I. Introduction: Some Definitions and Basic Phenomena; Innovation Management

What is a Technological Innovation?

- Science: creating knowledge (answers the question: why?)
- Technology: Applying knowledge (answers the question: how?)
- Difference between technology and scientific technology
- Science understands nature, scientific technology manipulates nature.
- Technological innovation is the **utilization** of technical inventions or technological know-how for **economic purposes**.
- A technological innovation is
  - a new or considerably improved product/service or
  - a new or considerably improved production process.
- The process of innovation includes all activities leading to the innovation: Starting with the perception of an unsolved need, the generation of an idea, R&D to solve the problem, through setting up new production capacities and ending with the introduction and widespread diffusion in the market.

Historically Important Innovations

Innovation	Function	Date
Tools	Technology	Pre-history
Pottery	Materials	Stone Age
Bronze	Materials	2500s BC
Writing	Literacy	2500s BC
Iron	Materials	1500s BC
Gun	Weapons	1300s AD
Printing	Literacy	1400s
Telescope	Optics	1500s
Microscope	Science	1700s
Steam Engine	Power	1700s
Powered Machinery	Production	1700s
Railroads	Transportation	1830s
Telegraph	Communications	1850s
Chemicals	Materials	1850s
Steam Ships	Transportation	1860s
Cameras	Images	1860s
Telephone	Communications	1880s
Electric Lighting	Illumination	1880s
Electrical Power	Power	1880s
Bicycles	Transportation	1880s
Automobiles	Transportation	1890s
Airplanes	Transportation	1900s
Plastics	Materials	1900s
Movies	Communications	1910s
Electron Tubes	Electronics	1910s
Radio	Communications	1920s
Radar	Sensing	1930s
Space Rockets	Transportation	1930s
Nuclear Fission	Weapons	1930s
Television	Communications	1930s
Computers	Computation	1940s
Transistors	Electronics	1940s
Satellites	Transportation	1950s
Integrated Circuits	Electronics	1950s
Computer Networks	Communications	1970s

Really called *innovation*?

Case Studies

- Best and worst practice stories that support the theory
- They themselves do not develop or validate a theory
- Ex: Concurrent engineering design of Ford Taurus (1981)
  - Examined 400 best features of top-class cars
  - Saved Ford in 1980, sold well, cancelled in 2008
  - Couldn't it save Ford from bankrupcy in late 00's?
  - Failure of proper innovation strategy
  - Bought Volvo and Jaguar
  - What happened to Ford?

Innovation

- Formerly: Business side
  - Focus on technological progress to
    - Design
    - Produce
    - Market new services, products, processes
- Technical side
  - Required Engineering Management (EM)
  - Technical personnal reqirement grew esp. in IT:
    - Programmers
    - Mathematicians
    - Computer scientists
- Now: Management of engineering and technology (MOT)
  - Empirical: describes historical patterns of change in science, technology and economy
  - Theoretical: develops useful concepts, techniques and tools for managing future change in science, technology and economy

Questions to be answered

- How is innovation organized as a process?
- What is technology?
- What kind of technologies are there?
- Why is progress in any technology eventually finite?
- How does technological progress impact a nation?
- How can innovation strategy be formulated for a nation?
- How does technological progress impact a business?
- How can a manager identify technologies relevant to the future of a business?
- How should high-tech research and development projects be managed?
- How should innovation strategy be formulated in a business?
- How does the innovation differ in hardware, software and sciences?
- What is the ethical context of technology?