

GBUS 808: Knowledge Chain Management in a High-Tech Environment
Quarter 4, Early Week (11:45am-1:10pm)
Professor Melissa Appleyard
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Course Overview 2001

Over the last few decades, knowledge-intensive industries have become an engine of growth in the global economy. This course will examine the technologies and economics behind knowledge-intensive industries. In a high-tech environment, the management of the creation, diffusion, and deployment of knowledge—the Knowledge Chain—is central to a firm's ability to add value and capture value over time. Through an in depth analysis of the electronics industry and its role in the evolution of the Internet infrastructure, this course will bring to life the management of the Knowledge Chain and derive lessons for firms and economic policy makers in terms of pursuing growth in a turbulent environment.

The course will start by diving inside the black box of the electronics industry to examine the primary technology drivers and competitive forces of the semiconductor industry. We then will step back and analyze the larger value-added chain of the “Post-Wintel” era, where Internet/wireless applications will drive the pace and direction of the electronics industry in the coming decades. We will examine not only private sector strategies, but also government policies that shape the knowledge chain.

The goals of the course include deepening your understanding of: 1) the technologies involved; 2) the process of innovation; and 3) the interplay between private sector decisions and government policy for the creation and diffusion of new technologies.

Module I: Inside the Microelectronics Industry: The technologies and companies that have driven the high-tech revolution

1. March 20: A Framework for Knowledge Chain Management

Material:

1) Dorothy Leonard, “Core Rigidities,” Chapter 2, *Wellsprings of Knowledge: Building and sustaining the sources of innovation*, 1995, pp. 29-56. (Book is on reserve in the Darden Library.)

2. March 21: Competitive Dynamics in the Global Semiconductor Industry

Material:

- 1) Jeffrey T. Macher, David C. Mowery, David A. Hodges, “Reversal of Fortune? The Recovery of the U.S. Semiconductor Industry,” *California Management Review*, Fall 1998, pp. 107-136.
- 2) Exhibit: Leadership in the Semiconductor Industry, 1980-1999

3. March 26: Technical Clinic on Semiconductor Technology

Material:

1) Hutcheson and Hutcheson, "Technology and Economics in the Semiconductor Industry," *Scientific American*, October 1997.

<http://www.sciam.com/specialissues/1097solidstate/1097hutch.html>

2) <http://www.intel.com/intel/intelis/museum/>

- How Chips Are Made
- How Microprocessors Work
- How Transistors Work
- Memory Technology
- History of the Microprocessor
- Clean Rooms

3) Optional:

• <http://www.howstuffworks.com/microprocessor.htm>

This site provides additional information regarding microprocessors

• <http://www.darden.virginia.edu/it/explore/>

Beta test site for Darden/SEAS eXplore microelectronics project

• <http://www.people.virginia.edu/~jcb6t/Research/Explore/explore.htm>

Alpha test site for content for eXplore project

• <http://www.scientificamerican.com/0697issue/0697villasenor.html>

For those interested in advanced topics: Configurable Computing including discussion of ASICs, field-programmable gate arrays, etc.

4. March 27: Strategies for Deploying New Process Technologies

Material:

1) Melissa M. Appleyard, Nile W. Hatch, and David C. Mowery, "Managing the Development and Transfer of Process Technology in the Semiconductor Manufacturing Industry," Chapter 7, *The Nature and Dynamics of Organizational Capabilities*, 2000, pp. 183-193 (pp. 193-207 will be distributed in class).

5&6. April 2 & 3: Bridging a Technological Discontinuity: The Pursuit of Next-Generation Lithography

Material April 2:

1) Melissa M. Appleyard, Next-Generation Lithography (A): Betting on a new production technology in the semiconductor industry [UVA-BP-0423].

2) Darden/SEAS eXplore microelectronics project

<http://www.darden.virginia.edu/it/explore/>

Material April 3:

1) Melissa M. Appleyard, Next-Generation Lithography (B): Betting on a new production technology in the semiconductor industry [UVA-BP-0424].

2) Darden/SEAS eXplore microelectronics project

<http://www.darden.virginia.edu/it/explore/>

7&8. April 9 or 10: Visits to the Engineering School

- We will not have class in the morning these days. Instead we will meet in the engineering school for a tour and dinner from 6:00-8:30pm.
- You will only need to attend one of the two evenings.

- Please confirm which evening you will attend.

Assignment:

1) Top 10 things to keep in mind when writing a business plan (2 pages in PowerPoint)

2) Summary of Next-Generation Lithography cases (4 pages in PowerPoint)

NOTE:

A) These two assignments are due by 1:10pm on Monday, April 9. Submit to Professor Appleyard by e-mail.

B) These assignments can be completed in groups of 5 or fewer.

C) A subset of these submissions will be selected for presentation in the engineering school during dinner on April 9 and 10.

D) These assignments will count towards 10% of your grade. If you work in a group, all group members will receive the same grade.

Module II: Adding and Capturing Value in the emerging “Post-Wintel” Era

9. April 16: The Players and Competitive Pressures in the “Net World Order”

Material:

1) Nikkei Business Publications, Inc., “Chipmakers Hunt Talent for Survival,” 2001, http://www.nikkeibp.asiabiztech.com/nea/200103/manu_124527.html

2) Russ Arensman, “Intel’s second try,” *Electronic Business*, March 2001.

3) Jeffrey S. Young, *Cisco Unauthorized: Inside the High-Stakes Race to Own the Future*, Roseville CA: Prima Publishing, 2001, pp. vii-39, 154-182.

4) Optional:

Marvin A. Sirbu, “Telecommunications Technology and Infrastructure,” <http://www.cs.cmu.edu/afs/andrew.cmu.edu/usr9/sirbu/www/pubs/ipaper.html>

10. April 17: Cisco and Networked Industries

Material:

1) James L. Heskett and John P. Morgridge, *Cisco Systems: Are You Ready?* (A) [HBS 9-901-002].

2) Optional:

Carl Shapiro and Hal R. Varian, *Information Rules*, Boston: Harvard Business School Press, 1999, pp. 135-225.

11. April 23: Managing Technological and Political Risks during Deployment

Material:

1) Joel West, *Qualcomm’s CDMA (B): China Market Entry* [UC Irvine GSM].

12. April 24: The Diffusion of the Internet from a Policy Perspective

Material:

1) Roger G. Noll, “Resolving Policy Chaos in High-Speed Internet Access,” 2001.

2) FCC, “Deployment of Advanced Telecommunications Capability: Second Report, August 2000, pp. 52-70 and related maps (Select One Case Study).

3) Optional:

Jason Oxman, “The FCC and the Unregulation of the Internet,” July 1999.

http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp31.pdf

Francois Bar, Stephen Cohen, Peter Cowhey, Brad DeLong, Michael Kleeman, John Zysman, "Access and innovation policy for the third-generation internet," *Telecommunications Policy*, 24 (2000), pp. 489-518.

http://www.stanford.edu/~fbar/Publications/Access-TP24_6-7.pdf

13&14. April 30 & May 1: Class Project: Mapping the Diffusion of the Internet

Material April 30:

1) Catherine L. Mann, *Global Electronic Commerce: A Policy Primer*, Washington, D.C.: Institute for International Economics, 2000, pp. 143-188.

Material May 1:

1) Lawrence Lessig, *Code and Other Laws of Cyberspace*, New York: Basic Books, pp. ix-8, 43-60, 85-99.

15. May 2: Digital Convergence: Will Content Overshadow Hardware/Software Capabilities?

Material:

1) David J. Collis, P. William Bane, Stephen P. Bradley, "Winners and Losers Industry Structure in the Converging World of Telecommunications, Computing, and Entertainment," in *Competing in the Age of Digital Convergence*, Boston: Harvard Business School Press, 1997, pp. 159-200.

Grading:

10% Top 10 things to keep in mind when writing a business plan (2 pages in PowerPoint) and write-up of Next-Generation Lithography cases (4 pages in PowerPoint) [To be presented over dinner to the engineering students and faculty on April 9 or 10.

Can be completed in groups of 5 or fewer.]

10% Contribution to class project on mapping the diffusion of the Internet

40% Class Participation

40% Take-Home Final Exam (Exam Period: May 5 – May 9)

Attendance Policy:

Darden students are expected to attend all classes. The rationale for this policy is found in the commitment faculty and students make to the case method as a group experience that depends heavily on the active participation of all members of the community, who bring their varying perspectives to the issues at hand.