2012 MIT Leaders for Global Operations Conference
The Future of Manufacturing in the U.S.

WRAPUP

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In case you’re planning to snooze:

**WRAPUP in a SLIDE**

1. Manufacturing needs Innovation and Innovation needs Manufacturing

2. Manufacturing is People

3. Entrepreneurs need Operations
CONCLUSION #1: Business & Economic success require both Creativity & Discipline

Manufacturing and Innovation are inseparable.
Need to proselytize?
What organizations are good at both creativity and discipline?

1. The new General Motors
2. Amgen
3. Spirit AeroSystems
4. Caterpillar
5. Boeing
6. Phillips
7. J&J
8. Accenture
9. GE
10. Amgen
11. Novartis
12. MIT
What “models” enable organizations BOTH creativity AND discipline?

1. The IDEO model
2. The Apple model
3. The Toyota/McDonalds Model
One Candidate:

IDEO

First Apple Production Mouse

Humulin Insulin Pen

... first commercial mouse, the first laptop, the first stand-up toothpaste tube and the first 25-foot robotic whale, the Palm V ...

Palm V
**IDEO Process**

**Principles**
- Respect for everyone
- Seek ideas from a wide variety of sources
- Incorporate learning rapidly
- Balance creativity and discipline

**Practices**
- Vote for decisions
- Encourage egalitarianism and teamwork, not hierarchy
- Seek out experts/customers
- Draw employees from widely divergent disciplines
- Encourage playfulness
- Ask for forgiveness, not for permission
- Utilize rapid iteration of prototypes
- Free flow of discussion
- Parallel conversations
- Encourage focused chaos
- "Adults" take over
- Have clear, tangible goals and serious deadlines
1. Define the Design Challenge.
   - Build the Team.
   - Set up the room.
   - Set the stage; prep the team(s); kick off the project.
   - Visit the experts; Learn, Display, and Share the insights.
   - Brainstorm possible solutions for the design problem.
   - Vote for the best solution ideas.
   - Create rapid prototypes.
   - Frenzies: Test prototypes and get rapid feedback.
   - Repeat the Cycle as necessary: Brainstorm, prototype, frenzy.
   - Complete the final prototype solution.
   - Deep Dive: After action review
Disruptive Process Innovation just as important as Disruptive Product Innovation

Disruptive Process Innovators:
1. Ford
2. Toyota
3. Dell
4. Wal-mart
5. Southwest Air
6. Wal-mart
7. Zara
Hammer’s Top Ten “Rules” of Process Engineering

1. **Understand process engineering concepts.**
2. **Identify your processes.**
3. **Understand existing processes.** Don’t over analyze them.
4. **“Serious” and committed leadership is critical.**
5. **Encourage aggressively creative ideas.**
6. **Use prototypes and experiments to test ideas.**
7. **Be fast. Be focused.**
8. **Everything should be on the table.**
9. **Implementation should be fast, improvisational, iterative.**
10. **Tend to the needs of your people.**

*Adapted from Hammer & Stanton, *The Reengineering Revolution*, Chapter 2, 1995*
The Apple Model

**Creativity**

**Discipline**

Think different.
Toyota & McDonald’s
Balance Creativity and Discipline

Process Discipline and Standardization

a. Tasks
b. Communication
c. Processes
d. Improvement Process
   (= the scientific method)
   Hypothesis, Experiment, Data, Conclusion, Change, Repeat
The Scientific Method
“greatest single innovation in the history of mankind”? 

But, is it enough?

a. Systems problems are too complex for simple designed experiments
b. Long time lags from experiment to results
c. Cause & effect relationships too noisy
d. Need Systems Models & Simulations
Conclusion #2: MFG=PEOPLE
Leaven Discipline w/Humanity & Humility

Motivated People
Drive faster Improvement

Continuous Improvement

Respect For People

Profits get shared
to reward and incentivize alignment

Need collaboration across gov’t, academia, industry
Conclusion #3: Entrepreneurs need Operations

1. Small entrepreneurs who master operations are more likely to grow up to be large entrepreneurs and employers.

2. Small entrepreneurs who master operations are less likely to outsource or offshore it.
Conclusion #3: Entrepreneurs need Operations

“Operations for Entrepreneurs”:

1. **NAIL IT.**

2. **SCALE IT.**

3. **SAIL IT (or SALE IT).**
Operations for Entrepreneurs:

1. **NAIL IT.**
   - Requires business creativity
   - and MUCH hard work (trial & error)
   - and sometimes technical creativity

2. **SCALE IT.**
   - requires operations discipline
   - requires a supply chain model
   - continued experimentation

3. **SAIL IT.**
   - requires operations discipline
   - requires continuous improvement
   - requires integral relationships(?)
All Conclusions are *Temporary*

Clockspeeds are increasing almost everywhere
Value Chains are changing rapidly

Assessment of value chain dynamics

Build Strategies and Roadmaps