MHR 848
Technology Strategy & Innovation Management
Associate Professor Michael J. Leiblein
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Technology Strategy & Innovation Management provides students with a strategic perspective on management in complex, knowledge-intensive, and dynamic environments. These settings pose a different set of challenges to the identification and pursuit of competitive advantage than described in your previous strategy courses. Although tradeoffs between different resource allocation policies and forms of organization remain critical, these tradeoffs will often emphasize whether and when to shift from old to new sources of advantage. Importantly, these distinctions often require new tools and frameworks to consider: (a) how to evaluate highly uncertain investment proposals, (b) whether and how to capture value from intangible, knowledge-based assets, and (c) how to design organizations that assemble and organize resources to exploit existing advantages and explore new opportunities. In sum, the course considers temporal tradeoffs in addition to the functional and product-market tradeoffs emphasized in other strategy courses.

The course is organized around three broad questions: First, how do business organizations generate value? Second, what factors influence the portion of this value that is captured by the innovating organization? Finally, how can managers assemble and organize knowledge resources to deliver value in dynamic settings? In considering these questions we will develop and apply a series of conceptual models that illustrate interactions between competitive strategy and patterns of technological, market, and competitive change. These models provide a means to consider which firms will benefit from technology or market change, why many existing firms fail to incorporate new technology in a timely manner and the types of technologies and markets in which a given firm should invest.

The pedagogical approach taken in *Technology Strategy & Innovation Management* involves a mixture of readings, lectures, and case analyses. The readings are primarily drawn from research in strategic management, organizational economics, and organization theory. The lectures are designed to elaborate on and extend key points in the readings. The case studies provide an opportunity to integrate and apply these tools in a variety of technology intensive contexts. The course is organized into three modules:

1. **Creating Value: Patterns of Change in Technologies & Markets.** The first module examines how changes in the structure of technological and consumer markets create opportunities for new value creation. The main idea is that imbalances created by change systematically create challenges that are amenable to innovative solutions. The primary objectives of this module are to consider methods for anticipating these changes and to evaluate investment proposals in uncertain and dynamic settings.

2. **Capturing Value: Profiting from innovation in the market for ideas.** The second module explores the factors which determine the portion of value created for society that is captured by an individual firm. Economic value is almost always created through the coordinated action of a group of firms. This is particularly true in industries where value is tightly linked to intellectual property. This module explores the tradeoffs inherent in the use of patents, complementary assets, standards and lead time to capture value from knowledge intensive innovations.

3. **Delivering Value: Identifying innovative ideas & building an innovation competence.** The third module examines the resource allocation policies and organizational mechanisms firms use to deliver particular types of innovative value. The module emphasizes differences in the types of technological problems managers choose to solve and the types of incentives, collaboration, and coordination mechanisms used to solve these problems. The primary purpose is to explore how managers assemble and organize resources to deliver various (e.g., incremental vs. radical; autonomous vs. systemic, sustaining vs. disruptive) forms of innovative value.

Technology Strategy & Innovation Management has been created to help students identify the different types of technological, market, and organizational problems that occur at various stages in a technology or product life cycle. In so doing, the course helps students' to identify the underlying patterns of change that affect economic activity and to gain experience applying conceptual tools in dynamic settings. The course is likely to be of particular interest to students interested in creating, managing, or consulting to business organizations active in complex, knowledge-intensive, and dynamic settings. Students with interests in public policy may also find the course rewarding.

Technology Strategy & Innovation Management
2012 Course Outline

Session	Topic	Reading	Assignment
Creating Value: Patterns of Change in Technologies and Markets			
1/ 3	Introduction	• Gluck, F. & R. Foster, 1975.	
1/ 5	Industry Transformation: The Evolution of Technologies and Markets	• Foster, R., 1986. pp. 88-111 (Ch. 4 of Innovation: The Attacker's Advantage). • Moore, G. 1999. pp. 9 – 62 (Chapters. 1 & 2 of Crossing the Chasm).	
1/10	Industry Transformation: The Evolution of Technologies and Markets		• Case: EMI and the CT Scanner (A).
1/12	Industry Transformation: Technological Disruption	• Bower, J. & C. Christensen, 1995.	• Back Bay Battery Simulation (pay to access at http://cb.hbsp.harvard.edu/cb/access/11625474).
1/ 17	Industry Transformation: Incumbents & Entrants		• Synthes
Capturing Value: Profiting from innovation & the market for ideas			
1/19	The Managerial Challenge of Managing IP	• Winter, S.G., 2000. pp. 242-265.	• Assignment 1 is due.
1/24	IP Regime	• Anand, B & A. Galetovic, 2004.	• Monsanto: Realizing Biotech Value in Brazil
1/26	Complementary Assets	• SKIM Gans J. and Stern S. 2003.	• Studio Realty
1/31	The Influence of Standards	• SKIM Cusamano, Mylonadis & Rosenbloom, 1992.	
2/2	Using Organization to Capture Value		• Inxight: Incubating a Xerox technology spinout
Delivering Value: Using Organization to identify innovative ideas and build innovative competence			
2/ 7	Allocating Resources to Develop Capability	• Wheelwright, S. & K. Clark, 1992.	• Linking Strategy to Innovation: Materials Technology Corporation • Assignment 2 is due
2/ 9	Investing in Real Options to Develop Capability	• Luehrman, T., 1998. • Leiblein & Ziedonis, 2007	
2/14	Managing a R&D laboratory	• Fleming & Sorenson, 2003.	• Managing Research at IBM in Internet Time.
2/16	Leadership & Development of Organizational Capabilities	• Guest Speaker	• Please note that this date is subject to change.
2/21	Managing the Development of Organizational Capabilities		• What's the BIG Idea?
2/23	Managing the Development of Organizational Capabilities	• Senge, P. 1990.	• Managing Innovation at NYPRO, Inc. (A)
2/28	Outsourcing to Develop Capabilities	• SKIM Leiblein, Reuer, & Dalsace, 2002..	• Molding the impossible: The Nypro /Vistakon Disposable Contact Lens Project
3/ 2	Evolution of Value Chains	• Christensen, Verlinden, & Westerman, 2002.	• Abgenix and the Xeno Mouse.
Technology Strategy in Practice			
3/ 6	Analytical Tools		• We've got Rhythm! Medtronic Corporation's Cardiac Pacemaker Business • Case Study & Theory Note is due.
3/ 8	Wrap-Up & Summary		

COURSE REQUIREMENT AND GRADING

Required Materials:

- Readings marked "DOWNLOAD" are available at no charge through the OSU library system. To download these articles, navigate to http://library.osu.edu/, click the "research database" quicklink and search for the "Business Source Complete" tool. If you are accessing the site from an off campus location you will need to provide your "name.number" OSU email username and password. Once you've found the Business Source Complete database you may search and download PDF files.
- Cases and Readings marked "PACKET" may be purchased through Xanedu. Xanedu will post a link to the Carmen Learning Management System page with further instructions.
- Please register for the SIMULATION at http://cb.hbsp.harvard.edu/cb/access/11625474. Upon registering you will be prompted to enter a payment and then will receive another link to access the simulation itself.

Popular Textbooks in Technology Strategy:

There is no required textbook, but the following are useful references:

1. Afuah, Allan. 1998. Innovation Management: Strategies, Implementation, and Profits. Oxford University Press. New York, N.Y.
2. Burgelman, R., Christensen, C., Wheelwright, S. 2004. Strategic Management of Technology and Innovation. Irwin-McGraw Hill.
3. Leiblein, M.J. and A. Ziedonis. 2011. Technology Strategy & Innovation Management, Edward Elgar Publishing.
4. McGahan, A. 2004. How Industries Evolve: Principles for Achieving and Sustaining Superior Performance, Harvard Business School Press.
5. Schilling, M. 2005. Strategic Management of Technological Innovation, Boston: McGraw Hill.
6. Tushman, M. & P. Anderson. 1997. Managing Strategic Innovation & Change, Oxford University Press, New York, N.Y.

Instructional Procedure:

This course will be taught in discussion format using a mixture of readings, lectures, and cases. The assigned readings provide background conceptual material for each session. The cases contain background information on the objective of the activity, the people involved, and a series of events and administrative difficulties that confront the responsible executive. The intent of case analysis is to provide you with the opportunity to make complex decisions with limited information and to sort through data that is available to a decision-maker, some of which may be superfluous. In preparing cases, the following guidelines may be helpful: (1) recognize that the data in a case are invariably incomplete, (2) do not overlook the data that are available, (3) if an essential piece of data is missing, make reasonable and explicit assumptions, and (4) believe the facts and data in a case, but be suspicious of stated opinions. You are not required to get data from other sources to analyze cases in this class.

Attendance:

The primary source of your learning in this course will take place in the classroom as you and your colleagues share your insights and debate alternative courses of action available to the actors presented in the case. Although the assigned readings provide background material, attending class is necessary for a satisfactory evaluation on the contribution component of the final grade. The class will start promptly on time and will run for the entire session. Arriving late or leaving early disrupts the class and lessens your contribution; please do so only when absolutely necessary.

Technology:

The use of computers is not allowed in class. While I see benefits to their use, I have found that their use often distracts from the learning experience. I ask that you refrain from using laptops and smartphones in this class.

Academic Integrity:
Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct. If I suspect that a student has committed academic misconduct in this course, I am obligated to report my suspicions to the Committee on Academic Misconduct (COAM).

Students enrolled in the course are expected to further adhere to the Fisher College honor code. In part, the honor code asks that students agree: (1) not to discuss a case or receive notes on a case that has not yet been discussed in class and (2) that written case assignments reflect you or your team members' effort. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Evaluation:
The grading plan describes the relative importance attached to each of the individual activities used to assign a course grade. Your **course grade** will reflect your performance in terms of **(1) class contribution (25%), (2)** a sequence of **group two page papers (20%), (3) a group project (25%), and (4) a final exam (30%).** Details on each of the grade components are provided below.

Class Contribution:
Class contribution is one of the best and most reliable ways that students can demonstrate their understanding of the ideas presented in class and their ability to apply these models to real business situations. In-depth case preparation and active class contribution are also excellent ways to prepare for the final exam. This is your course in the fullest sense—what each person takes away from the course is a direct function of the effort that they and the rest of the group put forth in the debate. The class contribution grade is composed of an overall (1) evaluation by the professor, (2) summary of scribe evaluations, and (3) peer evaluations.

Professor Evaluation. For each class session, I will have a list of five to seven questions that help to identify the issues underlying the discussed business problem or issue. These questions may or may not correspond to the study questions that are provided for the day. I will call on students to answer each of these questions. After each class, I will take notes on students' contributions to the class session. While my preference is to rely on voluntary contribution, I may call upon you at any time, whether to open the case discussion with a summary of the key issues, to discuss the required readings, or to answer a specific question on a case. I will assume that all students are prepared for each session. Preparation implies that you have completed the assignments and that you are prepared to discuss them thoughtfully in class. *If for some reason you are not prepared for the discussion, please signal this by placing your name card FACE DOWN.* If your name card is not up, I will assume you are unprepared and make a note of that for your class contribution grade.

The following criteria will be used to judge class contribution. Good class contribution entails providing effective answers to case and discussion questions. Effective answers indicate that the student is able to interpret case and reading material in a manner that generates relevant implications. Good class contribution further indicates that the student is actively listening to others, able to question others in a constructive way, and able to provide comments relevant to the ongoing discussion. Good class contribution adds to our understanding of the underlying conceptual material, challenges and clarifies the ideas expressed by others, integrates material from past classes or other courses, and shows evidence of analysis rather than mere opinion. Excellent class contribution demonstrates that the student has thought deeply about the issue or case and can develop creative and innovative insights through this analytic effort. Excellent contributions often evaluate and synthesize course material and contribute to others comments by keeping the discussion focused and /or suggesting alternative ways of approaching the material. *Excellent contributions can be the basis of class discussion for 20 minutes or*

more. Students may earn additional contribution points by identifying articles from the academic and/or popular press (e.g., WSJ, Economist, Business Week) that illustrate a concept used in class.

Scribe Evaluation. On most class sessions, I will elect one student to act as a "scribe." The selected student will receive maximum class participation points for their activity on this day for summarizing the day's learning objectives and the contributions from all student participants to this discussion.

Peer Evaluation. Attached to your syllabus is a *Peer Class Contribution Evaluation Form*. Each student will be asked to list on this form ***up to four people*** in the class who, in their opinion, demonstrated excellent class contribution throughout the quarter. Students may not list themselves on this form. Although student evaluations will be kept confidential, for accounting purposes, each student will need to sign their *Peer Class Contribution Evaluation Form*. The *Peer Class Contribution Evaluation Form* must be returned to the Professor no later than the end of class on the **last day of the course**. Students who fail to turn this form in on time will not receive the highest class-contribution grade.

"2 Pagers":

Students should form their own groups of four, five or six individuals. Any student not included in a group after the second session will be assigned to a group by the professor.

Each group will be required to write a series of very brief (no more than two pages) papers. These "2-pagers" should **illustrate the application of one or more of the frameworks developed during the previous module** to an industry and/or firm of your choice. All the papers should be about the same industry or firm—teams are welcome to submit a one paragraph description of the company and potential issues that you will examine in the course by January 12. The 2-page papers should use 1" margins, 1 and ½ line spacing, and 11 pt or 12 pt font sizes. I will provide feedback on these assignments in an effort to help each group develop their projects over the quarter. The assignments will be assessed in terms of the evidence that each team provides indicating that they have: (a) considered the primary questions outlined in the module, (b) determined which conceptual perspective is most pertinent to the situation described in their industry, and (c) can apply insights from that perspective based on the evidence that they have regarding the situation that they are examining. Similar criteria will be used to assess the final project.

Assignment 1 (A hardcopy is due in class on January 19): The objective of this assignment is to identify new sources of value by plotting and describing how technology is evolving and market preferences are changing. The intent is to provide you with an opportunity to consider the concepts that lead to technology S-curves and/or product diffusion curves. While team's are asked to sketch these curves, the bulk of your effort will likely be in describing what you found and explaining why (or why not) the data fits the theory. For instance, it may be helpful to consider how effort is related to technical performance in your setting, whether technical performance is subject to "natural technological limits," and whether this area has or is likely to experience a "disruption?" It is important to choose your industry wisely so that you can write about this area in later assignments. The most appropriate industries are those in which you can (1) access information on the performance of a particular innovation or family of innovations over time, (2) access information about the resources that created the innovation and how they were organized & (3) describe the organization structure used by at least one firm to create the innovation.

Assignment 2 (A hardcopy is due in class on February 7): The intent in assigning this exercise is to provide an opportunity to consider whether and how the value capture mechanisms discussed in the second module affect the ability of innovators to capture value from an innovation. The assignment asks you to identify a specific recent innovation commercialized by a firm in your industry and to describe actions the innovating firm should take to capture value from this innovation. The innovation could be embedded in a product or service or be organizational in nature. To complete this assignment, please briefly describe the innovation and evaluate the innovating firm's ability to capture value from this innovation. Do you believe that mechanisms such as patents,

technical know-how, complementary assets, etc. likely to protect this firm's position? Will this change in the future?

Case Study and Theory Note (Due on March 6):

The group case study and theory note assignment will use the same groups that write the "2-pages". This project provides an opportunity to apply the course concepts in a meaningful way and to better understand the merits and challenges of various technology strategies. My objective in providing you this alternative is to allow you to customize the course to **your** specific interests. **Please submit both a hard and an electronic copy of the final paper**. Hard copies should be submitted to the instructor personally in class (or slid under the instructor's office door); electronic copies should be uploaded to the appropriate Carmen dropbox.

The case study and theory note should be professional both in terms of content and style. In terms of content, the case study should identify the critical issues(s) facing the company and provide enough information to allow readers to discern and evaluate the alternative responses to these issues available to the firm and its managers. Examples of critical issues addressed in prior version of this course include decisions whether or not to invest in a particular innovation, how to organize to capture value form a specific innovation, or how to organize to foster innovation in the future. Examples of alternative responses include use of specific value capture mechanisms (e.g., complementary assets, lead time, or secrecy) or specific organizational decisions to foster innovation (e.g., resource allocation policies, organizational structures, level of outsourcing or collaboration). Experience suggests that it is often helpful to frame the primary issue(s) or question(s) in terms of a researchable proposition or propositions. For instance, a project on green energy may propose questions such as: (a) An entrant into the solar power industry may best create value by investing in the development of thin-film solar cell technology, (b) may best capture value from thin-film solar technology through secrecy and lead time, or (c) the appropriate organization to develop thin-film solar cell technology will outsource only generic components.

The theory note should articulate the *relevant* frameworks and approaches used to identify tradeoffs across alternatives and/or support a particular recommendation for management action given the issues developed in the case. Experience suggests that the best theory notes emphasize compare and contrast how one or two particular frameworks illustrate aspects of and solutions to this problem. By way of example, a theory note may: (1) describe whether and how a particular framework suggests change in an underlying technology, consumer market, or government regulation is likely to affect competition in an industry; (2) suggest how a company can take advantage of these trends, (3) suggest how particular resource allocation and organizational policies are likely to affect a firm's ability to identify and deliver value from an innovation.

The case study and theory note should be typed **one and one-half or double-spaced**, **12 point Times New Roman Font**, with **1 inch margins** all around. The case study will generally be between **15 and 20 pages**, excluding references, and exhibits. The theory note will generally be between **5 and 7 pages.** Ideas and facts that are not your own should be appropriately cited. Tables and bullet points are excellent ways to organize your information so long as your points are made clearly. All exhibits should be referred to in the text of the analysis. Please pay careful attention to the clarity and quality of your writing. Difficult-to-comprehend passages are a signal that your team has struggled to fully comprehend the application of the frameworks to your case analysis.

The case study and theory note will be evaluated in terms of a team's ability to critically evaluate and generate new insights regarding the chosen framework, phenomenon, or organizational decision. The evaluation of the case study will emphasize the clarity of the focal issue or problem addressed and the accuracy, the relevance of the information presented in the case (e.g., company, product-market, resource or technical, organizational and competitive data), and the clarity and organization of the presentation. The evaluation of the theory note will emphasize the identification of appropriate frameworks, the clarity with which the assumptions and insights of these frameworks are presented, and the clarity of the application of these frameworks to the case. Excellent projects often are clearly focused on a particular framework and issue. They demonstrate a thorough understanding of the situation, the relevant framework, and provide support for any resulting conclusions. Good projects typically suffer from limitations in at least one of these areas. The least successful projects generally

provide a summary of information from the business press, articulate few linkages to the frameworks presented in this class, and generate few, if any, new insights.

Team Evaluation: In general, each team member will receive the same grade on all team assignments. Unfortunately, however, there may be times when one or more members of a group "free ride" on the work of others. The grades of such free riders will be substantially reduced if consistent evidence of free riding is found. To discover free riding, each team member is provided the **opportunity** to submit an individual team evaluation form on the **due date for each team assignment**. An example team evaluation form is included with this syllabus. If you do not submit a team evaluation form for a particular assignment, I will assume that, from your perspective, no free riding problems existed.

Final Exam:

The final exam will be a written analysis of a case or a series of newspaper articles. The final exam must be completed independently. Responses to exam questions will be due at the conclusion of the university scheduled final exam period. The exam will be evaluated in terms of the following general criteria.

> *Excellent* exam answers demonstrate both a student's understanding of the theories and models discussed in class and in the readings as well as a student's ability to apply these theories and models to generate insights about real business situations facing firms.
>
> *Good* exam answers demonstrate either that a student understands the theories and models ***or*** that a student can generate insights about a real business situation facing firms, but not both.
>
> *Poor* exam answers demonstrate neither an understanding of the theories and models nor an ability to generate insights about real business situations facing firms.

Grade Appeals:

Grades on exams and assignments are intended to reflect the overall quality of performance of the student. You may appeal your grade on a particular assignment or the final project. To appeal a grade, submit a clear written explanation describing why you believe the assigned grade is inappropriate within one week after your work is returned. I will carefully consider all such appeals. I will not re-grade an individual question or portion of an assignment; rather I will re-grade the entire assignment. As a result, the final grade for the re-graded assignment may be greater than, less than, or equal to the original grade.

Suggestions:

If you have special inquiries or constructive suggestions concerning the progress of the class, please feel free contact me in my office (Fisher 848), via phone (292-0071) or email (leiblein.1@osu.edu) at any time.

ABOUT YOUR INSTRUCTOR

Michael J. Leiblein is an Associate Professor in the area of Strategic Management. Michael received his Ph.D. from Purdue University as well as an M.B.A. and a B.S. in Electrical Engineering from Rensselaer Polytechnic Institute. Prior to his doctoral studies, Michael worked as a consultant for Andersen Consulting (Accenture) and as an engineer for Johnson Controls.

Professor Leiblein teaches the Technology Strategy, Advanced Competitive Analysis, and the Innovation Field Study elective courses in the MBA Program at the Fisher College. He has previously taught the MBA business core and MBA corporate strategy core courses as well as electives on corporate strategy and strategy consulting. In 2000 and 2002 the Ohio State University evening MBA students named him outstanding core course instructor. Michael has consulted in the United States and Europe for a wide variety of organizations and associations. At Ohio State, he serves as a co-director for the Food Innovation Center, one of President Gee's two inaugural trans-disciplinary centers devoted to improving global health, life quality and economics by way of innovations in the food industries.

Michael's academic research focuses on the relationship between organizational form and firm performance in technology-intensive industries. His work has been published in leading academic journals such as the *Strategic Management Journal,* the *Academy of Management Journal,* the *Journal of Industrial Economics,* and the *Journal of Management* and has received international media coverage in outlets such as *The Financial Times* (London), *Les Echos, Red Herring,* and *USA Today*. Michael's academic papers have been recognized with several awards including the 1994 Glueck Best Paper Award, an honorable mention for the 1995 Best Paper Award in Technology and Innovation Management, Distinguished Paper Awards from the Business Policy and Strategy division of the Academy of Management in 2005 and 2007, and Distinguished Paper Award from the Operations division of the Academy of Management in 2009. His dissertation research on the adoption of new technologies in the U.S. semiconductor industry was recognized by the Academy of Management as one of the best dissertations in the field of strategic management (1997 Free Press Award). He is currently the primary investigator on a grant from the National Science Foundation that extends this work by exploring the causes and innovative consequences of organizational decisions in the global semiconductor industry.

Michael currently serves as member of several prestigious editorial boards including the *Strategic Management Journal* (since 2004), the leading academic journal in the field of strategic management, and the *Academy of Management Review* (since 2005). In addition, he has also served as an editorial board member (2002 through 2007) and as an associate editor (2008 through 2011) at the *Journal of Management,* as a member of the executive committee for the Business Policy & Strategy division of the *Academy of Management* and as a representative and officer of the Competitive Strategy division of the *Strategic Management Society*.

In his free time, Michael enjoys attending collegiate sporting events, opera, and hiking through New England and the American Southwest.

Technology Strategy & Innovation Management

MODULE I:
CREATING VALUE: PATTERNS OF CHANGE IN TECHNOLOGIES & MARKETS

Session 1	**Introduction to Course**
Reading:	• DOWNLOAD. Gluck, Frederick and Richard Foster. 1975. "Managing Technological Change: A box of cigars for brad." *Harvard Business Review* 53, no. 5 (1975): 139-150.
Supplemental Reading:	• Claire McCloud (HBS # 9-680-030). • Christensen, Clayton M., Michael E. Raynor, and Matt Verlinden. "Skate to Where the Money Will Be." *Harvard Business Review* 79, no. 10 (2001): 72-81. • Christensen. C. & M. Raynor, 2003. Why Hard-Nosed Executives Should Care About Management Theory," *Harvard Business Review*, 81(5): 67-74. • Porter, ME, & J. Rivkin, 2000. Industry Transformation (HBS # 9-701-008).

Study Questions:

1. Are the challenges of technological change different now than in this case?
2. What are the key challenges to implement Miles' three decisions (p. 148)?
3. Why do we try to understand the patterns of technological change?
4. What is top and middle managers' role and responsibilities when face with potential technological change?
5. What organizational mechanisms would you put in place to help identify future profitable opportunities? Why?

Session 2	The Evolution of Technologies and Markets
Reading:	• PACKET. Foster, R. (1986). "The S-curve: A New Forecasting Tool." Ch. 4 (pp. 88-111) in *Innovation: The Attacker's Advantage,* Summit Books, Simon and Schuster, New York (NY). ISBN: 0671622501 • PACKET. Moore, G. 1999. "High-Tech Marketing Illusion" and "High-Tech Marketing Enlightenment" Chapters 1 & 2 in *Crossing the Chasm*. Harper Collins, NY.
Supplemental Reading:	• Utterback, James. "Invasion of a Stable Business by Radical Innovation." Chapter 7 in *Mastering the Dynamics of Innovation*. Cambridge, MA: Harvard Business School Press, 1994. ISBN: 0875847404 • McGahan, A.: "The evolution of industries", *Harvard Business Review*, 2004. • Christensen, Clayton. "Exploring the Limits of the Technology S-Curve Part I: Component Technologies." *Product and Operations Management* 1, no. 4 (1992): 334-357.

Study Questions:

1. What determines the limits of an S curve? Can such limits be determined *ex post* (after the fact)? How would one determine what to map on the vertical axis of an S curve?
2. Compare and contrast the concept of a technology S-curve with the concept of a diffusion curve? How is the phenomenon outlined by Christensen related to Foster's S-curve?

Session 3	**The Evolution of Technologies and Markets**
Case:	• PACKET. EMI & the CT Scanner (A)
Supplemental Reading:	• Gourville, John. "Eager Sellers and Stony Buyers: Understanding the Psychology of New Product Adoption." *Harvard Business Review* 84, no. 6 (2006): 98-106. • Ulwick, Anthony. "Turn Customer Input into Innovation." *Harvard Business Review* 80, no. 1 (2002): 91-97. • Leonard, Dorothy, and Jeffrey Rayport. "Spark Innovation through Empathic Design." *Harvard Business Review* 75, no. 6 (1997): 102-113.

Case Questions:

1. Where is the technology headed, and why?
2. Forecast the future demand for the CT scanner. Why was the scanner initially so profitable? Is this likely to continue?
3. What strategy would you recommend EMI pursue, and why?

Session 4	**Industry Transformation: Technological Disruption**
Reading:	• DOWNLOAD. Bower, Joe and Clayton Christensen. 1995. Disruptive Technologies: Catching the wave. Harvard Business Review, Vol 73, Issue 1, pp. 43-53.
Simulation:	• Online Password. Back Bay Battery Simulation
Supplemental Reading:	• Henderson, R.M. and K. Clark. 1990. "Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms" *Administrative Science Quarterly*, Vol. 35. pp. 9-30. • Abernathy, William J. and Kim B. Clark. 1985. "Innovation: Mapping the winds of creative destruction." *Research Policy* 14: 3-22. • Christensen, Clayton "How can great firms fail? Insights from the hard disk industry" Chapter 1 in The Innovator's Dilemma, Harvard Business School Press, 1997, pp 3-28. • Henderson, R. 1993. "Underinvestment and Incompetence as Responses to Radical Innovation: Evidence from the Photolithographic Alignment Equipment Industry," *Rand Journal of Economics*, 24(2). Read pages 248-252 and Figure2; skim the rest.

Simulation.

1. *Assignment:* Run simulation ONCE prior to class to insure that you and your team understand the system. We will run the simulation jointly in-class and conduct a debrief discussion of our results.

Session 5	**Entrants, Incumbents, & Disruptive Technologies**
Reading:	
Case:	• PACKET. Synthes
Supplementary Reading:	• Suarez, Fernando F., and Gianvito Lanzolla. 2005. "The Half-truth of First-mover Advantage." *Harvard Business Review* 83, no. 4: 121-127. • Lieberman, M.B. and Montgomery, D.B. 1988. First mover advantages, *Strategic Management Journal*, Vol. 9, pp. 41-58. • Besanko, Dranovec, & Shanley, 2002. Competitive Strategy, Chapter 11. • Robinson, W.T. and Fornell, C. 1985. Sources of market pioneer advantages in consumer goods industry, *Journal of Marketing Research*, 25 February, pp. 87-94.

1. *Discussion Questions:* What is a disruptive technology? How might incumbent firms affect the impact of a disruptive technology? Does this tell us anything about the environmental, technological, and firm conditions that suggest when 1st mover advantages are most likely to exist?

Case.

1. Are "bioreusable implants" worth the risk for Synthes?
2. What are the risks of coming out with a biorusable product? What is the worst that could happen? The best? What are the risks of not coming out with a biorusable product? What is the worst that could happen? The best?
3. What should Synthes do?

MODULE II:
CAPTURING VALUE: PROFITING FROM INNOVATION & THE MARKET FOR IDEAS

Session 6	**Managing Intellectual Property I**
Reading:	• PACKET. Winter, S.G. (2000). "Appropriating Gains from Innovation." *Managing Emerging Technologies* (New York, NY: Wiley & Sons): pp. 242-265.
Case:	
Supplemental Reading:	• USPTO http://www.uspto.gov/web/offices/pac/doc/general/whatis.htm. and US Copyright Office (paragraphs 1 & 2) http://www.copyright.gov/circs/circ1.html. • "The market for ideas," *The Economist*, 10/22/2005. • See also. "As luxury industry goes global, knock-off merchants follow," *Wall Street Journal*, 1/31/06; "The idea wars, a fight to control a new world currency," *New York Times*, 11/11/2001; "Idea for online networking brings two entrepreneurs together," *New York Times*, 12/1/2003. • The Protection of Intellectual Property in the United States (HBS Note #9-897-046) • Rivette, K.G. & D. Kline (2000). "Discovering new value in intellectual property," *Harvard Business Review*, Jan.-Feb., 2000.

Study Questions:

1. Assume you seek advice regarding a valuable technology that your firm has just developed. After meeting with lawyers and patent attorneys, you decide to contact Professor Winter, a prominent economist and author (book chapter). Based on the arguments put forth in their articles, what advice do you think that (a) the patent attorney and (b) Professor Winter would provide regarding the development of this technology?

Session 7	**Implications of IP Regime in a Global Environment**
Reading:	• DOWNLOAD. Bharat Anand & A. Galetovic. 2004. How market smarts can protect property rights. Harvard Business Review, Vol. 82, Issue 12, pp. 72-79.
Case:	• PACKET. Monsanto Realizing Biotech Value in Brazil
Supplemental Reading:	

Study Questions:

1. Give Monsanto a grade for the appropriation strategy in Brazil.
2. What are the possible risks of the POD system?
3. Should the POD system be applied to other nations?

Session 8	**Complementary Assets**
Reading:	• DOWNLOAD & SKIM. Gans J. and Stern S. 2003. The product market and the market for "ideas": commercialization strategies for technology entrepreneurs, Research Policy 32, 333-350.
Case:	• PACKET. Studio Realty
Supplemental Reading:	• Teece, DJ. 1986. "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing & Public Policy." *Research Policy* 15(6): 285-305. • See Also: Teece, D.J. 1987. "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy." *The Competitive Challenge*, ed. D. Teece, Ballinger Publishing, Cambridge (MA). pp. 185-219 (Chapter 9). Teece, D.J. 1987. "Capturing Value from Technological Innovation: Integration, Strategic Partnering, and Licensing Decisions." *Readings in Technology and Innovation,* M. Tushman & P. Anderson (eds). Teece, DJ. 1998. "Capturing Value from Knowledge Assets: The New Economy, Markets for Know-how and Intangible Assets." *California Management Review* 40(3): 55-79. Teece, DJ. 1996. "Firm Organization, Industrial Structure and Technological Innovation," *Journal of Economic Behavior and Organization* 31(2): 193-224. • Tripsas, M. 1997. "Unraveling the Process of Creative Destruction: Complementary Assets and Incumbent Survival in the Typesetter Industry." *Strategic Management Journal* 18, (Summer 1997): 119-142.

Study Questions:

1. What is the difference between the market for ideas and the product market?
2. When does it make sense for a team of entrepreneurs to 1) Enter the market directly? 2) Attempt to sell their ideas?
3. How does the relative importance of appropriability and complementary assets change over the life cycle of an industry?

Case:

1. What benefits did Connor's Electronic Open House offer to the various players in the real estate industry?
2. What is the basis of competition amongst Realtors?
3. Do you think that Connor can succeed in using his technology to begin selling real estate over the internet? If so, what should Connor do in order to accomplish this objective?

Session 9	**The Influence of Standards**
Reading:	• DOWNLOAD. Cusumano, M. A., Mylonadis, Y. and Rosenbloom, R. S. (1992). Strategic Maneuvering and Mass-Market Dynamics: The Triumph of VHS over Beta, *Business History Review*, 66(Spring): 51-94.
Case:	• See Carmen for contemporary articles regarding standards battles.
Supplemental Reading:	• Shapiro, C. and H. Varian. 1999. "The Art of Standards Wars," *California Management Review*, 41(2): 8-32 • Brandenburger, A. & B. Nalebuff. 1996. "War and Peace," "Co-opetition," and "Added Value." Chapters 1, 2 (pp. 3-39), & 5 (pp. 110-158) in Co-opetition. New York, NY. Doubleday • Gandal, Neil. 2002. "Compatibility, Standardization, and Network Effects: Some Policy Implications," Oxford Review of Economic Policy, Vol. 18, pp. 80-91.

Study Questions:

1. Why do some markets "tip" to a single standard?
2. Can you list the sources of the externalities that led to tipping in the case of VHS vs. Beta? How are these sources similar and different from those that affected the cases of QWERTY vs. DVORAK keyboards? Windows CE and Palm? HD DVD and Blu-Ray DVD? TiVo vs. Generic DVR's?

Session 10	**Using Organization to Capture Value**
Case:	• PACKET: Inxight: Incubating a Xerox Technology Spinout

Study Questions:

1. Why has Xerox had trouble capturing value from its technology in the past?
2. Why has Xerox created Xerox New Enterprise (XNE) as an incubator? Do you think this rationale is similar to OSU's focus on technology commercialization and innovation centers in Food and Health?
3. How does the XNE structure work? How is it managed?
4. What types of innovations and/or technologies do you think would fit well in this sort of incubator? What types would not fit well?

MODULE III:
DELIVERING VALUE: DEVELOPING AN ORGANIZATIONAL COMPETENCE

Session 11	**Allocating Resources, Project Portfolios and Technology Platforms**
Reading:	• DOWNLOAD. Wheelwright, S. & K. Clark. 1992. "Creating Project Plans to Focus Product Development," in Harvard Business Review, 92 (March-April): pp. 70-82.
Case:	• PACKET. Linking Strategy to Innovation: Materials Technology Corporation.

Study Questions:

1. How would you characterize the various projects MTC has undertaken in the framework proposed by Wheelwright & Clark?
2. Is this the right set of projects for MTC?
3. How many projects does MTC have the capacity to have underway at a given point in time?
4. If you were advising Spencer Quinn on how to build MTC into a successful company, what would you tell him?

Session 12	**Real Option Logic & Investment Timing**
Reading:	• DOWNLOAD. Luehrman, "Investment opportunities as real options: Getting started on the numbers", Harvard Business Review, July-Aug. 1998: 51-67. • DOWNLOAD. Leiblein, M.J. & A. Ziedonis. "Deferral and Growth Options Under Sequential Innovation." http://ssrn.com/abstract=950450
Supplementary Reading:	• Courtney, H., Kirkland, J., & Viguerie, P. 1997. Strategy under uncertainty. *Harvard Business Review*, (November-December): 67-79. • Luehrman, T. 1998. Strategy as a portfolio of real options, Harvard Business Review, Vol. 76: 5(Sept.-Oct).

1. *Discussion Questions:* Why are traditional DCF techniques such as NPV limited? How might one distinguish between contexts that support growth or deferral option value on real assets?

Session 13	**Managing a R&D Laboratory**
Reading:	• DOWNLOAD. Fleming, Lee and Olav Sorensen. 2003. "Navigating the technology evolution landscape." *Sloan Management Review*. 44(2): 15-23.
Case:	• PACKET. Managing IBM Research in Internet Time
Supplemental Reading:	• Hounshell, David A. "The Evolution of Industrial Research in the United States" pp 13-85 in *Engines of Innovation*, R. Rosenbloom and W. Spencer, Eds, Harvard Business School Press, 1996. • Nelson, R. (1962). "The Link Between Science and Invention: The Case of the Transistor", *The Rate and Direction of Inventive Activity: Economic and Social Factors*, National Bureau of Economic Research, Princeton University Press, Princeton (NJ). pp. 549-586. • Cohen, W. & D. Levinthal (1990). "Absorptive Capacity: A New Perspective on Learning and Innovation", *Administrative Science Quarterly*, Vol. 35. • O'Reilly, C. & M. Tushman, M., 2004. The Ambidextrous Organization, *Harvard Business Review* (April). See also Tushman, M. and C. A. O'Reilly 1996. "The Ambidextrous Organization: Managing Evolutionary and Revolutionary Change" *California Management Review*, 38(4).

Study Questions:

1. How much "basic" research should a firm invest in?
2. Should "basic" and "applied" research be managed differently?

Case:

1. Why has IBM struggled to get projects out of its research organization into its business units?
2. Is IBM's research organization well positioned to exploit the internet? Why or why not?
3. What should Paul Horn do to have the Research Division contribute to Gerstner's vision of "network-centric computing"?

Session 14 Guest Speaker, Jim Sonnett, VP Science & Technology, Battelle Memorial Institute

Session 15	**Managing the Development of Organizational Capabilities**
Reading:	• DOWNLOAD & SKIM Leiblein, M.J., and T. Madsen. 2009. "Unbundling Competitive Heterogeneity: Incentive Structures and Capability Influences on Technological Innovation." *Strategic Management Journal*.
Case:	• PACKET. What's the BIG Idea?
Supplementary Reading:	• Burgelman, R. 1991. "Intraorganizational Ecology of Strategy Making & Organizational Adaptation: Theory & Field Research." Organization Science. 2(3): 239-263. • Notes on Problem Solving; The creativity machine; Structured innovation process.

Case:

1. Why does BIG seem better able to identify and bring to market innovative toy concepts, whereas the major toy companies feel they are in a period of a "lack of innovation" (p.3)?
2. How proprietary or defensible is BIG's system? Could one of the major toy companies replicate it? Why or why not?
3. Can BIG replicate its system in other industries, such as lawn and garden?

Session 16	**Managing the Development of Organizational Capabilities**
Reading:	• PACKET. Senge, Peter M. 1990. "The Leader's New Work: Building Learning Organizations." *Sloan Management Review*. 32.1: 7-23.
Case:	• PACKET. Managing Innovation at NYPRO, Inc. (A)
Supplementary Reading:	• Burgelman, R. 1991. "Intraorganizational Ecology of Strategy Making & Organizational Adaptation: Theory & Field Research." Organization Science. 2(3): 239-263. • Leiblein, M.J. 2007. "Environment, Organization, and Innovation: How Entrepreneurial Decisions Affect Innovative Success," *Strategic Entrepreneurship Journal*, Vol. 1(1), pp. 141-144 • Notes on Problem Solving; The creativity machine; Structured innovation process.

Study Questions:

1. What are the organizational problems facing managers attempting to increase innovation in their firms? Do you believe that tools such as the creativity machine or TRIZ may be used to generate competitive advantage?

Case:

1. How would you characterize Lankton's mental model of his business (using the definition provided in Senge)?
2. What is the process employed at Nypro to identify and standardize upon important innovations?
3. Can you make any generalizations about the sorts of innovations that are likely to thrive within NYPRO's "internal marketplace" for technologies? What sorts of innovations are likely to languish?
4. How should Lankton roll out the Novaplast technology?

Session 17	**Challenges to Open Innovation**
Reading:	• DOWNLOAD & SKIM. Leiblein, M.J., J. Reuer, & F. Dalsace. 2002. "Do make or buy decisions matter? The influence of governance on technological performance," *Strategic Management Journal*, Vol. 23, pp. 817-833.
Case:	• PACKET. Molding the Impossible. The NYPRO/ Vistakon Disposable Contact Lens Project
Supplemental Reading:	• Leiblein, M.J. and J.T. Macher (2009). "The Problem Solving Perspective: A Strategic Approach to Understanding Environment and Organization," in B.S. Silverman and J.A. Nickerson (eds.), The Economic Institutions of Strategy – Advances in Strategic Management, Volume 26:

Study Questions:

1. When is it advisable to outsource a value-added activity in which you do not have a "core competence?" When might it be important to develop that competence in-house? What are some barriers to creating close problem-solving relationships between suppliers and customers? Can an organizational capability exist in the interface between companies?

Case.

1. Using your regression analysis skills, are there any hypotheses you can develop from the data in Exhibits 8 & 9 about the problem that Nypro and Vistakon are facing?
2. Whose job should it be to guide the selection of customers in a manufacturing company like Nypro?
3. What has the Vistakon project done for Nypro? If you were Gordon Lankton, which of the capabilities of Jones' team is developing would you consider the most valuable? How would you transfer this capability to other parts of the Nypro organization?
4. What could Dennis Jones do to create a more productive working relationship with the Vistakon team?

Session 18	**Evolution of the Value Chain**
Reading:	• DOWNLOAD. Christensen, C., M. Verlinden, & G. Westerman. "Disruption, Disintegration and the Dissipation of Differentiability." *Industrial and Corporate Change* 11, no. 5 (2002): 955-993.
Case:	• PACKET. Abgenix and the Xeno Mouse.
Supplemental Reading:	• Fine, Charles H. 1998. Clockspeed: Winning industry control in the age of temporary advantage. Perseus Books, Reading, MA. Chapter 9.

Study Questions:

1. How do you think Abgenix can best exploit the Xeno Mouse?
2. Does Pharmacol or BioPart represent a better way to go for Abgenix? Why?
3. What factors would you focus on in choosing a partner? Which of these factors are most important?
4. What should Scott Greer do? Go it alone through Phase II trials? Sign with Pharmacol? Sign with BioPart?

TECHNOLOGY STRATEGY IN PRACTICE

Session 19	**Analytical Tools**
Case:	• PACKET. We've got Rhythm! Medtronic Corporation's Cardiac Pacemaker Business
Supplemental Reading:	• Scwartz, Peter. 1991. "The Smith & Hawken Story: The Process of Scenario Building", pp 17-31 in *The Art of the Long View*, Doubleday. • Coyne & Subramaniam, 1996. "Bringing Discipline to Strategy" McKinsey Quarterly. (Winter). pp. 14-25.

Study Questions:

1. Why did things go so badly wrong at Medtronic?
2. Of all the things that Medtronic did to "fix" it's process, what do you think was the most important? Why?

Session 20,	**Summary and Wrap-Up**
Supplemental Reading:	• Claire McCloud (HBS # 9-680-030).

TECHNOLOGY STRATEGY & INNOVATION MANAGEMENT
PEER CLASS PARTICIPATION EVALUATION FORM
This form is due on the second to last day of class.

Your name: _____
(Print)

Please list up to five people in the course who, in your opinion, demonstrated consistent excellent class participation throughout the quarter. Do not include your own name with this list. Please also indicate the participation grade that you believe you deserve in this course. Please sign your name at the bottom of this form.

As a reminder, excellent class participation is defined as: a student consistently attends class, consistently and appropriately contributes to case discussions, and occasionally contributes unusually insightful comments in these discussions. Please print legibly!

1. _____
2. _____
3. _____
4. _____
5. _____

_____ I believe I deserve a participation grade of: _____
Sign here

TECHNOLOGY STRATEGY & INNOVATION MANAGEMENT

TEAM EVALUATION FORM

This form may be submitted with any assignment.

This form will be used in assessing the quality of contribution provided by your teammates on group projects. You have 100 group participation points to allocate to members of your group. If you believe that each member of your group participated equally in this group project, then you should assign each member of the group the same number of points. If one or more members of the group did not contribute equally, you should assign fewer points to them and more points to members of the group who contributed more to this project. In any case, the total number of points you allocate to members of your group must sum to 100. Please neatly write the name of each of your group members, including your own, in the space provided immediately below

Your Name: _____

List the names of the people in your group (<u>besides yourself</u>), and the group participation points you would assign to each. Remember, total Group Participation Points must sum to 100.

Members of your Group	Group Participation Points
1.	
2.	
3.	
4.	

Total : 100 points

TECHNOLOGY STRATEGY & INNOVATION MANAGEMENT READING LIST
MBA 848
Professor Michael Leiblein (292-0071)
Winter, 2012

Packet	Cases	Library
• Foster, R. (1986). "The S-curve: A New Forecasting Tool." Chapter 4 in Innovation: The Attacker's Advantage, Summit Books, Simon and Schuster, New York (NY). pp. 88-111. • Moore, G. (1999). "High-Tech Marketing Illusion" and "High-Tech Marketing Enlightenment." Chapters 1 and 2 in Crossing the Chasm. Rev. Ed., (NY: Harper Collins). • Winter, S.G. (2000). "Appropriating Gains from Innovation." Managing Emerging Technologies (New York, NY: Wiley & Sons): pp. 242-265. • Senge, Peter M. "The Leader's New Work: Building Learning Organizations." *Sloan Management Review*. 32.1 (1990): 7-23.	• EMI & the CT Scanner (383-194) • Strategic Innovation Simulation: Back Bay Battery • Synthes (9-502-008) • Monsanto: Realizing Biotech Value in Brazil (9-507-018) • Studio Realty (9-697-036) • Inxight: Incubating a Xerox Technology Spinout (9-699-019) • Linking Strategy & Innovation: Materials Technology Corp. (5-698-082) • Managing IBM Research in Internet Time (9-601-058) • What's the BIG Idea? (9-602-105) • Managing Innovation at NYPRO (9-696-061) • Molding the impossible: The Nypro /Vistakon Disposable Contact Lens Project (5-694-062) • Abgenix and the Xeno Mouse (9-501-061). • We've got Rhythm! Medtronic Corporation's Cardiac Pacemaker Business (5-698-004)	• Gluck, Frederick and Richard Foster. 1975. "Managing Technological Change: A box of cigars for brad." *Harvard Business Review* 53, no. 5 (1975): 139-150. • Bower, Joe and Clayton Christensen. 1995. Disruptive Technologies: Catching the wave. Harvard Business Review, Vol 73, Issue 1, pp. 43-53. • Bharat Anand & A. Galetovic. 2004. How market smarts can protect property rights. Harvard Business Review, Vol. 82, Issue 12, pp. 72-79. • Gans J. and Stern S. 2003. Research Policy 32, 333-350 • Cusumano, M. A., Mylonadis, Y. and Rosenbloom, R. S. (1992). Strategic Maneurvering and Mass-Market Dynamics: The Triumph of VHS over Beta, *Business History Review*, 66(Spring): 51-94. • Wheelwright, Steven C. and Clark, Kim B. (1992) Creating Project Plans to Focus Product Development. *Harvard Business Review*. 70(2): 70-82. • Luehrman, "Investment opportunities as real options: Getting started on the numbers", Harvard Business Review, July-Aug. 1998: 51-67. • Leiblein & Ziedonis. "Deferral and Growth Options Under Sequential Innovation." http://ssrn.com/abstract=950450 • Fleming, Lee and Olav Sorensen. 2003. "Navigating the technology evolution landscape." *Sloan Management Review*. 44(2): 15-23. • Leiblein, MJ, J. Reuer, & F. Dalsace (2002). Do make or buy decisions matter? The influence of organizational governance on technical performance. *Strategic Management Journal*, 23: 817-833.