

MT5007 Management of Technological Innovation

The aim of this course is to help students develop a strong conceptual foundation for managing technological innovation. It introduces concepts and frameworks for how firms can create, commercialize and capture value from technology-based products and services.

The course is designed for business managers and engineers who are involved in the research and development, marketing, acquisitions, and strategic assessments of new technologies. Topics covered include (1) the evolution of industries; (2) technological discontinuities and vertical disintegration; (3) network effects and standards; (4) profiting from innovation and intellectual property (IP); (5) R&D management; and (6) managing knowledge and learning.

The course covers a broad number of high-tech industries (particularly those that involve electronics and electro-mechanical technologies) including mobile phones, semiconductors, computers, software, the Internet, telecommunications, automobiles, tires, semiconductor manufacturing equipment, video games, music, videos, software, chemicals, pharmaceuticals, and toiletries.

Syllabus

1. Introduction
What is creative destruction and why does it happen? What are the differences between internal and external capabilities?
2. Patterns of Technological Change
 - (a) How do industries evolve?
What determines a shakeout in the number of firms? How do dominant designs and increasing returns to scale explain shakeouts? What are the managerial implications from each explanation for incumbents and entrepreneurs? How might “dominant designs” cause a change in innovation from product to process ones?
 - (b) Technological Discontinuities, Modular Design and Vertical Disintegration
Can we use the S-curve to forecast discontinuities? How are architectural, radical, incremental, and disruptive innovations different and how do they pose different challenges for firms? What are the advantages and disadvantages of modular design? How does it impact on competition? What are the types of strategies that firms can use to deal with modular design? What are the implications for new entrants, including entrepreneurs? How has modularity impacted on the semiconductor industry? What are its implications for new entrants, including entrepreneurs?

3. Competing in Technology-Intensive Industries
 - (a) Network Effects and Standards
How do standards, network effects, and eco-systems impact on technological competition?
 - (b) Profiting from Innovation and Intellectual Property (IP)
How does a firm capture the economic returns from an innovation? What is the role of complementary assets? What are the advantages and disadvantages of patents, trademarks and copyrights? How should a company ensure it continues to capture value from its innovations?
4. Creating and Managing an Innovative Organization
 - (a) R&D Management
What type of portfolio of projects should a firm fund? How should they choose these projects? What implications does “open innovation” for R&D have for firms? What is driving the internationalization of global R&D and product development? What are the issues facing MNCs and Asian companies in organizing international R&D and global product development?
 - (b) Managing Knowledge and Learning
Why is knowledge management important? How is knowledge management related to the issues previously discussed in this course? Are knowledge workers different from other workers?

Readings

Main text:

- Strategic Management of Technology and Innovation
Author: Robert A. Burgelman, Clayton M. Christensen, Steven C. Wheelwright

Other readings/case studies will also be discussed in class.