

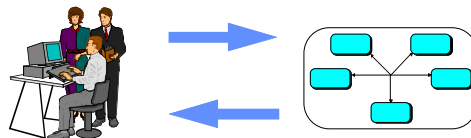
# Virtual Factories

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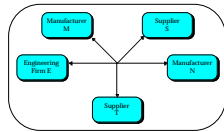
# Virtual Enterprises

- Definitions
- Strengths
- Virtual Manufacturing in a Virtual Enterprise
- Optimal Selection of Partners  
for Agile Manufacturing
- Forming a Virtual Enterprise
- Requirements
- Challenges

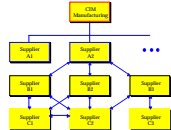


## Definitions of a Virtual Enterprise

- Several smaller companies that cooperate to design and manufacture a product
- A global partnership that integrates its activities via computer communication



- A large manufacturer and its supply chain
- A flexible organization that changes when new opportunities appear



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## Virtual Enterprise Strengths

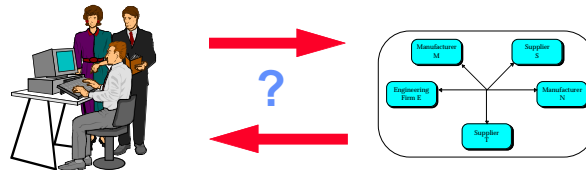
- **Adaptive:** reacts **quickly** when market conditions change or a military threat appears
- **Customized:** includes manufacturing resources **selected** for their abilities
- **Efficient:** **low-cost**, low-volume production
- **Effective:** supporting technology enables it to manage the supply chain **better**
  - » Increase on-time deliveries
  - » Compress lead times
  - » Reduce inventory, freight, changeover costs

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## Virtual Manufacturing in a Virtual Enterprise

- Need to select partners to develop and manufacture a product
- Which comes first? Product design or partner selection?
- Designers should consider partner capabilities
- Virtual enterprise should have optimal partners



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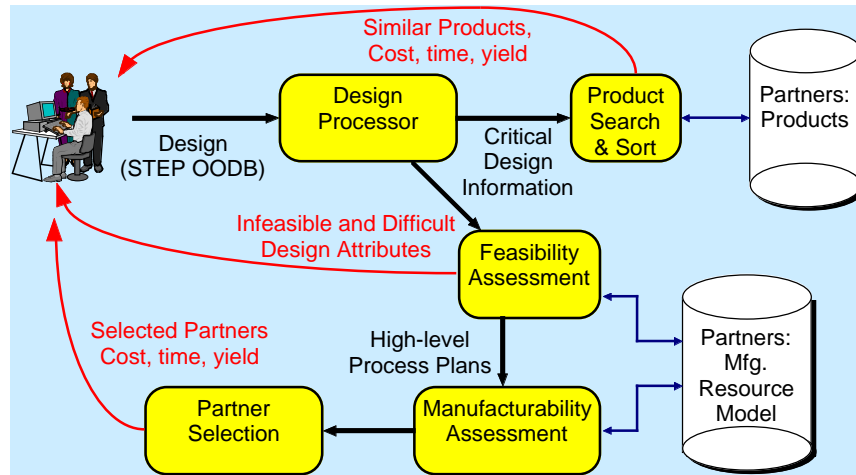
## Optimal Selection of Partners for Agile Manufacturing

- **Vision**
  - » Design for manufacture by multi-enterprise partnerships
  - » Assign production tasks to most suitable partners
  - » Perform design evaluation and partner selection early in product life cycle
- **Technical Objectives**
  - » Retrieve similar designs already developed by partners
  - » Detect infeasible design attributes
  - » Evaluate design manufacturability with respect to partners' production capabilities
  - » Integrate solid modeling and Internet technologies

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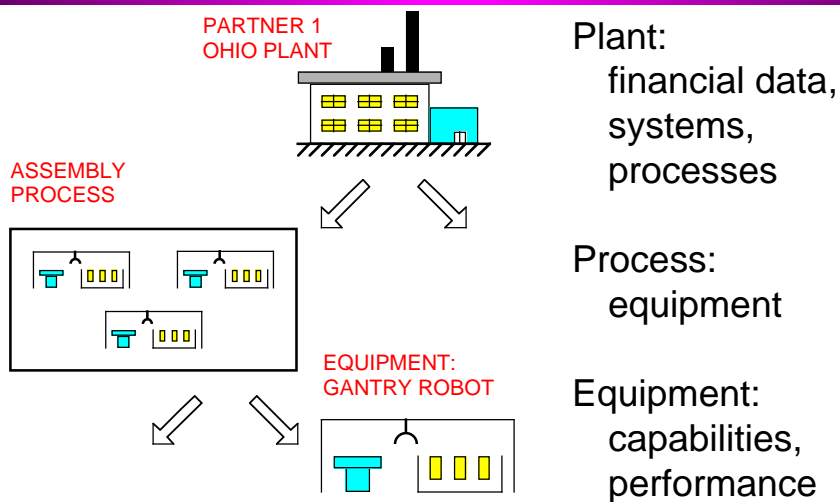
# Integrated Design Evaluation and Partner Selection



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# Manufacturing Resource Model

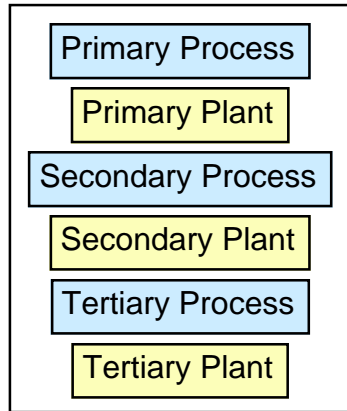


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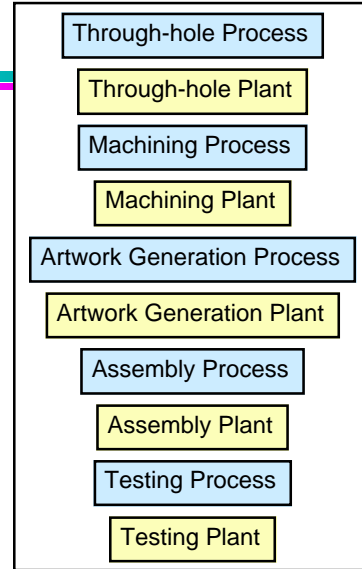
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# High-level Process Planning

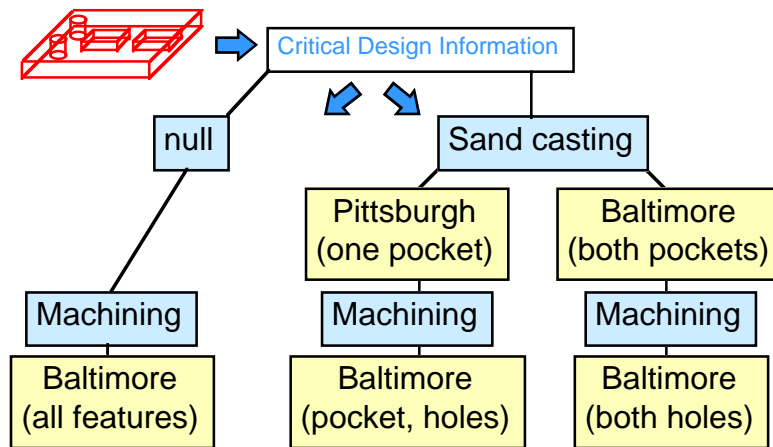
## Mechanical Product



## MWM Product

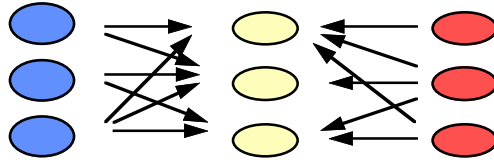


# High-level Process Planning



# Forming a Virtual Enterprise

Alternatives Requirements Partners



Select an alternative and partners simultaneously

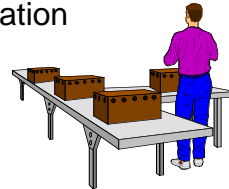
Evaluate how well partners meet requirements

# Requirements

- Business Practices



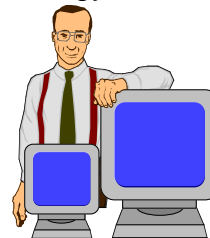
- Shared Manufacturing Information



- Communication



- Technology



## Challenges

- Changing corporate culture (security, trust, perspective, integration)
- Protecting proprietary information while allowing potential customers access
- Developing standards
- Using heterogeneous legacy databases
- Communicating complex engineering knowledge
- Creating robust technology