



MANAGEMENT 731: TECHNOLOGY STRATEGY
SPRING 2014

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COURSE DESCRIPTION

The course is designed to meet the needs of future managers, entrepreneurs, consultants and investors who must analyze and develop business strategies in technology-based industries. The emphasis is on learning conceptual models and frameworks to help navigate the complexity and dynamism in such industries. This is not a course in new product development or in using information technology to improve business processes and offerings. We will take a perspective of both established and emerging firms competing through technological innovations, and study the key strategic drivers of value creation and appropriation in the context of business ecosystems.

Some questions that the course will help answer include:

- How do industries change and how should firms manage/leverage the change?
- What are the patterns of technology development and market adoption, and the strategic considerations for pursuing existing and new technologies?
- Why established firms struggle to embrace and compete with new technologies, and what can they do to sustain their success?
- How does the recent shift from industries and products to business ecosystems and technology platforms affect firm' competitive and cooperative strategies?
- What are the different types of business models that firms can use to appropriate value from their intellectual property (IP), and how should firms choose which business model to use?

The course uses a combination of cases, simulation and readings. The cases are drawn primarily from technology-based industries. Note, however, that the case discussions are mainly based on strategic (not technical) issues. Hence, a technical background is not required for fruitful participation.

EVALUATION

Individual

- Class participation (35%)
- Back Bay Battery write-up (10%)

Team

- Application project
 - Project proposal (5%)
 - Project presentation (15%)
 - Final paper (35%)

INDIVIDUAL RESPONSES TO THE DAILY POLL

For class sessions 2-5, 7-11, there will be a survey posted on the course website under "Quizzes." Everyone will be individually responsible for responding to the survey by 7AM the day of class. Answering the poll will not take much time beyond your normal preparation for the class. If you do not respond to the poll, I will assume that you have not prepared for class and will not call on you. Your participation in the online survey will count towards your class participation grade.

BACK BAY BATTERY SIMULATION

Firms face many challenges and tradeoffs regarding their technology investment decisions. The case of Back Bay Battery will help us apply course concepts to a real business situation. You will play the role of the President at Back Bay Battery Company, a manufacturer of nickel metal hydride (NiMH) batteries. The President's responsibility is to determine the appropriate timing and level of R&D investments between existing and new battery technologies under uncertain real-world conditions. You will also need to provide yearly sales forecast and decide which market opportunities to pursue, based on market intelligence and differing short- and long-term payoff prospects. Your decisions are of course subject to corporate-level financial constraints. You can get "fired" for missing sales forecast (i.e., actual annual sales is less than 80% of forecasted sales) or having a negative net income for three years in a row. You can also get fired if you miss sales forecast by a horrific 50% in a given year.

You are required to play two runs of the simulation and submit the individual write-up before the class. The write-up should be about 1000 words (12 pt. Times Roman font, single spaced, with margins no less than 1 inch). It should clearly articulate your strategy (both how it changed over time within a run and across different runs) and describe the main challenges that you faced while making the technology investment decisions. It would also be useful if you could identify the additional information that you would have liked to have before making your decisions.

APPLICATION PROJECT

The team project is meant to apply the concepts and frameworks learnt in the course to an episode of technology strategy in an industry. The project should be worked on in a team of five or six (preferred) students. In keeping with the spirit of the class, the project will examine how a specific firm chose to create and capture value from its technological innovation. I am open to studying both successes and failures. The more specific the innovation, the more narrow the definition of the market, the better. For example, it is better to focus on digital imaging than printing technologies; web browsers than internet application software; pacemakers than medical devices. Past projects have included Amazon's Kindle, Cosan's biofuels, eBay's auction platform, Google's Android, Microsoft's mobile OS, Netflix's video streaming, Nintendo's Wii, Palm's PDA, PayPal's online payment, Sony's 3D TV, Skype's VOIP application, SunPower's solar panels, TiVo's Set-top box, Toyota's Prius and Verifone's mobile payment.

The one page proposal (due on 2/2) is meant to define the boundaries within which your team would work on the application project. I will provide feedback/suggestions so as to align our expectations going forward. The proposal should include the topic and outline the strategic/technological issues that you plan to consider. It will also be helpful if you can mention how you plan to collect data for the project (e.g., archival sources/interviews).

The project presentations are meant to showcase your analysis to your classmates and to receive feedback that can be incorporated into the final paper. The presentation should last for about ten minutes followed by five minutes for Q&A. It should provide a brief industry overview (about two minutes) but mostly focus on your analysis, recommendations, and lessons learnt. All presentation should be uploaded on canvas by 2/25 (midnight).

The final paper (due on 3/9) should be about 6,000 words (excluding references and exhibits). The paper will be evaluated on four dimensions: First, the insight offered by the analysis – does it go beyond describing what happened to shed light on the fundamental causes. Second, the quality of the analysis and how well it integrates the concepts developed in the course. Third, how relevant, useful, and well supported are the lessons and recommendations presented. Fourth, the readability of the paper and readers' access to the ideas presented.

While you are probably aware of the conventions of properly citing material and ideas, I believe a short note on the subject is worthwhile. Material reproduced verbatim should be enclosed in quotation marks, with proper attribution made to the source. Ideas and concepts even if not quoted verbatim should be attributed to the author/source, also via proper citation.

COURSE OUTLINE*

Class 1 (Wed 01/15) - Introduction; What is Technology Strategy?

Readings: (1) Taylor III, A. (2010), "Here comes the electric Nissan Leaf," *Fortune*, 161(3); (2) Weingarten, T. (2010), "The new hot wheels," *Newsweek*, 156(24). (3) White, J. B. (2009), "Eyes on the Road," *Wall Street Journal*.

Mon 01/20: No Class (Martin Luther King, Jr. Day)

Class 2 (Wed 01/22 - Understanding and Managing Industry Change: A Firm Perspective

Case: Kodak and the Digital Revolution (HBS 9-705-448)

Reading: (1) McGahan, Anita (2004), "How Industries Change." *Harvard Business Review*. 82(10): 86-94; E-books

Supplementary Reading: Tushman, M., Smith, W. K., Wood, R. C., Westerman, G., & O'Reilly, C. (2010), "Organizational designs and innovation streams," *Industrial and Corporate Change*, 19(5): 1331-1366

Class 3 (Mon 01/27) - Understanding and Managing Industry Change: An Ecosystem Perspective

Case: E-Books in 2009: Did the Long Heralded Revolution Finally Arrive? (Wharton Case-48)

Complete Team Sign-Up on Canvas by 01/28

Class 4 (Wed 1/29) – Developing and Commercializing New Technologies (I)

Case: E Ink in 2005 (HBS 9-705-506)

Reading: (1) Foster, R. (1986), "The S-curve: A New Forecasting Tool," Chapter 4 in *Innovation, The Attacker's Advantage*. (2) Moore, G. (1999), "High-tech Market Illusion" and "High-Tech Marketing Enlightenment," Chapters 1 and 2 in *Crossing the Chasm*.

Application project proposal to be uploaded on Canvas by 02/02

Class 5 (Mon 02/03) – Developing and Commercializing New Technologies (II)

Case: Hewlett-Packard: The Flight of the Kittyhawk (HBS 9-606-088)

Reading: Christensen, C. (1997), "Value Networks and the Impetus to Innovate," Chapter 2 in *Innovator's Dilemma*.

Back Bay Battery write-up to be uploaded on Canvas before Class 6

Class 6 (Wed 02/05) - Managing Existing and New Technologies

Simulation: Back Bay Battery (HBS 7015-HTM-ENG)

Class 7 (Mon 02/10) - Network Externalities and Standards

Case: (1) DVD War (HBS 9-706-504), (2) Kenji Hall, "DVD Format Wars: Toshiba Surrenders," *BusinessWeek*, February 19, 2008.

Reading: Shapiro, C. and Varian, H. (1999), "Networks and Positive Feedback," Chapter 7 in *Information Rules: A Strategic Guide to the Network Economy*.

Class 8 (Wed 02/12) - Business Ecosystem and Platform Strategies

Case: Apple vs. Google (Businessweek, January 14, 2010)

* Please note that slides will be posted after each class in the course web site set up for this course.

Reading: (1) Iansiti M. and Levien R. (2004), “Strategy as Ecology,” *Harvard Business Review*, 82(3): 68-78.; (2) Gawer, A. (2012), “What Managers Need to Know about Platforms,” *European Business Review*. www.europeanbusinessreview.com/?p=4078

Class 9 (Mon 02/17) - Innovation Ecosystems

Case: previous cases (Electric Car; E Ink; Hewlett Packard)

Reading: Adner, R. 2006, “Match your innovation strategy to your innovation ecosystem,” *Harvard Business Review*, 84(4) 98-107.

Supplementary Readings: (1) Adner, R. and Kapoor (2010), “Value Creation in Innovation Ecosystems: How the Structure of Technological Interdependence Affects Firm Performance in New Technology Generations,” *Strategic Management Journal*, 31(3): 306-333; (2) Adner, R. and Kapoor, R. (2010), “Innovation Ecosystems and the Pace of Substitution: Re-examining Technology S-curves,” The Wharton School Working paper.

Class 10 (Wed 02/19) - Complementary Assets and Strategies for Capturing Value from IP

Case: Abgenix and the Xenomouse (HBS 9-501-061)

Reading: Teece, D. J. (1986), “Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy,” *Research Policy*, 15(6): 285-305.

Class 11 (Mon 02/24) - Capturing Value from Technology Licensing

Case: Carrot or Stick? Getting Paid for Innovation at Tessera Technologies (HBS 9-610-085)

Reading: Pisano, Gary P. and Teece, David J. (2007), “How to Capture Value from Innovation: Shaping Intellectual Property and Industry Architecture,” *California Management Review*, 50(1): 278-296

Supplementary Readings: (1) Cohen, W. M., Nelson, R. R., & Walsh, J. (2000), “Protecting their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not),” National Bureau of Economic Research Cambridge, Mass., USA.; (2) Abrams, D. S. and Wagner, R. P. (2012), “Poisoning the Next Apple? How the America Invents Act Harms Inventors,” *Stanford Law Review*.

Copy of presentation to be uploaded on Canvas by midnight on 02/25

Class 12: Project Presentations (Wed 02/26)

Class 13: Project Presentations (Mon 03/03)

Class 14: Course Wrap-up (Wed 03/05)

Final paper to be uploaded on Canvas by 03/09