

**NEW JERSEY INSTITUTE OF TECHNOLOGY
SCHOOL OF INDUSTRIAL MANAGEMENT**

Course: Management of Technology
Semester: SPRING 2004
Course No: MGMT 620
Professor: S. Gopalakrishnan
Office: CAB 3017
Tel: (973) 596-3283
Fax : 973-596-3074
Email: gopalakr@adm.njit.edu
Homepage: <http://www.web.njit.edu/~sgopalak>

Office Hours: Monday: 11:30 to 1:00 p.m.
Wednesday: 11:30 to 1:00 p.m.

TEXT: Strategic Management of Technology and Innovation. Fourth Edition.
ISBN: 0-07-253695-0

Authors: **Burgelman, R.A., Christensen, C.M. & Wheelwright, S.C.**

Course Content

The course focuses on the strategic management of technology and innovation in firms. We take an evolutionary process perspective on technology strategy and innovation in this course. The ideas that underlie this perspective are:

- (a) A firm's technology strategy emerges from its underlying technological competencies and capabilities;
- (b) A firm's technology strategy is shaped by external (environmental) and internal (organizational) forces; and
- (c) The enactment of technology strategy within the firm serves to further develop its technological capabilities.

We use this perspective at various levels of management (corporate, business, project) and study the process of creating change through technological innovation and internal entrepreneurship. We examine key activities at each of these levels of management, analyze how they interlock, and attempt to understand how such complex systems of activity can be effectively managed.

The course is based on research and theory but is practice oriented. Our case discussions of various real life situations will require in-depth analysis to be complemented with specific action recommendations and a willingness to commit oneself to a specific course of action.

Course Objectives

The objectives of this course are the following:

- (1) To develop an awareness of the range, scope, and complexity of the phenomena, issues, and problems related to technological innovation and internal entrepreneurship.
- (2) To develop a conceptual framework for assessing and auditing the innovative capabilities of a firm.
- (3) To develop insight concerning the skills to be an effective general manager in the innovation process.
- (4) To offer practice in defining and working out strategic management problems related to technological innovation and internal entrepreneurship.
- (5) To develop an understanding of technology in global industries
- (6) To develop an insight concerning ethical issues associated with the management of technology and innovation.

Grading:

Attendance & class Participation	100
Case Discussion & Report	150
Case Briefs	200
Mid Term & Final	300
Term Paper (Group Project)	150
In class assignments	100
Total	1000

Grading

>890	A
840-889	B+
800-839	B
750-799	C+
700-749	C
<700	D

Student Responsibilities

You should come prepared for every class. The quality of class time is considerably enhanced when you come to the class with the assignments already completed. My goal is to stimulate a lively dialogue. During the lectures, discussions, and case analyses, I will call upon students to share their understanding and insights about the readings and cases.

1. Attendance and Class Participation

Absence and tardiness significantly reduce the learning that can occur in class and tardiness is disruptive to other participants. Therefore, attendance and tardiness are considered as a part of the participation grade. If you must be absent or late to a class, it is courtesy to make arrangements with the instructor ahead of time. I will allow two absences without your grade being affected. If you are unable to participate more than two times, your class participation grade will be affected.

Effective participation includes contributions that reflect preparation through reading the required material. Effective contribution should substantially improve the quality of discussion in the class.

2. Case Presentation and Report

Students will be assigned to groups. Each group will be required to make one case presentation to the class. This case will be a different one from the five case briefs that you have to do. Questions will be provided to guide your presentation. Your answers to the case questions should include the theory covered in the articles assigned to you and the facts and figures provided in the case. In general do not restate the information in the case. Use the information to analyze issues and recommend a course of action. Use industry information and current data to strengthen your recommendation. In addition to an oral presentation, you will be required to submit a written report on the day of the presentation.

3. Case Briefs

You should be able to identify key issues, problems and opportunities facing the central protagonists, articulate and evaluate alternative approaches to problems, and select the best alternative and provide reasons for your selection. Your recommendations should be feasible given the firm's resources, including their cash and their ability to raise money. Case data including financial and other quantitative data should be used wherever possible. **You are to submit five case briefs during the semester.** I will use the grades from the best four grade summaries. **These case briefs should be submitted before the beginning of the class that we are scheduled to discuss a case.** Preparation questions will be given to you before the beginning of the class. Each case brief should be at least 2-3 pages double-spaced. Even if you choose not to do a case brief, you should still read the case and come prepared to discuss the case in class.

4. Mid Term and final Examination

The mid term and final examination will consist of multiple choice questions, short answers and essays. The exact format of the examination will be decided after discussion in class.

5. Group Project (Term Paper)

The group project allows you to analyze in depth one or more aspects of the course in detail. This is an opportunity to apply what you have learned to your unique interests, technical background and /or current employer. You should work with others with common interests.

Students should group themselves into teams of three to four persons. The project can be to study either: an individual company or a specific innovation or technological advance.

Each project should develop a specific topic related to the management of technology and innovation. Details of the objectives of this project will be discussed in class; however, you will have a large amount of latitude to design the project to fit your interests. I intend to be closely involved with each project to a) ensure the scope of your project is appropriate, and b) suggest references, etc. to help improve your project (and increase what you learn from the project). Possible topics are:

1. Evaluation and analysis of the industry and potential customers for a new technology – eg. Wi-Fi etc
2. Industry evolution and transformation as a consequence of the emergence of new technologies
3. Ethical Issues Concerning Technology Transfer across companies (Corporate Espionage)
6. Mergers, Acquisitions, Alliances and technology acquisition and integration
7. Outsourcing and its consequences on the workforce
8. Policy issues with outsourcing
9. Strategic importance of outsourcing and industry competitiveness
10. External vs. Internal sourcing of technological innovation

The finished products of the group project will be 1) 18-20 page (double-spaced) paper, with exhibits, references and 2) a 20 minute oral presentation. I will ask for your team project proposal a month into the course (**Early to March**). A progress report, a list of references, and a list of learning objectives will be due **Early April**. The oral and written reports are graded as one submission. If the group cannot manage its own project (e.g., one member refuses to do his/her share of the work), you should discuss the problem with me, but only after all of your other management techniques and options have failed. Remember, this exercise is also a test of how you can work in a group and overcome hardships.

Course Schedule

January 21st	INNOVATION AND TECHNOLOGY MANAGEMENT Discussion of the syllabus, and course requirements. Ice Breaker Exercise. Introduction and overview of the course.
Management	Reading 1: Integrating Technology and Strategy: A general perspective. Pg. 1-13
January 28th	STRATEGY, TECHNOLOGY AND INNOVATION Reading 2: What is Strategy? Pg. 113-129 Reading 3: The Art of High Tech Management pg. 130-156 Reading 4: The Core Competence of the organization pg.102-112 <i>In class Exercise 1</i>
February 4th	Reading 4: How to put technology into corporate planning pp.62-67 <i>Case 1a: Electronic Arts in 1995(Class discussion)</i> <i>Questions</i> (1) <i>What has EA overall business strategy been?</i> (2) <i>What are some key issues with respect to EA's technology strategy? How does this tie in to its business strategy?</i> (3) <i>What are the advantages of developing hardware and software as opposed to software only in the video gaming industry?</i> (4) <i>Looking beyond 1995, how should EA evaluate the platform development decisions it faces.</i> (5) <i>What are some key issues for Electronic Arts Today?</i> <i>Case 1b Electronic Arts in 2002</i> (1) <i>How has the internet affected the video game industry?</i> (2) <i>In 2002, what should EA's strategy be for the next five years? Why? How should it execute this strategy?</i>

February 11th

UNDERSTANDING THE TECHNOLOGICAL ENVIRONMENT

Reading 6: Exploring the limits of the Technology S-Curve. Part 1 Component technologies. Pg. 208-226

Reading 7: Exploring the limits of the Technology S-Curve. Part 11 Architectural technologies. Pg. 227-232

Reading 8: Patterns of industrial innovation pg. 202-207.

Case 3: Hewlett-Packard's Merced Decision. (Group 1)

Questions

- (3) *Does the market need the Merced chip?*
- (4) *Discuss the pros and cons of the HP/Intel collaboration? Was it a good idea to begin with?*
- (5) *Who will benefit the most from the introduction of the Merced chip in the markets served by ESG?*
- (6) *Who will benefit the least and why?*
- (7) *What should Jim Davis recommend?*

February 18th

ORGANIZATIONAL CONTEXT AND TECHNOLOGICAL INNOVATION

Reading 9: Profiting from Technological innovation: Implications for integration, collaboration, licensing and public policy. Pg. 32-48

Reading 10: Strategic dissonance Pg. 478-489.

Case 4: Inside Microsoft: The untold story of how the internet forced Bill Gates to reverse course. (Group 2) Pg. 587-592

Questions

- (1) *When and how did Microsoft become aware of the importance of the Internet?*
- (2) *Discuss the role of strategic dissonance in the reformulation Microsoft's strategy.*
- (3) *What was Microsoft's new strategy at the end of 1995? Why did they decide on that strategy?*
- (4) *What are the implications of the strategy going forward?*

February 25th

LEAD USER RESEARCH AND PRODUCT DEVELOPMENT

In Class Exercise 2

Reading 12: Note on Lead User Research. Pg. 794-800

Case 5: Innovation at 3M Corporation (A) (Group3) pg. 781-793.

Questions

- (1) *How has 3M's innovation process evolved since the company was founded?*
- (2) *What are some organizational factors that have contributed to 3M being a hothouse of innovation?*
- (3) *How does the Lead User research process differ from and complement other traditional market research methods?*
- (4) *What should the Medical- surgical Lead user team recommend to Dunlop - The three new product concepts or a new business strategy? Assess the advantages and disadvantages of both recommendations.*

March 3rd

MID -TERM EXAMINATION – 2 hour Exam

March 10th

Reading 13: Damanpour & Gopalakrishnan. Dynamics of the adoption of product and process innovations in organizations. Journal of Management Studies. **(Handout)**

Reading 14: Crossing the Chasm - and Beyond. Pg. 362-367

Discussion of ideas for the Term Paper, its Structure, and Reference List etc.

Case 6: Charles Schwab Inc in 1999. (Case Presentation and Discussion) (Group 4) 592-609.

Questions

- (1) *What are some factors that describe the brokerage industry as of the early 1990s?*
- (2) *What were some of the key factors underlying Schwab's competitive advantage up until the mid 1990s? How have these factors reinforced each other?*
- (3) *How has the Internet affected the brokerage industry?*
- (4) *In 1999 what should Schwab do to protect and leverage its strategic*

position in the brokerage industry? Please prepare an action plan

March 17th

SPRING BREAK

March 24th

THE EMERGENCE OF INDUSTRY STANDARDS

Reading 15: Predators and Prey: A New Ecology of competition. Handout.

Reading 16: The Standard Wars – Varian, Hal (Handout)

Case 7: Apple Computer 1999. (Case Presentation)(Group 5) pg. 1110-1126.

Questions

- (1) Historically what were Apple's major competitive advantages?*
- (2) Analyze the structure of the personal computer industry over the last 10 years. How have the dynamics of the PC industry changed ?*
- (3) Evaluate Apple's strategies since 1990.*
- (4) What should Steve Jobs do today?*

March 31st

Reading 17: Managing the internal corporate venturing process.
pp. 692-702

Reading 18: Ambidextrous organizations : Managing evolutionary and revolutionary change

FILM: Reengineering the Corporation

**Case 8: 3M Optical Systems: Managing corporate entrepreneurship
(In class Discussion)**

Questions

- (1) As Andy Wong, how would you handle the authorization for expenditure for the re-launch of the privacy screen?*
- (2) As Paul Guehler would you approve the AFE if Wong had set it up for you?*
- (3) How effective has Wong been as a front line manager in the #m context? How effective has Guehler been as a 3M division president?*
- (4) What is it about 3M that makes it perhaps the most consistently entrepreneurial large company in the world?*

April 7th

PRODUCT DEVELOPMENT AND PRODUCT FAILURES

Reading 19: The Vasa Syndrome (Handout)

Reading 20: Organizing and Leading Heavy weight development teams pp. 1012-1022

Reading 21: The New Product Development Map – pg. 1089-1097.

Film: Developing the Palm Pilot.

Case 9: Eli Lilly: The Evista Project pp. 990-1004 (In class Case Discussion)

Questions

- (1) What is a heavyweight project team and how does it differ from a traditional approach used for organizing development projects at Eli Lilly?*
- (2) What is your assessment of the performance of the two heavyweight project teams described in the case? What factors contributed most to these performance results? In the Pharmaceutical context how far back in the development process should heavyweight teams be deployed?*
- (3) Is the heavyweight project team an approach that you would recommend to Lilly for purposes of commercializing the Evista project? What additional recommendations would you make to Lilly management concerning the use of heavyweight teams going forward.*

April 14th

STRATEGIC ALLIANCES AND INNOVATION

Reading 21: Collaborate with your competitors and win. Pp. 650-657

Reading 22: Technological alliances in the bio-pharmaceutical arena: The relationship between alliance context and performance. **(Handout)**

Case 10: We've got Rhythm! Medtronic Corporation's Cardiac Pacemaker Business (Group 6)

Questions

- (1) Review the history of how Medtronic nearly lost its position as market leader in the 1970s and 1980s.*
- (2) Which improvements in the new product development process that the Medtronic management team has implemented strike you as having been crucial in turning the company around?*
- (3) What do the concepts of Product line architecture and train schedule mean in the pacemaker business? What are the costs and benefits of having implemented these concepts as the Medtronic management team has done?*
- (4) Evaluate the nature of the senior management involvement in Medtronic's implementation of its product development system.*

(5) How is Medtronic doing today? What do you attribute to its success?

April 21st	All term paper presentations will be followed by question and answer session by the class and instructor PRESENTATION OF TERM PAPERS GROUPS 1, 2 and 3
April 28th	PRESENTATION OF TERM PAPERS Groups 4, 5 and 6
May 5 th	Reading Day
May 6th	Final Examination (As per Exam Schedule)

Good luck. Work hard and enjoy the course. There will be no make up exams given.
Class participation is crucial for this course. Make sure that you read current business news.
Any changes in schedule will be announced in class.