➢ Industrial product maturity impact on manufacturing

➢ What is manufacturing system design

➢ The manufacturing system design framework
Post Dominant Design Industrial Role

➢ 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

2. Manufacturing system “structure” design
   - Buildings, location, capacity
   - Machine selection
   - Layout
   - WIP

Manufacturing System Design Tools

Manufacturing Strategy Tools
Manufacturing System Design

Stakeholders
- Corporate Level
  - [Seek approval]
- Business Unit
  - [Interpret]

Product Strategy
- Suppliers
- Product Design
- Manufacturing
- Marketing

Requirements/Considerations/Constraints
- Design Kaizen
- VSM
- Kaizen
- Trial & Error
- Kaikaku
- Analytical Tools
- Simulation Tools

Manufacturing System Design/Selection
- DFMA, IPT
- 3-DCE
- Concurrent Engineering

Implement (pilot)
- Fine Tune
- Evaluate/Validate

Rate Production

Make/Buy
- Risk-sharing Partnerships

Finalized Product Design
High Level Strategy Tools/Concepts

- 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
Lean Aerospace Initiative

Manufacturing System Design Tools

➢ 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
Conclusions

➢ 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