Industrial Engineering, Finance, and Strategic Operations

John R. Birge
University of Chicago Graduate School of Business
Theme

• IE has a rich tradition that contributed significantly to productivity gains over the past century
• Increasing challenges of complexity, network interactions, and global market pressures
• Adaptable and integrated approaches based on our core discipline can enable continued productivity improvements across industries, processes, and functions
Outline

• IE’s traditional core contributions
• Challenges in complex global interactions
• Successes and opportunities in integrating across functional boundaries and enabling adaptive processes
• Keys for further innovation
• Conclusions
IE’s Core Contributions

• Origin in Taylor’s search for “one best way”
• Process descriptions and standardizations enabling productivity measurement and improvement
• Focus on key areas:
  – Efficiency
  – Quality
  – Evaluation (and Valuation)
• Clear contribution to much of the success of manufacturing sector (and beyond)
Challenges to Continued IE Value Proposition

• Manufacturing success brings smaller impact on economy
  – Productivity improvements will continue to reduce share of GDP (both US and worldwide)

• Increasing complexity makes impacts harder to measure, breakdowns more likely, and limited models/programs potentially harmful

• Globalization and market trends toward customization and time competitiveness have changed traditional measures and rankings
Results of Network Complexity

• Common failures
  – Energy – blackouts, California crisis
  – Financial - bubble, crashes, firm failures
  – Communications – regional losses
  – Health – epidemic spreads
  – Media – disinformation spreads

• Why?
  – Lack of central control
  – Lack of awareness, visibility
  – Interdependencies

• What to do?
  – New form of modeling
  – New analyses and computation
Complexity Increase Example: Regulated to Deregulated Markets

• Regulated
  – Single or few producers
  – Prices controlled by commission
  – Costs passed to consumers (eventually)
  – Little incentive for efficiency

• Deregulated
  – Multiple producers
  – Prices governed by market mechanism
  – Potential for market power (vary supply to manipulate price)
  – Questions about security (sufficient capacity)
Complexity and Trends in Automotive Market: Craft to Mass Customization

• Production Trends:
  Craft => Mass => Lean

• Next Steps:
  Agile/Flexible and Mass Customization
Additional Trends

- Globalization

- Consolidation

Source: OICA

Source: Accenture
Valuations and Asset Base

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<tr>
<th>Company</th>
<th>Market Cap ($B)</th>
<th>Market/book*100</th>
<th>Market/assets*100</th>
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Inventory Turns

- GM
- Ford
- Daimler-Chrysler
- Toyota
- Harley-Davidson
- Johnson Controls

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Summary of Measure Changes

- Not just hours per product
- Value enhancement from variety increases and responsiveness
- Inventory not the same measure of lean-ness
- Valuations increasingly based on more than hard assets
Opportunities for Growth

• Core analytical tools necessary for grasping enterprise level systems, interactions, and measurements (but beware of narrow focus)
• Potential demonstrated in key integration steps across functions
• Service sector and non-traditional processes offer broad opportunities
Some Lessons from Studying Current Approaches

• JIT?
  – Linked to more profitability, not to efficiency; Responsive inventory improves returns (not absolute levels) (Callen/Morel/Fader – CAR)

• Merging?
  – Need consistency on function/product alignment and incentives (Gertner et al. Chicago GSB)

• Supply chain organization?
  – External supplier collaboration helps (i.e., less vertical OEM integration) and disruptions hurt (Rich/Hines – Singhal/Hendricks)

• Reducing product lines?
  – Customer preference data can inform choice (Numerous – Marketing/design)

• Multiple improvement programs?
  – May coordinate or be in conflict (e.g., quality/JIT - Callen et al.)
Integration Successes: Marketing Operations

• Principle: treat marketing as a process with potential for improvement
• Example: Yahoo!
• Former situation: Individual sales (craft)
• Current: Plan for each inventory unit (mass)
• Results: Quarterly earnings up 50% in 2 years
Integration Successes: Finance and Operations

• Increasing use in “back-office” operations from traditional transactions to “middle-office” activities (e.g., risk management)
• Increasing academic interest in bridging functional divide
• Empirical indications of integrated activity
Integrated Activity Implications in US

• If operations and financing are interacting, then (for profitable firms) leverage should decrease with margins and then increase.

• Observations: Different with negative margins?
Integrating Strategy and Operations

• Changing planning to process of addressing issues
• Incorporating adaptability into strategic plans
• Example: Boeing corporate planning process – continuous process of “strategic decision making” not “strategic planning”
Integration in R&D

• Recent survey*
  – 45% increasing rate of new product innovation
  – 27% decreasing time to market
  – 30% project majority new product from outsider vendors

• Implications?
  – Faster and greater market changes
  – Relationships key

*NineSigma, Inc. 2004
Innovation-Based Operations: Zara

- Small finished-goods inventory
- Constant product introductions: 2 weeks lead/300/week
- Substantial material availability
- High peak capacity
- Local manufacturing
- Direct market measurement
- Results: 85% average full price (compared to industry 65%); 20% average annual sales growth
Other Forms of Innovation

- Apple: consumer understanding, new ideas
- Microsoft/Toyota: continuous improvement
- Dell: cost-cutting
- Google: new views of information
- Wal-Mart: refining supply chain
Keys for Further Improvements in Impact and Recognition

- Consider enterprise-level impacts and interactions across full system
- Expand process models to include functions for innovation as well as traditional areas
- Focus on the value for services throughout an organization and the needs for measurement and process description
Conclusions

• IE has had major impact on growth of world economy
• Threats appear from narrowness of application, function, and industry
• Opportunities lie in integration across functions and in taking a direct role in the process of innovation
Thank you!