CPET 575 Management Of Technology

Introduction and Overview

Paul I-Hai Lin, Professor
http://www.ipfw.edu/~lin
M.S. Technology • IT and Advanced Computer Applications
Purdue University Fort Wayne Campus

Course Description

CPET 575 Management of Technology, Class 3, Cr. 3
This course introduces conceptual foundation and the method for managing technology and innovation. Topics includes technology and society; technology development infrastructure; technology and strategy; technology competitive analysis, forecasting and assessment; techniques for dealing with risk, uncertainty and change; tools and best practices for technology lifecycle management; government, societal, and international issues. A combination of lectures, reading, presentation and reports, a variety of case studies and group discussions is used.

Class Activities, Expectations, Grading

- The class format will be 3 hour lecture each week, 16 weeks total.
- Active student participations in presenting case studies and papers from the recent literature, class case studies/discussion, and a team-based final project and presentation are expected.

Required Text Book (Case studies and readings)

Recommended Text
Class Activities, Expectations, Grading
(continue)

- Student assignments include weekly assignment on case studies and reading 2-3 technical papers a week and writing short summary for each paper.
- Reading summary/report: Each student must submit four short (four pages) summary reports on topics related to the reading assignments.

Case Activities, Expectations, Grading
(continue)

- Case studies and presentations: Each student will take responsibility for "leading" the discussion of a minimum of two case studies (details and sign-up will be discussed in first class).
- Final project report: students will complete a final project working in groups of 2-3 students, present projects in class and complete a written project report. Guidelines for the project will be provided in the class.

Terms Defined in Webster’s New Collegiate Dictionary

Technology
- Systematic treatment of a technical method of achieving a practical purpose.
- The totality of the means employed to provide objects necessary for human substance and comfort.

Technology – Other Definitions

- What is Technology, http://www.aber.ac.uk/media/Modules/MC10220/whattech.html
Management
• The act or art of managing
• The conducting or supervising of something (as a business)
• The collective body of those who manage or direct an enterprise

Innovation
• The introduction of something new
• A new idea, method, or device

Strategy
• The science and art

Strategy
• The science and art of employing the political, economic, psychological, and military forces of a nation or group of nations to afford the maximum support to adopted policies in peace or war
• The science and art of military command exercised to meet the enemy in combat under advantageous conditions

Strategy
• A careful plan or method
• The art of devising or employing plans or stratagems toward a goal
Terms Defined in Webster’s New Collegiate Dictionary (continue)

- Project
  - A specific plan or design
  - A tasks or problem engaged by a group of students to supplement and apply classroom studies

- Design
  - A preliminary sketch or outline showing the main features of something to be executed
  - A particular purpose held in view by an individual or group

History of Technology

- Technology in Archaeology
  - Material technologies (stone tools, wood, pottery, copper, bronze, iron (steel))
  - Agriculture technologies
  - Information technologies (cave art, Venus figures, writing)
  - Energy technologies (fire, irrigation, sailing ships, wheeled vehicles)

- Technology in Transportation
  - Horse, wheeled vehicles
  - Ship, steam boat, submarines
  - Railroads, steam locomotive,
  - Cars, trucks
  - Air planes, rocket

- Energy Technology
  - Man power
  - Animal power
  - Wind power
  - Coal, steam power
  - Fossil fuel power

What is Management of Technology\(^1\)?

- Different meaning to different people
- Scope is very broad and diverse
  - MOT relates to specific research and development of new concepts
  - MOT means engineering design and development, manufacturing, or operations management
- Over the last 20 to 30 years,
  - management literature has shifted its technology focus to new product development and then to product enhancement

"Management of technology links engineering, science, and management disciplines to plan, to develop, and to implement technological capabilities to shape and accomplish the strategic and operational goals of an organization." (National Research Council, 1987)

Management of Technology (MOT)\(^1\)?

- MOT involves
  - The management of engineering, natural science, and social science
  - Administrative science in planning, decision making, development, and implementation of technology
  - Operational processes, tools and techniques, and people who make it all happen
  - Guidance and leadership aim toward the development of products and services
  - Managing many interdisciplinary components and managing their integration into a whole system
  - Managing the system

- MOT focuses on
  - The development of operational capabilities such as manufacturing, distribution, and field services
- MOT is influenced by
  - Business strategy
  - Organizational culture, and
  - The business environment, and vice versa

All About Technology

Technology Development Processes
- Identification of a specific need
- Assessment
- Strategy, Funding, Plan, etc
- Design
- Prototyping
- Transfer (Intellectual property)
- Commercialization
  - Production
  - Marketing
  - Sales
  - Distribution
  - Customer support
  - Maintenance
- User/customer/consumer

Classification of Technology

State-of-the Art Technologies
- Technologies equal or superior to competitive offering

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

Classification of Technology (continue)

Leveraging Technologies
- Technologies that support several products or classes of products

Supporting Technologies
- Technologies that support core technologies

Pacing Technologies
- Technologies that control the product or service development

Emerging Technologies
- Technologies under consideration for future application

Classification of Technology (continue)

Scouting Technologies
- Technologies tracked for potential applications

Unknown Technologies
- Technologies currently unknown, but believed of considerable benefits

Other Classifications of Technology

- Sustaining Technology
  - Improving on existing technologies, most often in the areas of performance
  - Compatible with existing standards and address current market needs
  - Examples
    - Microsoft Windows Oss
      - Windows 3.0, 3.1
      - Windows 95, 98
      - Windows 2000, XP, Vista
    - Palm’s PDA

- Disruptive Technology
  - Andy Grove, Intel co-founder, defines it as "a time in the life of a business when its fundamentals are about to change"
  - The needs of the customer can no longer be met inside the current technology parameters
  - Radical change at a system level with paradigm-shifting innovations
  - Huge positive impact on the economy, new categories of products and services, new companies and jobs

- Disruptive Technology - Examples
  - Transistor-based devices
    - Battery-powered transistor radio introduced by Sony in 1950
    - Over time, the transistor radio became cheaper, smaller, and better quality of sound
  - Integrated Circuits
    - Microprocessor (MOS-based) in 1970's
    - Microcontrollers
    - Intel CPUs for PCs
Other Classifications of Technology (continue)

- Disruptive Technology -Examples
  - Personal Computer
    - not disruptive to the mini-computer industry (DEC, Wang Computer); disruptive to companies making terminal connect hardware
    - altered paradigm: a computer on every desk vs. a computer in every office
  - Storage Devices
    - Magnetic memory/RAM/DRAM
    - Floppy disk/Zip Disk/Flash Drive

Other Classifications of Technology (continue)

- Disruptive Technology -Examples
  - Internet Technology
    - Computer-computer communications
    - Collaboration, resource sharing
    - Information sharing/publishing
    - E-learning and education
    - Advertisement
    - Business automation
    - Communications
    - E-business/E-commerce
    - Services
    - Social networking
    - etc

Other Classifications of Technology (continue)

- Specific Applications
  - Aerospace Technology
  - Biological Technology
  - Business Technology
  - Computer Technology
  - Energy Technology
  - Information Technology
  - Material Technology
  - Military Technology
  - Medical Technology
  - Transportation Technology
  - Vehicular Technology
  - Nanotechnology
  - etc

Business, Firms, Enterprise & Technology

- High-Tech – Strategy, Marketing, High-Tech Production
- Technology Oriented: high-tech products
- Competitive advantages
  - Value creation by applying technology: growth potential
  - Lower barriers to entry
- Improve efficiencies
  - Using technology as solutions for business problems: automation
  - Replacing manual labors: automation, AI
  - Reducing time-to-market
- Infrastructure: IT, networking, Internet, etc
- Business Intelligence and Decision Making Support
Resources

- Others

Assignments

- Reading: “Integrating Technology and Strategy,” pp. 1-12
- Case I-1: Elio Engineering, Hari Sankra and Harald Winkmann, pp13-31