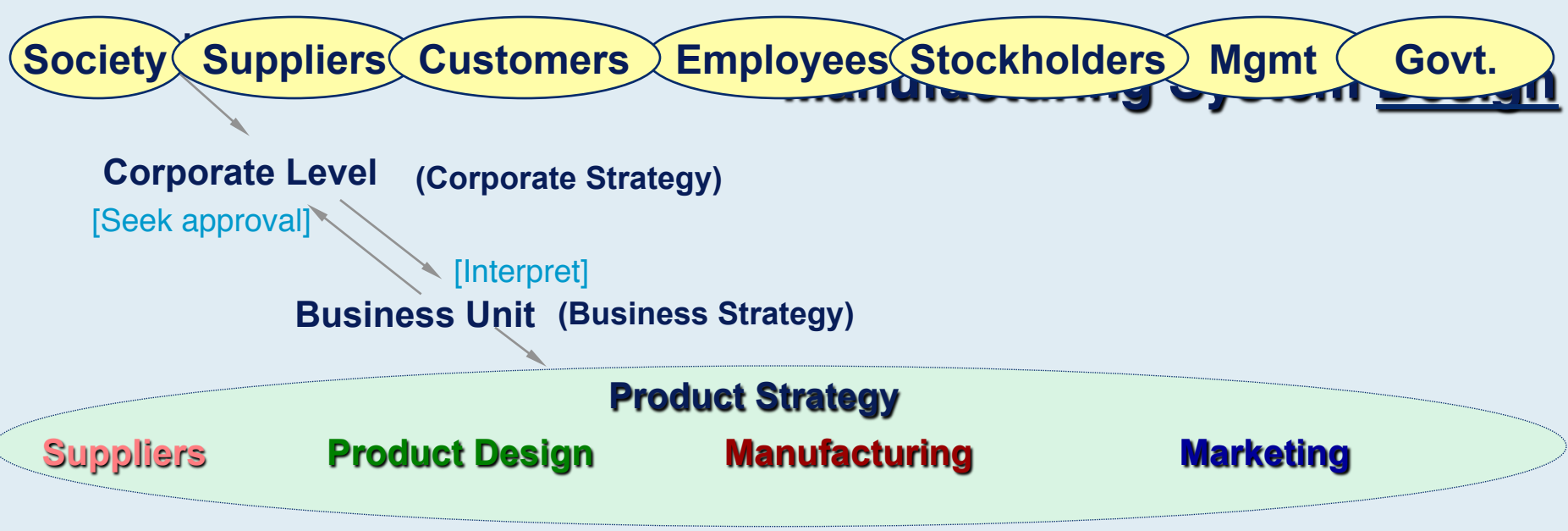
*Manufacturing  
Strategy Tools*

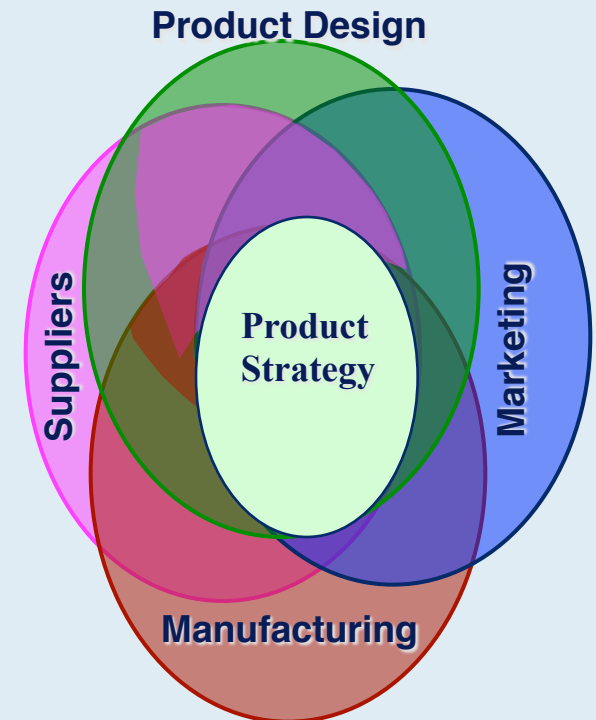
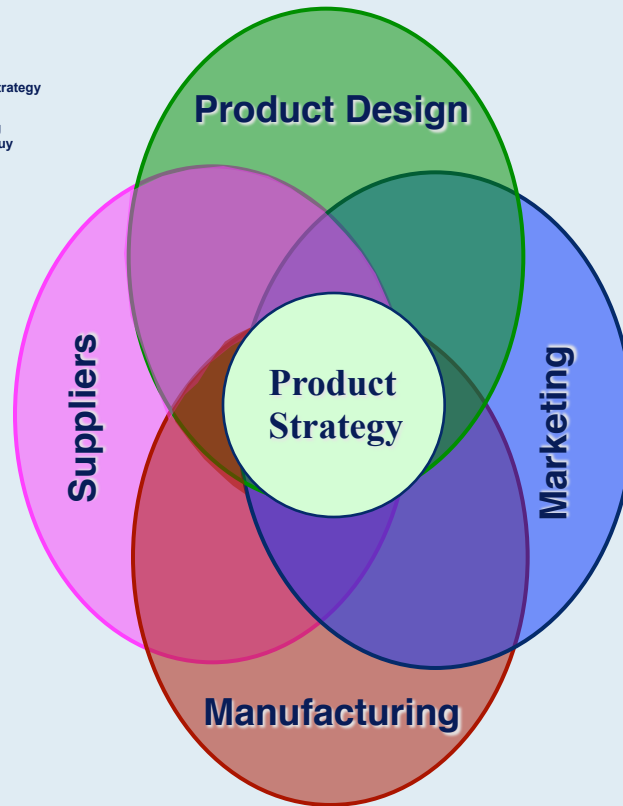
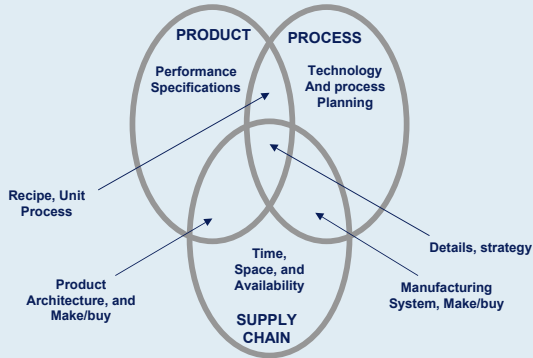
## 2. Manufacturing system “structure” design

- Buildings, location, capacity
- Machine selection
- Layout
- WIP

*Manufacturing  
System Design  
Tools*

# Manufacturing System Design





# Manufacturing System Design

Stakeholders

Corporate Level

[Seek approval]

[Interpret]

Business Unit

Product Strategy

Suppliers

Product Design

Manufacturing

Marketing

Make/Buy  
Risk-sharing Partnerships

DFMA, IPT  
3-DCE  
Concurrent Engineering

Customer Needs  
Technical Feasibility  
Feasible performance guarantees

Requirements/Considerations/Constraints

- Miltenburg, - 3P, - 2D plots,  
- MSDD, - AMSDD - design Kaizen

Manufacturing System Design/Selection

- Analytical Tools,  
- Simulation Tools

Implement (pilot)

Fine Tune

Evaluate/Validate

- VSM
- Kaizen
- Trial & Error
- Kaikaku

Modifications

Finalized Product Design

Rate Production

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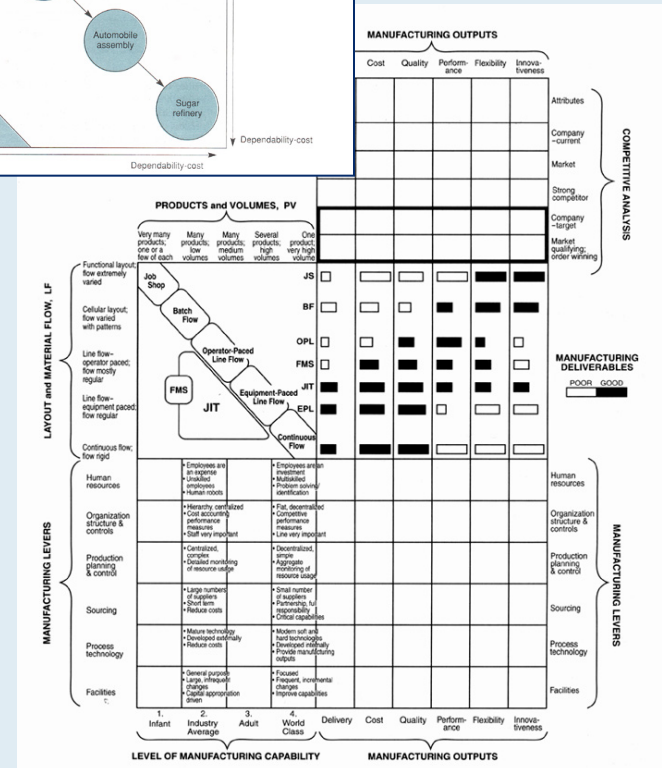
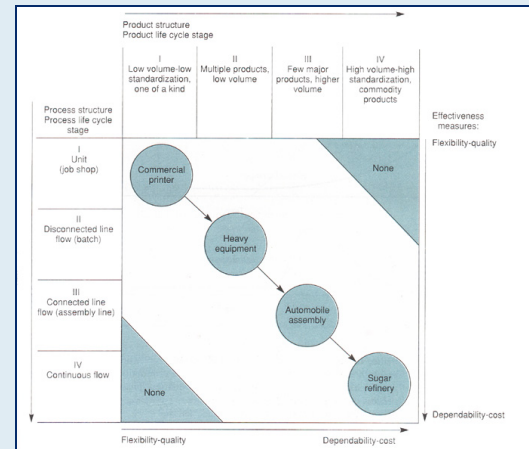
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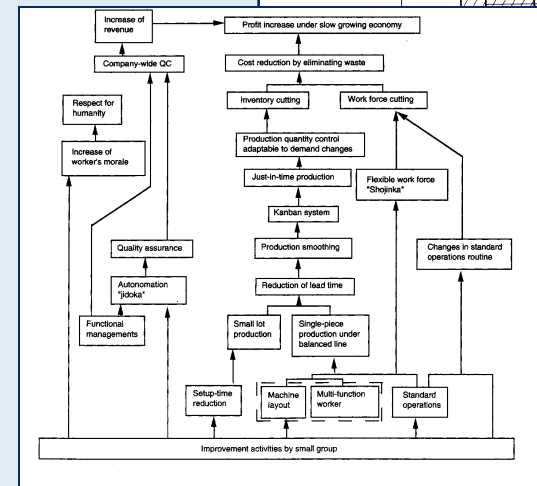
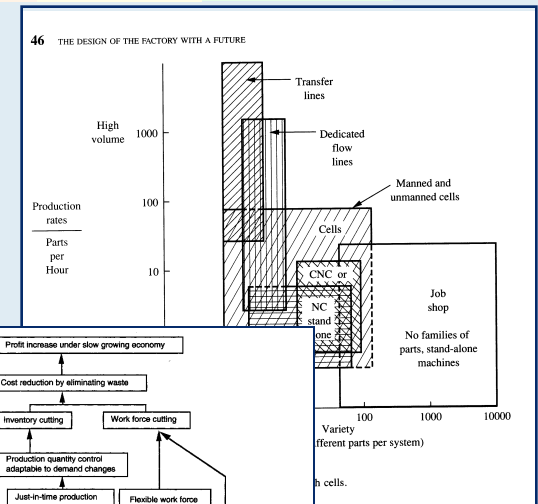
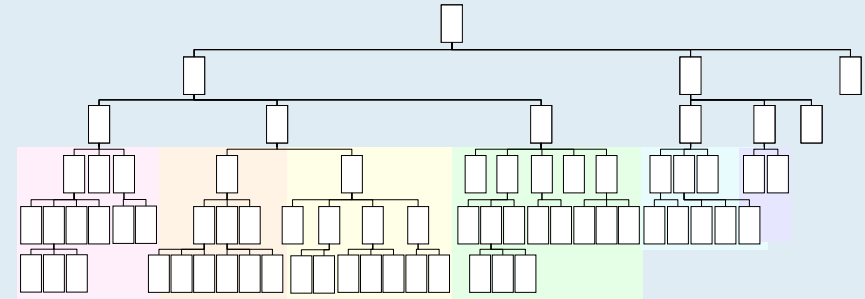
Finalized Product Design

Rate Production

- **Focused Factory**
  - Wickham Skinner
- **Product-Process Matrix**
  - Hayes and Wheelwright
- **3-DCE**
  - Charlie Fine
- **Nine Components of Manufacturing Strategy**
  - Fine and Hax
- **Manufacturing Strategy Worksheet**
  - Miltenburg



- **Axiomatic design/MSDD**
  - Cochran
- **Production Preparation Process (3P)**
- **2-D manufacturing world maps**
- **Toyota production system frameworks**
  - Ohno, Shingo, and Monden
- **Various analytical tools/  
computer simulation tools**



- **Manufacturing system design is more than the factory floor**
- **Manufacturing system design is strategy driven**
- **There is no one size fits all general manufacturing system design methodology**
- **Best results realized by interacting with design, suppliers and marketing**
- **Manufacturing is a competitive weapon in a maturing product industry**