CPET 575 Management Of Technology

Managing in an E-Business World¹

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Topics of Discussion¹

- A Changing Environment
- The Unique Nature of Managing Technology-Based Business
- History of Managing Technology
- Forces that Drive Technology Companies Today
- Measuring Technology Content and Intensity
- Case Study: Reprogramming Amazon

A Changing Environment

- Demands
  - Better, faster, and cheaper solution

- Factors
  - Internet => globalization and transparency
  - Technology =>
    - New products and services
    - Improvement of products and services
    - Faster respond to customer and market needs
    - Economics of scale
  - Advanced communication and Computer Technology
    - Siphoned off - Customer loyalty and unique business infrastructure
    - Lower barriers to entry

Environment Changes – Past to Present

- Alvin Toffler, *The Third Wave*, 1980
  - First wave of change (ten thousand years ago) – Invention of agriculture
  - Second wave of change (three hundred years) – Industrial revolution
  - Third wave of change – Highly technological and anti-industrial

- Second Wave of Changes
  - More powerful technologies
  - Bigger cities
  - Faster transport
  - Mass education
Environment Changes – Past to Present

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  - Knowledge, wealth, and violence at the edge of 21st century

  - The top trends that will reshape the world for the next 5, 10, and 20 years

Environment Changes – Past to Present

- Industrial society => Information Society
- Information Society & Age
  - Value <= Knowledge <= Information
  - Knowledge of technology
    - Superior goods and services
  - Product life cycle implication
  - Examples (added value)
    - Online banking
    - Computers, Chips, Connectivity, User Interfaces, Applications,
- Technology-based companies
  - Organizational agility and responsiveness to market conditions
The Unique Nature of Managing Technology-Based Business

- Frequently cited study: *Made in America: Regaining the Productive Edge*, Dertouzos M., Lester R., Solow R., and the MIT Commission on Industry Productivity, 1990: “.. While it is not necessary for every manager to have a science or engineering degree, every manager does need to understand how technologies and investment choices, and how to shepherd scientific and technical concepts through the innovation and production processes to the marketplace”

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The Unique Nature of Managing Technology-Based Business (cont.)

- What is unique about managing in technology?
  1. Value Creation by Applying Technology
  2. Use of Advanced Technology within the Firm’s Operation
  3. Highly Educated Skilled Workers
  4. Replacement of Manual Labors with Technology
  5. Infrastructure
  6. High R&D and Product Development Expenditures
  7. High Risks
  8. Continuing Changes
The Unique Nature of Managing Technology-Based Business (cont.)

- What is unique about managing in technology?
  8. Complex Decision-Making Processes
  9. Short Product Life Cycles
  10. Quick Market Response
  11. Fast Growth Potential
  12. Low Barrier to Entry
  13. Low Profitability in Split of Strong Cash Flow
  14. Threats to Survival and High Failure Rate
  15. Many Alliance, Joint Ventures, and Partnership

The Unique Nature of Managing Technology-Based Business (cont.)

- Six Selected Business Subsystems
  - Work
  - People
  - Work Process
  - Managerial Tool
  - Organizational Culture
  - Business Environment

Figure 2.1 Business subsystems unique to technology-intensive organization
Six Selected Business Subsystems (Work)

- **Work**
  - More complex and requiring special skills, tools, processes, and support system.
  - Project oriented and executed by a multidisciplinary team
  - Incrementally and iteratively

- **Impact Areas**
  - Organizational structure
  - Work planning
  - Work processes (e.g. project management)
  - Personnel recruiting and advancement
  - Skill development
  - Management style
  - Organizational culture, and
  - Business strategy

Six Selected Business Subsystems (People)

- **People**
  - Highly specialized skills, Better educated, Self-motivated and directed, require minimum supervision
  - Enjoy autonomy and freedom of decision making, willing to take responsibilities
  - Enjoy problem solving, sense of community and team spirit
  - Little tolerance for personal conflict, anxiety, and organizational politics

- **Impact Areas**
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  - Work planning
  - Work processes (e.g. project management)
  - Personnel recruiting and advancement
  - Skill development
  - Management style
  - Organizational culture, and
  - Business strategy
Six Selected Business Subsystems (Work Process)

- Work Process
  - Ability to deal effectively with
    - Complexity
    - Uncertainty
    - Speed, and
    - Innovation
  - Less sequential and centrally administrative
  - More team based, self-directed, and agile

- New Organizational Models and Management Methods
  - Stage-gate
  - Concurrent engineering
  - Design-build processes
  - Matrix
  - Project management
  - Product management

Six Selected Business Subsystems (Work Process)

- Impacted Areas
  - People Issues
  - Management Style
  - Organizational Culture
  - Management tools
    - Scheduling
    - Budgeting
    - Project Performance Analysis
    - Operational Effectiveness
      - Time to Market
      - Cost
      - Flexibility
Six Selected Business Subsystems (cont.)

**Managerial Tools and Techniques**
- Project Management
- Product Management
- Quality Control
- General Management (legal, HR, accounting, training)
- Strategic

**Impact Areas**
- Effectiveness of Tools and Techniques
- Trade-offs Factors
  - Efficiency vs. Speed
  - Control vs. Flexibility
  - Optimization vs. Risk
- Implementation Challenges

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Six Selected Business Subsystems (cont.)

**Organizational Culture**
- More Team-Oriented
  - Decision Making
  - Work Flow
  - Performance Evaluation
  - Workgroup Management
- Authority
  - Earned, Credibility, Trust, Respect
- Rewards
- Recognition

**Impact Areas**
- People
- Work Processes
Six Selected Business Subsystems (cont.)

- Business Environment
  - Fast Changing
    - Market Structure
    - Suppliers
    - Regulations
  - Shorter product life cycles
  - Intense global competition
  - Strong dependency on
    - Technologies
    - Support systems

- Impact Areas (speed, agility, efficiency)
  - Need speed, agility, efficiency
  - Work process design
  - Organization and execution of work
  - Management methods, tools, and techniques
  - Business strategy and competitive behavior
    - Alliance, Mergers, Acquisitions, Consortia, and Joint Ventures

History of Managing Technology

- How did we get into such a complex world of business?
- What role did technology play in the past?
- Earlier Civilizations
  - Stone Age
  - Bronze Age
  - Iron Age
- More Recent Periods
  - Steam Age
  - Electricity Age
  - Nuclear Age
  - Electronic Age
  - Space Age
  - Information Age
  - Biotechnology Age
History of Managing Technology (cont.)

- 1950s
  - Formal Recognition of Technology and Its Importance to business for leveraging resources and competitive positioning

- Next 30 Years
  - Increasing awareness
  - Recognizing benefits

- 1980s
  - Management focus on Innovation and Technology Transfer toward the generation of proprietary knowledge applied to new products, processes, and services

History of Managing Technology (cont.)

- Traditional Technology Development
  - Basic research
  - Applied research
  - Product development
  - Manufacturing

- Japanese Firms
  - Very effective in rapid transferring research into successful commercial products
  - Performing several of conventional development phases in parallel
  - Productivity Enhancement: New product development, Automation of manufacturing & testing, and Information processing
Forces That Drive Technology Company Today

- Shift from Linear Process to Dynamic Systems
- Shift from Executing Projects to Enterprise-Wide Project Management
- Shift from Managing Information to Fully Utilizing Information Technology
- Shift from Managerial Control to Self-Direction and Accountability
- Shift from Managing Technology as Part of a Functional Specialty to Management of Technology and Engineering Management with Distinct Skill Sets and Professional Status

Measuring Technology Content and Intensity

- Specific Dimensions
  - Capital equipment/employee
  - Value added/employee
  - Sales of goods and services/employee
  - Technology-based skill requirements/employee
  - Purchase or acquisition of technical materials and services
  - Life cycle (shrinking) of materials, components, and services used in the business process
  - Life cycle (shrinking) of products and services generated

- Force Field Analysis
Measuring Technology Content and Intensity

Classification of Technology (Gaynor, 1996)

- State-of-the-Art Technologies
  - Technologies equal or superior to competitive offerings
- Proprietary Technologies
  - Technologies protected by patents, and so forth
- Known Technologies
  - Technologies common to many companies but used uniquely
- Core Technologies
  - Technologies essential for maintaining competitive positions
- Leveraging Technologies
  - Technologies that support several products or classes products

Measuring Technology Content and Intensity (cont.)

Classification of Technology (Gaynor, 1996)

- Supporting Technologies
  - Technologies that support core technologies
- Pacing Technologies
  - Technologies that control the product or service development
- Emerging Technologies
  - Technologies under consideration for future applications
- Scouting Technologies
  - Technologies tracked for potential applications
- Unknown Technologies
  - Technologies currently unknown, but believed of considerable benefits
Case Studies

- Case Study: Hughes Electronics and Directive TV
- Case Study: Reprogramming Amazon


Assignment 3

- To Be Announce Jan. 28, 2009