

## **MT6001: Research in Tech & Innovation Management**

Workload: 3-0-0-4-3

### **Description:**

This course surveys theory and research on innovation and technology management. This includes models of technological change, technological discontinuities, vertical integration versus disintegration, organizational design, competencies/capabilities, and management of R&D. Through readings, papers and discussions, students will know about conceptual and methodological issues, how innovations are developed over time, and the processes leading to successful/unsuccessful development, adoption and implementation of innovations.

Students will learn how to conduct rigorous research in innovation and technology management by studying seminal papers in the selected topics. Through classical as well as recent seminal papers, students will be exposed to the state of art on research methodology and key theories. The learning will be made through interactive and small group discussions. All students will read selected readings in advance and students will take turn to lead the discussions, facilitated by the instructor.

### **Syllabus:**

Broadly speaking, the course begins with a micro-level and ends with a macro-level analysis of the innovation literature. The module starts with models of technological change including the roles of technological discontinuities and vertical disintegration. This is followed by models of competencies/capabilities, organizational design, and intellectual property. The module concludes with models of R&D Management and national innovation systems.

The topics covered are:

1. General Models of Technological Change
2. Product Life Cycle Theory
3. Cyclical Model of Technological Change
4. Technological Discontinuities
5. Disruptive Technologies
6. Modularity and Vertical Disintegration
7. Capabilities/competencies
8. Intellectual Property and Complementary Assets
9. Organizational Design
10. Network Effects and Standards
11. R&D Management
12. National Innovation Systems

## References:

Papers and chapters from books will be assigned for each class. Examples of readings (for books, only chapters will be assigned) are as follows:

### Week 1. General Models of Technological Change (1)

- Mowery, D. and Rosenberg, N. (1979), "The influence of market demand upon innovation: a critical review of some recent empirical studies", *Research Policy*, vol 8, pp 103-53; reproduced in N. Rosenberg (1982), *Inside the Black Box: Technology and Economics*, New York: Cambridge University Press, chapter 10.
- von Hippel, E. 1983. Lead Users: A Source of Novel Product Concepts, *Management Science*, Management Science 32, no. 7 (July):791-805.
- Rosenberg, N. (1982), "Technological interdependence in the American economy", chapter 3 in *Inside the Black Box: Technology and Economics*, New York: Cambridge University Press.

### Week 2. General Models of Technological Change (2)

- G. Dosi, "A suggested interpretation of the determinants and directions of technical change," *Research Policy*, vol. 11, no. 3, pp. 147-162, 1982.
- N. Rosenberg, "The Direction of Technological Change: Inducement Mechanisms and Focusing Devices," *Economic Development and Cultural Change*, vol. 18, no. 1, pp. 1-24, 1969
- von Hippel, E. 1983. Scientific Instruments, Chapter 2 in *The Sources of Innovation*, NY: Oxford University Press.

### Week 3. Product Life Cycle Theory

- Utterback, James (1994), "Dominant Designs and the Survival of Firms," Chapter 2 in *Mastering the Dynamics of Innovation*, Harvard Business School Press, pp. 23-55.
- Klepper, S. and Simons, K. (1997), "Technological Extinctions of Industrial Firms," *Industrial and Corporate Change*, 6(2), 379-401.
- Windrum, P. (2005), 'Heterogeneous preferences and new innovation cycles in mature industries: the amateur camera industry 1955–1974', *Industrial and Corporate Change*, 14, 1043 - 1074.

### Week 4. Cyclical Model of Technological Change

- Anderson, P. and Tushman, M. (1990), 'Technological discontinuities and dominant designs: A cyclical model of technological change', *Administrative Science Quarterly*, 35, 604-633.
- Tushman, M. and Anderson, P. (1986), 'Technological discontinuities and organizational environment', *Administrative Science Quarterly*, 31, 439-456.
- Afuah, A. and Bahram, N., 1995. The hypercube of innovation, *Research Policy* 24: 51-76

### Week 5. Technological Discontinuities

- Abernathy, W., and Clark, K. (1985), 'Innovation: Mapping the winds of creative destruction', *Research Policy*, 14, 3-22.

- Henderson and Clark, (1990), “Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms,” *Administrative Science Quarterly*
- de Figueiredo, J. and Kyle, M. 2006. Surviving the gales of creative destruction: the determinants of product turnover *Strategic Management Journal* 27(3): 241 – 264.

#### Week 6. Disruptive Technologies

- Christensen, C. and Bower, J. 1998. Customer Power, Strategic Investment, and the Failure of Leading Firms, *Strategic Management Journal* 19(3): 197-218.
- Adner, R. 2002. “When are technologies disruptive? A demand-based view of the emergence of competition,” *Strategic Management Journal*, vol. 23, no. 8, pp. 667 – 688
- Christensen, C., Rosenbloom, R. 1995. Explaining the attackers advantage: technological paradigms, organizational dynamics, and the value network, *Research Policy* 24: 233-257.

#### Week 7. Modularity and Vertical Disintegration

- Langlois, R. 2003. The vanishing hand: the changing dynamics of industrial capitalism, *Industrial and Corporate Change* 12(2): 351-385.
- Langlois, R. and Robertson, P. 1992. Networks and innovation in a modular system: lessons from the microcomputer and stereo component industries. *Research Policy* 21: 297-313.
- Brusoni, S. and Prencipe, A. 2001. “Unpacking the Black Box of Modularity: Technologies, Products and Organizations,” *Industrial and Corporate Change*, vol. 10, no. 1, pp. 179-205.
- Baldwin and Clark, 2001. The Microstructure of Designs, in *Design Rules*, Chapter 2, Cambridge: MIT Press

#### Week 8. Capabilities/competencies

- Cohen and Levinthal 1990. Absorptive Capacity: A New Perspective on Learning and Innovation, *Administrative Science Quarterly* 35: 128-152.
- Nonaka and Takeuchi, Theory of organizational knowledge creation, Chapter 3 in *The Knowledge Creating Company*, New York: Oxford University Press, 1995, pp 56-94.
- Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Review*, vol 18, no. 7, pp. 509-533.
- Zander, I. (1997), "Technological diversification in the multinational corporation: historical evolution and future prospects", *Research Policy*, vol. 26, no. 2, pp. 209-228.

#### Week 9. Intellectual Property and Complementary Assets

- D. Teece, “Profiting from technological innovation: Implications for integration, collaboration, licensing, and public policy,” *Research Policy*, vol. 15, pp. 285 – 305, 1986.
- Levin, R.C., Cohen, W. and Mowery, D. (1985), "R & D appropriability, opportunity and market structure: new evidence on the Schumpeterian hypothesis", *American*

Economic Review vol. 75, no. 2, pp. 20-24.

- Almeida, P. (1996), "Knowledge sourcing by foreign multinationals: patent citation analysis in the US semiconductor industry", *Strategic Management Journal*, vol. 17, pp. 155-165.

#### Week 10. Organizational Design

- Westerman, G., McFarlan, F.W., & Iansiti, M. 2006. Organization design and effectiveness over innovation life cycle. *Organization Science*, 17: 230-238.
- He, z., & Wong, p. 2004. Exploration vs. exploitation: An empirical test of ambidexterity Hypothesis. *Organization Science*, 15: 481-494.

#### Week 11. Network Effects and Standards

- Rohlfs, J., 1974. A Theory of Interdependent Demand for a Communication Service. *Bell Journal of Economics* 5 (1), pp. 15-37.
- David, P. 1984. Narrow windows, blind giants and angry orphans: the dynamics of systems rivalries and dilemmas of technology policy. *Innovation Diffusion*, vol. 3 Oxford University Press, New York.
- Katz, M. and Shapiro, C., 1985. Network Externalities, Competition, and Compatibility. *American Economic Review* 75(3), pp. 424-440.
- Katz, M. and Shapiro, C., 1994. Systems Competition and Network Effects. *The Journal of Economic Perspectives* 8(2), pp. 93-115.

#### Week 12. R&D Management

- Pearce, R.D. (1999), "Decentralized R&D and strategic competitiveness: globalised approaches to generation and use of technology in multinational enterprises (MNEs)", *Research Policy*, vol. 28, nos. 2-3, pp. 157-178.
- Tidd, J., Bessant, J. and Pavitt, K. (2005). *Managing Innovation: Integrating technological, market, and organizational change*, NY: John Wiley & Sons. Chapter 6: Integration for Strategic Learning

#### Week 13. National Innovation Systems

- Zander, I. (2002), "The formation of international innovation networks in the multinational corporation: an evolutionary perspective", *Industrial and Corporate Change*, vol. 11, no. 2, pp. 327-353.
- Nelson, R.R. (1992), "What is 'commercial' and what is 'public' about technology, and what should be?" in N. Rosenberg, R. Landau and D.C. Mowery (eds.), *Technology and the Wealth of Nations*, Stanford: Stanford University Press.
- Patel, P. and Pavitt, K.L.R. (1994), "National innovation systems: why they are important, and how they may be measured and compared", *Economics of Innovation and New Technology*, vol. 3, no. 1, pp. 77-95.