Lean Enterprise Value Simulation Game

Presented By
Hugh McManus and Eric Rebentisch
Metis Design and MIT

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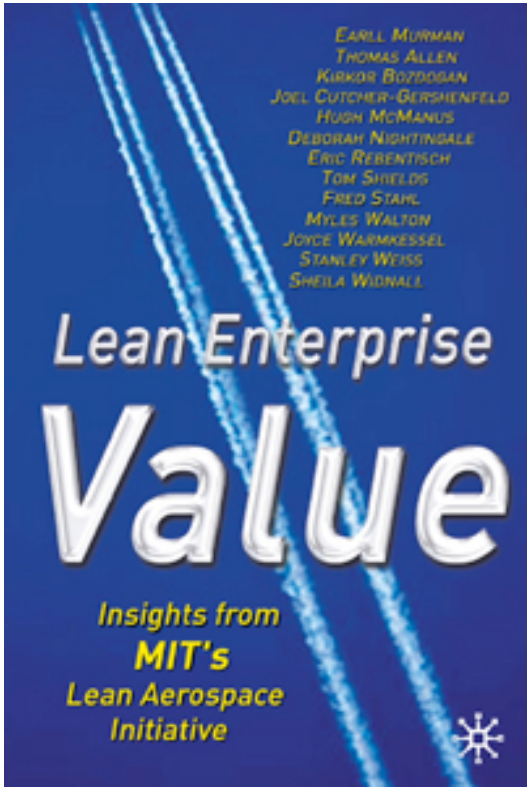
The Game

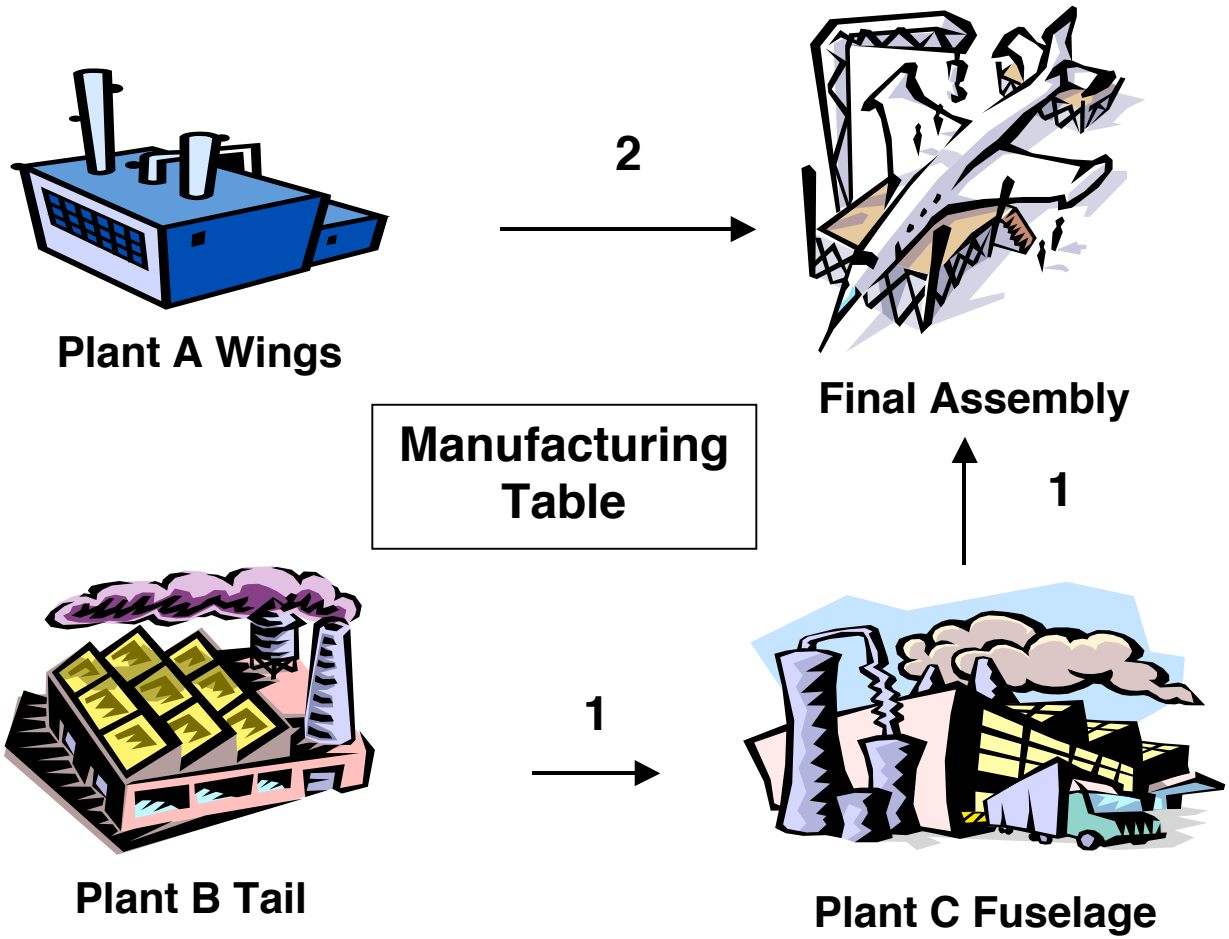
- A simulation of a complex aerospace enterprise
- Philosophy draws heavily on LAI research and the recent book *Lean Enterprise Value*
- Content and cases based on LAI member experience
- Integrated with lecture material to provide intellectual basis, tools, and experiential learning



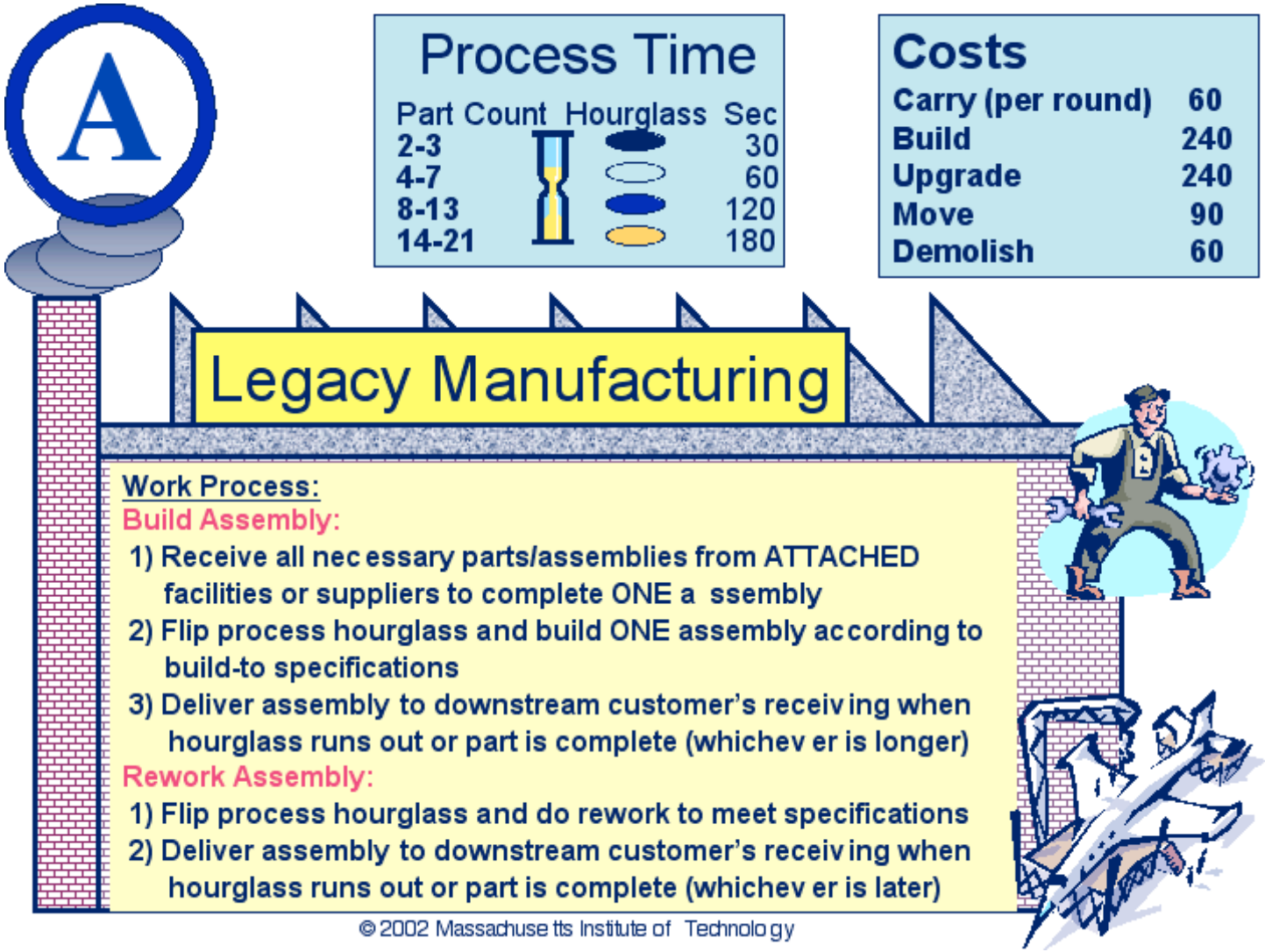
Game Architecture

- Tables of 4-6 people represent major silos
  - Manufacturing
  - Supplier Network
  - Product Development
  - Each table can be a stand-alone game
- Each person has their own facility, or “Mat”
  - Manufacturing plant
  - Individual 1st or 2nd tier supplier
  - Product Development function
- Game Goals:
  - Build Lego™ aircraft efficiently, make “money”
  - Adapt to changes in supply base and customer need

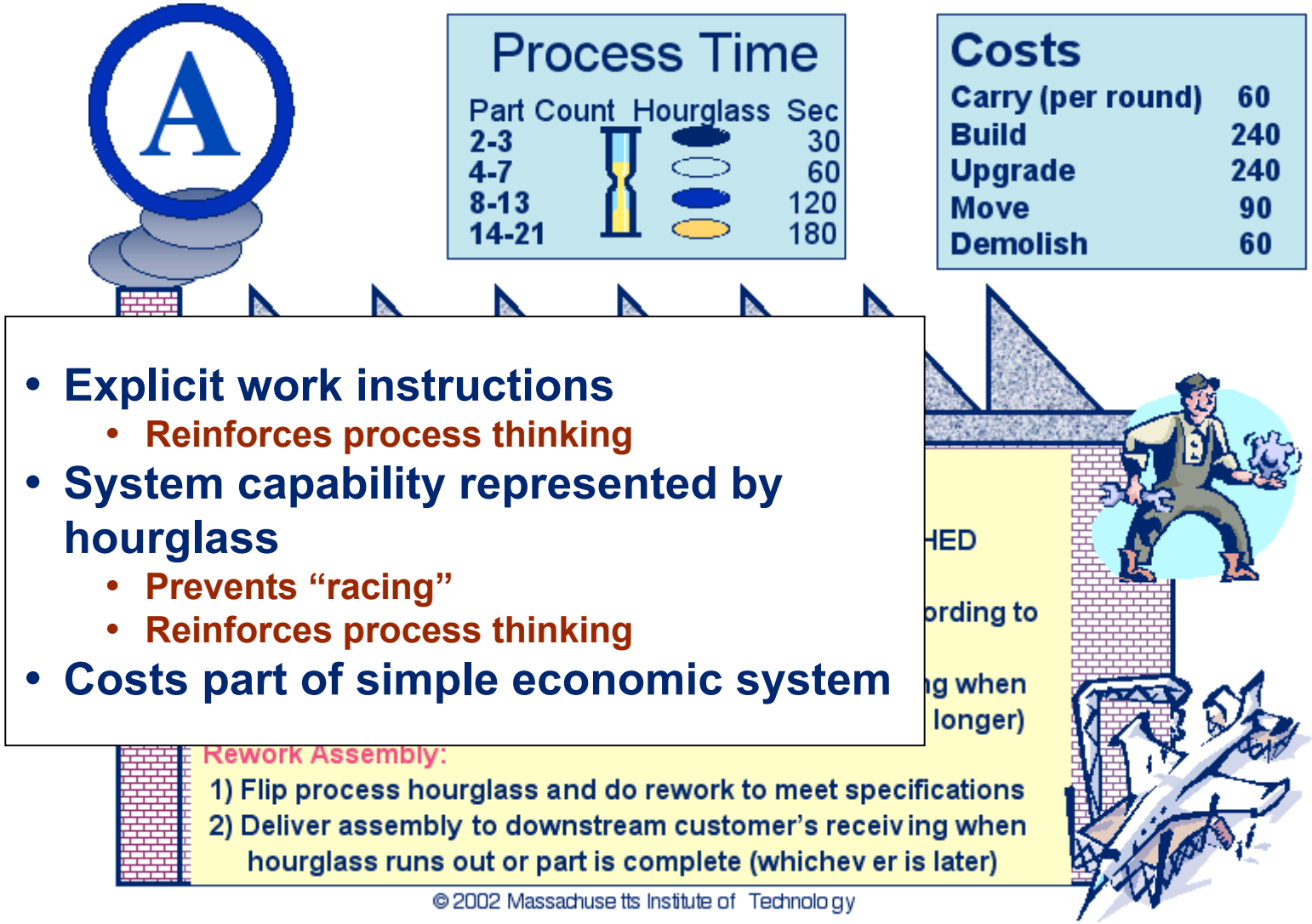
Manufacturing Table



Manufacturing Mat

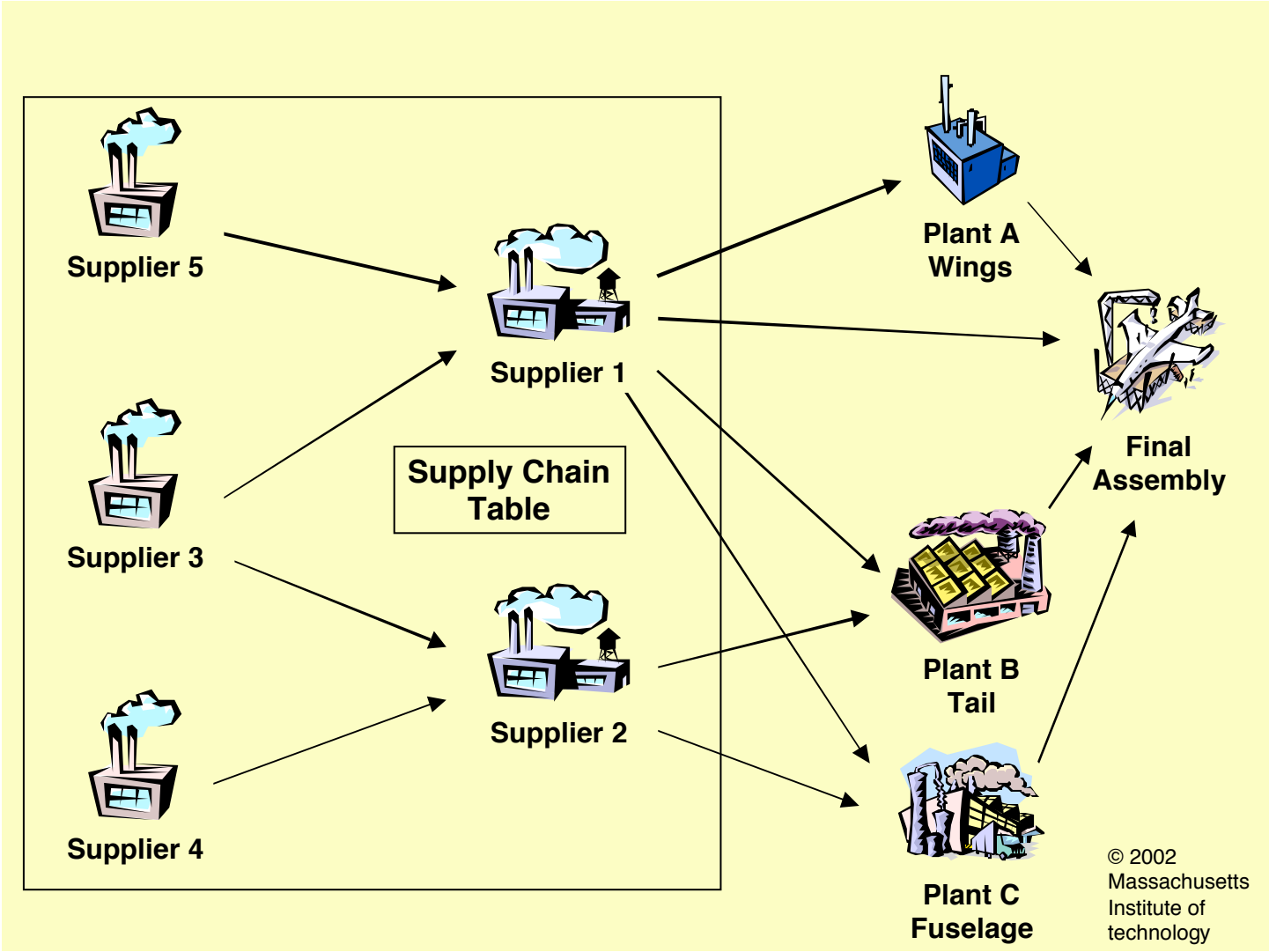


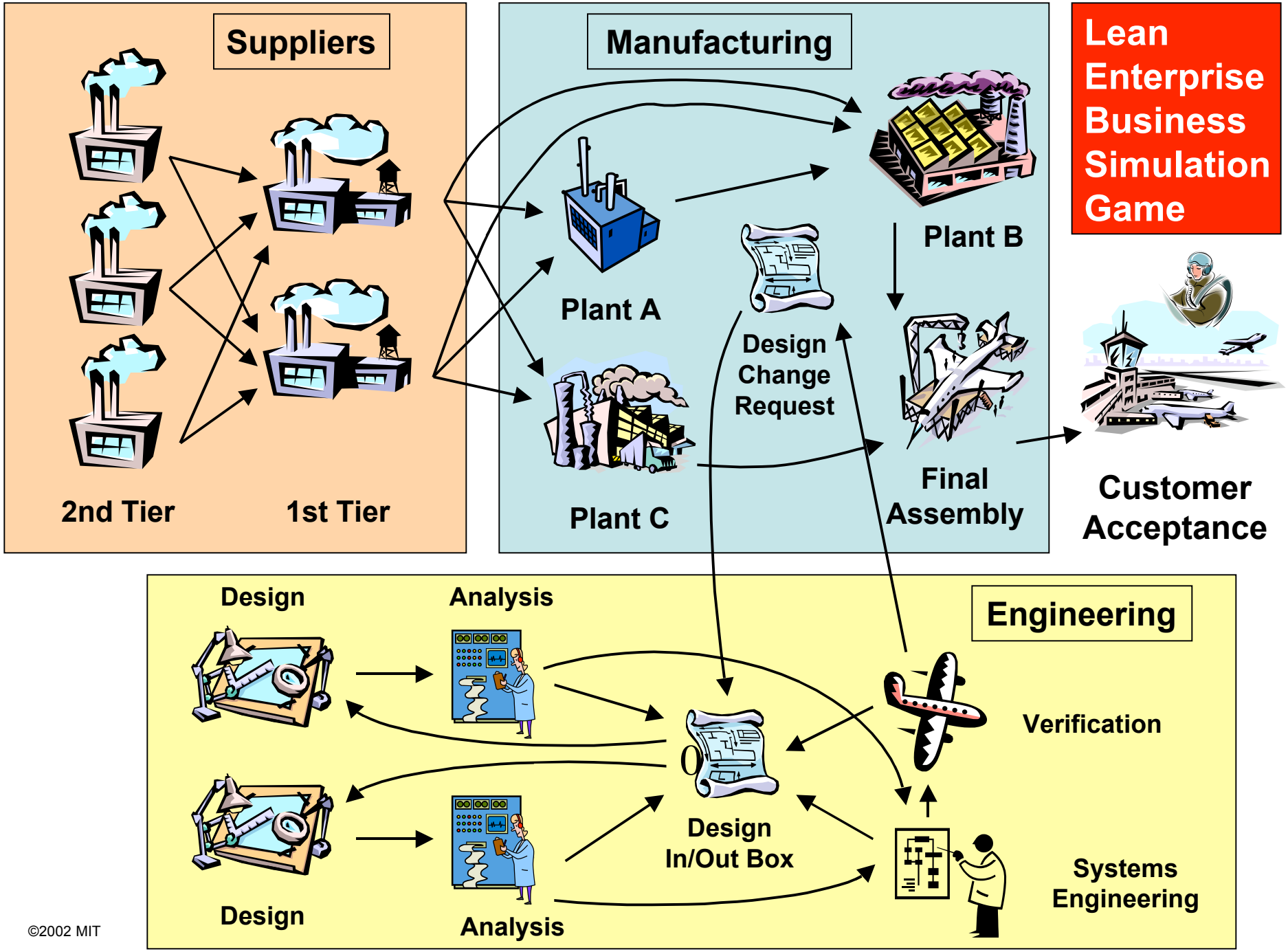
Manufacturing Mat



- Explicit work instructions
  - Reinforces process thinking
- System capability represented by hourglass
  - Prevents "racing"
  - Reinforces process thinking
- Costs part of simple economic system

Supply Chain




Suppliers
Manufacturing
Lean Enterprise Business Simulation Game
2nd Tier
1st Tier
Plant A
Plant B
Plant C
Design Change Request
Final Assembly
Customer Acceptance
Design
Analysis
Engineering
Design
Analysis
Design In/Out Box
Verification
Systems Engineering

Designed for minimum complexity given *advanced* lean lessons

- Manufacturing table
  - Balancing load distributions, establishing and reducing Takt time
  - Targeted capability improvements at bottlenecks
  - Links to Supply Chain and PD
- Supplier Network table
  - Supply chain architecture
  - Transactions (orders management and accounting) burdens
  - Role of visibility across the supply chain
- Product Development table
  - Visualizing Process
  - Uncertainty and Iterations
  - Mixed model line with conflicting priorities
- Enterprise Integration and Adaptability Issues
  - Relationship development and information system design
  - Learning curve and enterprise change dynamics
  - Multi-stakeholder value proposition creation

The Game as a Teaching Tool

- Game "Scenarios" designed to support learning objective
  - Which modules to use
  - Start point - chaos to almost lean
  - Level of mentoring - free play to dictated improvements
  - Many other variables
- Integration with lecture material and other tools
  - Most effective when interspersed with lean lessons
  - Serves multiple learning styles
- The game provides tactile and experiential lessons in lean
  - "I like how the day was broken up -- lecture/simulation alternating. It made for a more interesting day *and less boring*. Thanks."

Example: Lean Enterprise Value Seminar

- A three-day integrated learning experience for advanced students - Summer 2002
- Learning objectives
  - Necessity (and difficulty) of full enterprise lean
  - Big payoffs in cross-functional cooperation
  - Living with change and disruption
- Scenario
  - Entire game (participants "staff" manufacturing, suppliers, and PD)
  - Legacy (very unlean starting position) to Lean transition
  - Active mentoring on game mechanics, but players made their own decisions
  - Early improvements made at individual tables
  - Later improvements made cooperatively *across* tables
  - Instabilities in supply chain and changing customer needs

Scenes from LEV game

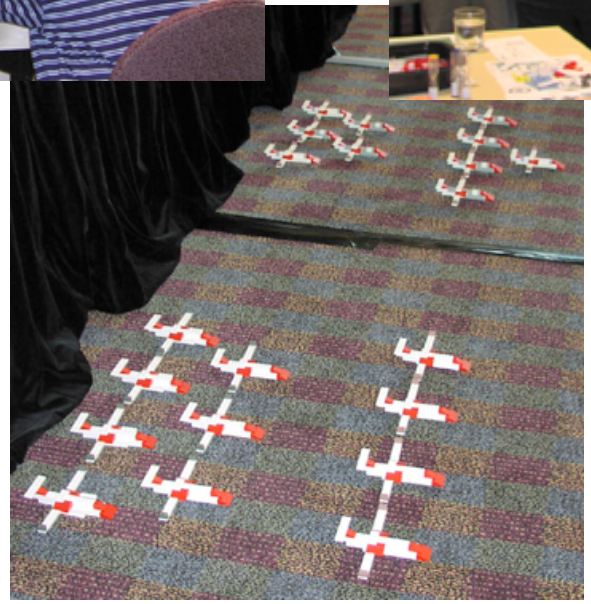
Supplier Network Table

Manufacturing and PD

Integrated Learning

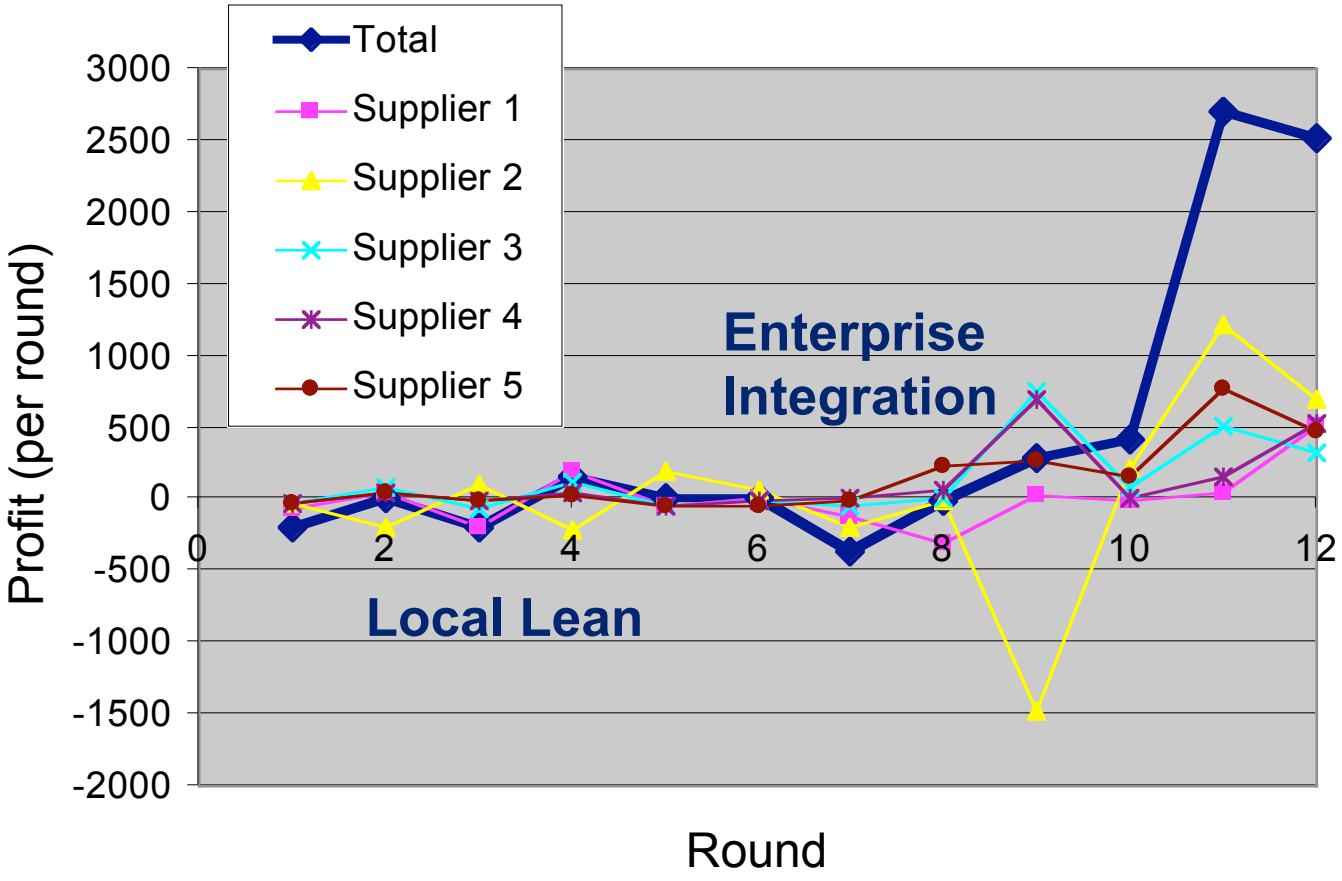
Lecture

Peer Learning



Lean Production

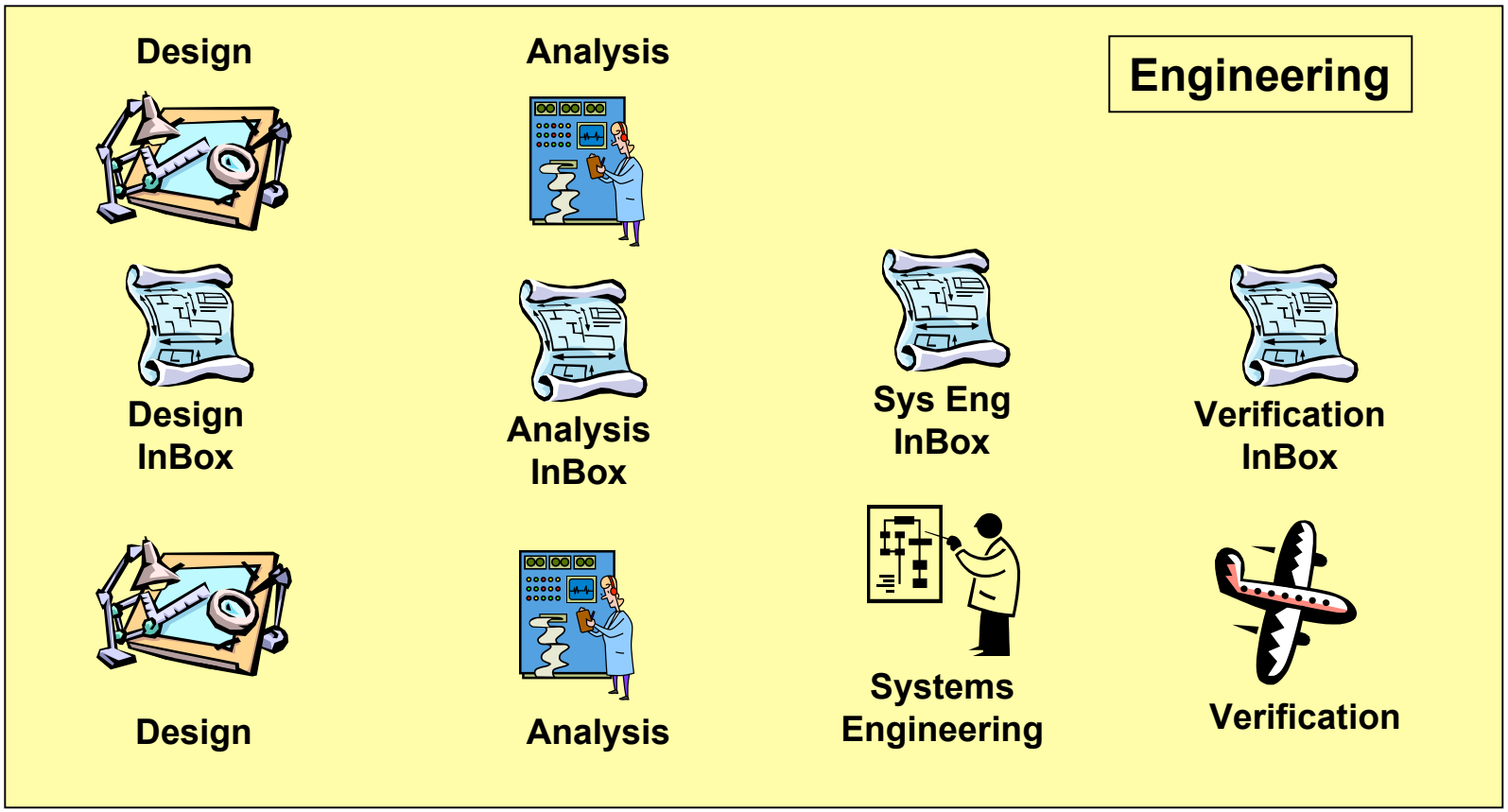
Game Simulates Lean Enterprise: Supplier Profits

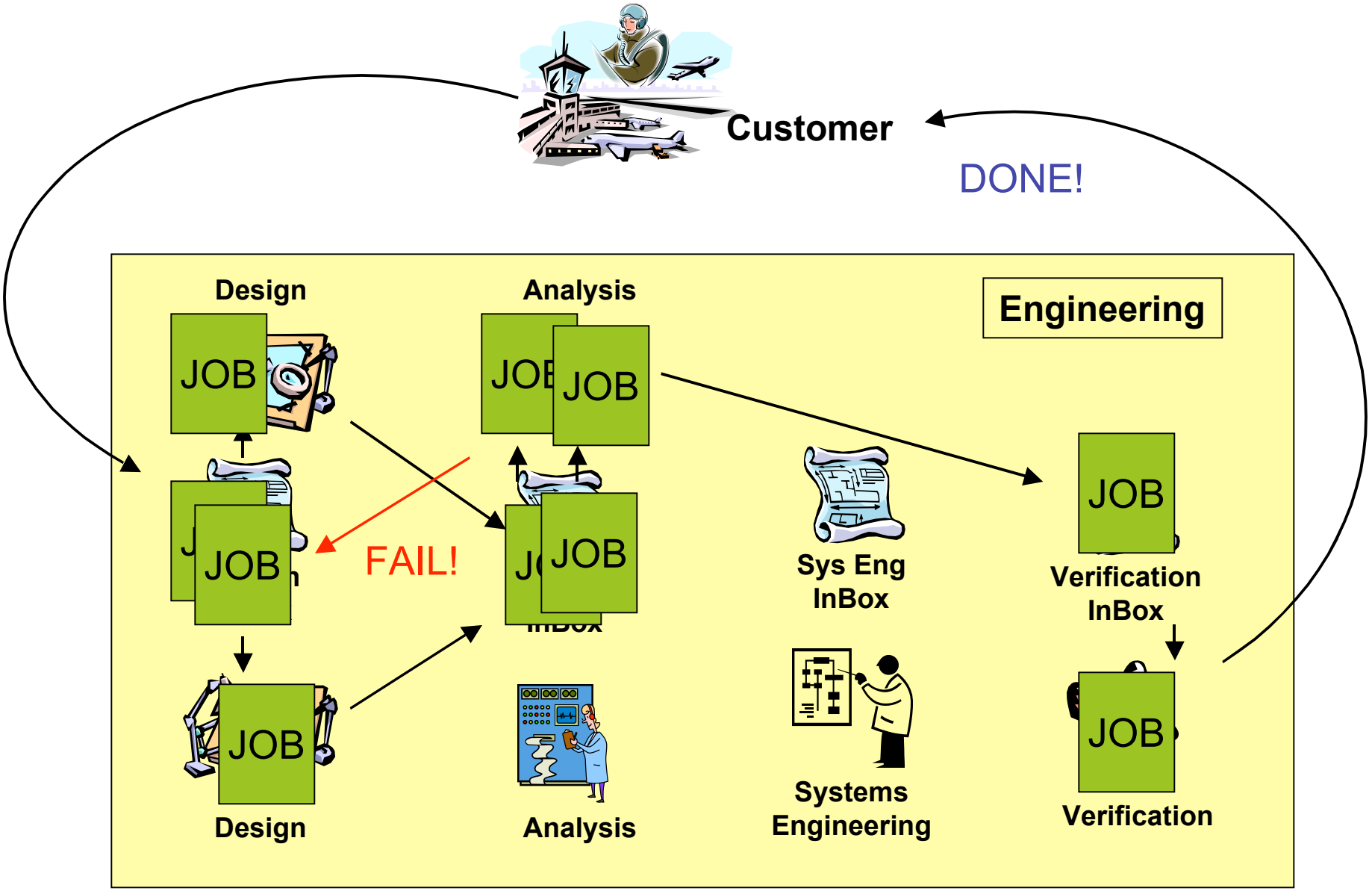


Example: Lean Engineering Training

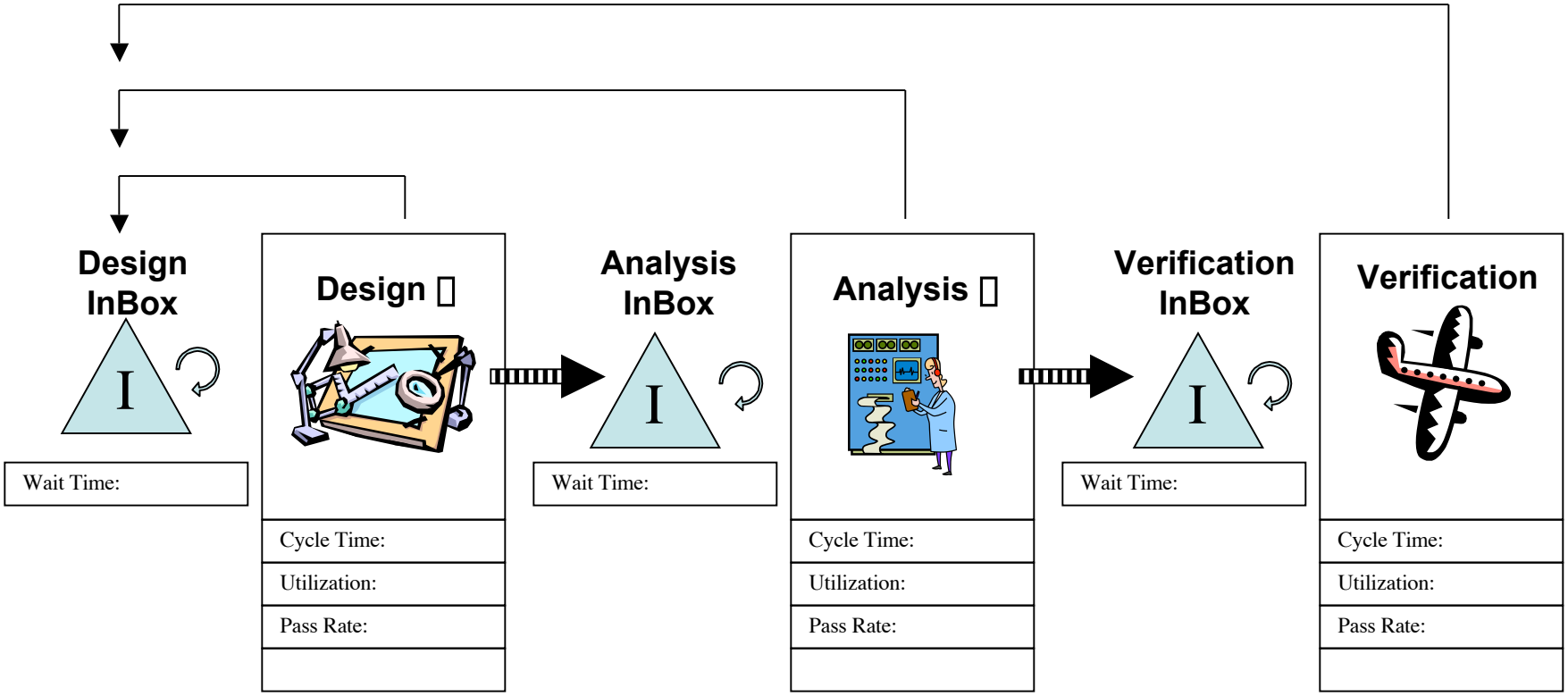
- One day course in basic lean concepts for engineers
- Lecture, film, game
- Learning objectives - understanding how lean applies
  - Understanding and visualizing engineering processes
  - Effect of uncertainties and iterations
  - Effect of “mixed model” production (hard and easy jobs)
- Scenario
  - PD table as stand-alone game
  - Situations modeled on CMMI levels 1, 3, 5 (unlean and unmeasured process to lean, measured, managed process)
  - Active mentoring on game mechanics and improvements
  - “Customer” provides lots of work, demands cycle time improvement

Visualizing Engineering Processes

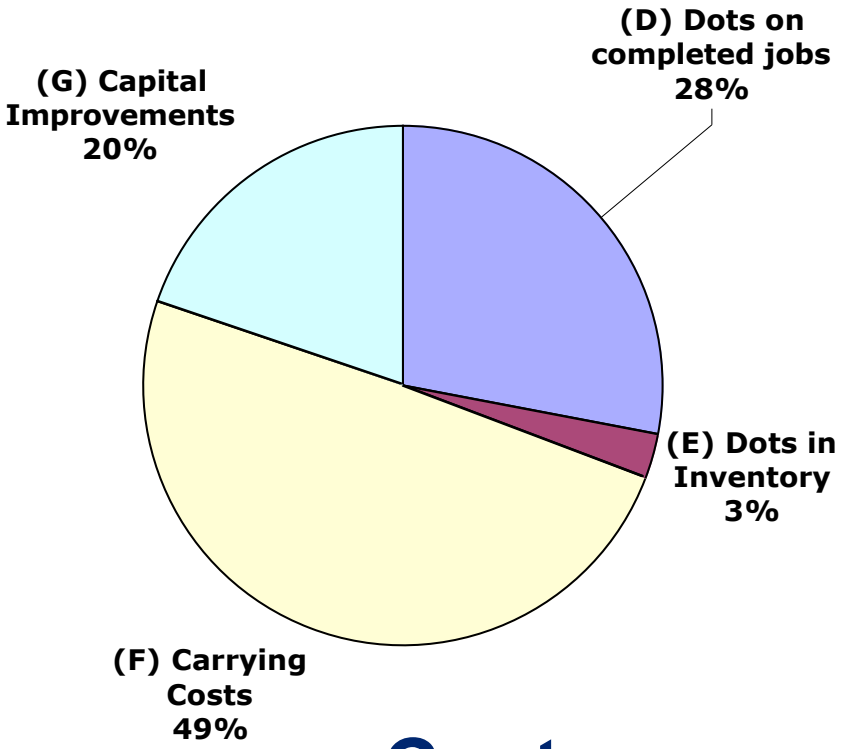



Customer
DONE!
Engineering
Design
Analysis
JOB
JOB
JOB
JOB
JOB
JOB
FAIL!
Sys Eng
InBox
Verification
InBox
Systems
Engineering
Verification
Design
Analysis

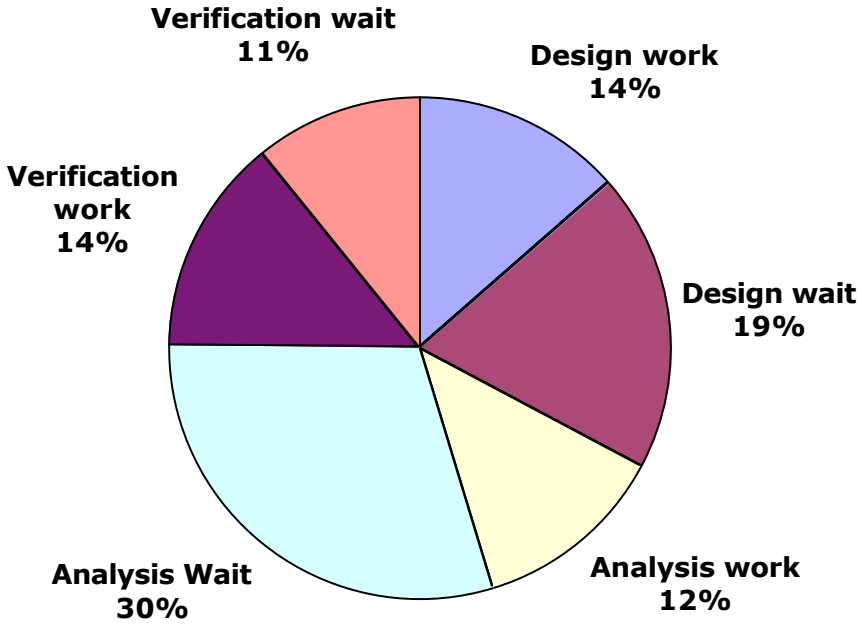
Understanding the Value Stream



Understanding causes and metrics



Cost



Time

Lessons Learned

- Game effective
- Game scenario needs to be adapted to learning objectives
- Time needed to learn mechanics and absorb lessons
- Active mentoring (helping players learn) and mastering (adapting scenario real-time) vital

- Response enthusiastic - game is fun
- Students quickly come up with improvements
- Students map game situations onto real problems

- Good solutions difficult (esp. enterprise integration)
- Communication and collaboration key to success

An Emerging LAI Product

- **LAI-administered workshops**
  - Summer 2002 Lean Enterprise Value 3-day workshop
  - Future workshops depend on demand
- **Training at your site**
  - Lean Enterprise Value training material and scenarios
  - Custom training possible
- **Collaborative relationships**
  - Use the game and other materials in your training
  - Scenario design, train-the-trainer mentoring possible
  - IP policy emerging
- **Please ask us about possibilities**

