Boston University Questrom School of Business
595 Commonwealth Avenue
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SI845: Technology Strategy
Fall 2016

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Office Hours: By appointment (HAR 641)

Course Overview

Technology Strategy is an advanced graduate class that equips students with an array of interrelated frameworks, concepts, tools and language for analyzing and managing businesses in an environment with rapid technological change. The course complements both a core strategy course and other strategy and functional electives. It should be particularly valuable for students who want to work in or start businesses in high-technology sectors, and also those who want to better understand how growth and wealth are created through technological innovation in a modern economy. Technology Strategy provides a comprehensive review of the key theories and tools needed to understand: (a) how technological change creates new markets and prompts new business models; (b) how technology-based firms can outcompete rivals in fast-growing markets characterized by high uncertainty; (c) how firms assemble the resources required to commercialize an innovative technology; and (d) how the evolution of technology affects the type of firm capabilities needed to succeed in an industry over time.

In addition to being conceptually rigorous, the course is designed to be very "hands-on" and "experiential" in several ways. First, most of the material taught deals directly with areas in which Questrom's Strategy & Innovation Department are active and well-known researchers; this means that we will be learning frameworks and concepts that our own faculty members have helped develop. Second, the use of hands-on exercises based on vignettes and situations of specific companies will provide students with an opportunity to apply the class concepts to specific companies and situations they can relate to. Third, we will take full advantage of "live cases" by linking short class assignments to the industries and situations faced by outside guest speakers' companies, or companies "in the news" during the semester. By asking students to write about what they learned from linking these company's challenges to the class concepts, students will have an opportunity to deepen their learning. Fourth, through the use of an online simulation centered on the strategic management of technology and innovation, the students will have the opportunity to be in the driving seat of a (virtual) firm – and compete against their classmates for best performance managing a technological disruption. Lastly, students are expected to extend the class discussions by posting comments or relevant links/material in the QuestromTools course forum. We will also use the forum to post proposals for final team projects and receive feedback from the rest of the class.

After taking this course, students will have a solid understanding of:

- How innovation emerges and how industries are born or disrupted through technological change.
- How technology-based companies make strategy decisions to identify, explore and exploit market opportunities.
- How factors beyond the control of a single firm, such as competition in complementary markets or the organization of the broader technology-developing community, can influence the chances of success of competing technologies.

Specific topics to be covered include:

- Sources of Technological Innovation
- Technology Diffusion / Crossing the Chasm
- Disruptive Innovation / Technology S-curves
- Industry evolution / Dominant Designs
- Dynamics of Industry Platforms / Platform Strategies
- Learning from failures as technology and market needs evolve.
- Appropriability Mechanisms: Intellectual Property, Lead Times, Secrecy, Copyright
- Complementary Assets: Sales & Distribution, Key inputs, Related Technology
- Industry Standards / Regulatory Environment
- Technology Transfer and Commercialization

What is Expected of Students

Prerequisites: Introductory "Core" Strategy (SI 751 or equivalent) or permission of instructor.

Prepare the Readings: The course pack will consist of articles, cases, and videos on issues related to business and technology. These readings will provide conceptual frameworks and specific industry and firm examples for the discussions and analyses in class. Additional readings might be added during the course of the semester to accommodate ideas generated during class discussions.

Class Contributions. Students are expected to prepare for every class, including the introductory lecture. The class is highly interactive. To prepare for the class discussion, students should summarize the problem or topic covered in the article, outline the article's core points and recommendations, and assess the strengths / weaknesses of the readings' central argument. To prepare for cases, students should pay attention to the main story and the details, think about the factors that contributed to the existing situation, and about the course of action they would recommend and why. Class participation is graded and is crucial to a valuable class experience. Still, students are reminded that they should use airtime judiciously and build upon the existing discussion whenever possible.

Attendance. Satisfactory class participation entails attendance at every session; preparation of all materials for every session; and active participation in class discussions. You may be absent once during the course; please notify the professor in advance if you have to miss a session. All subsequent absences will materially affect your final grade for the course. If a student anticipates that she will have to miss two or more sessions, then that student should let the professor know in advance and explain the reason for the absence. Assignments are always due at the beginning of class on their due date, even if you are unable to attend class that day.

Course Grading and Assignments

The final grade of the course will be composed of five components:

Component	Type	Weight
Contribution to Class Discussion	Individual	25%
Burning Platform Exercise	Team	10%
"Live case" assignment	Individual	20%
Back Bay Battery Simulation Report	Individual	15%
Final Research Project	Team	30%

Contribution to Class Discussion (Individual)

- Please see preceding section "What is Expected of Students." Please note that all contributions to class discussion will be taken into account, including questions to guest speakers and to other teams presenting their work.
- Case discussions will follow the Socratic method, and you should arrive at every class prepared to answer a "cold call" from the instructor on your analysis of the assigned material. Assessment of participation is based primarily on your active involvement in class discussion, and may include contributions such as: providing germane illustrations; providing motivation for a tool or technique; helpful recapitulation or summarizing; making observations that link or integrate concepts or discussion; responding effectively to questions; asking perceptive questions; presenting or supporting alternative, or unpopular, positions.
- Class discussions will be conducted by the norms of a professional business meeting: you are expected to arrive on time and to comply with the scheduling of class breaks. In particular you are expected to treat colleagues with respect: to disagree with an idea without discrediting the speaker; to help others to articulate their points of view; and to use airtime judiciously. Students who persistently attempt to dominate discussion, discourage or intimidate other participants, or otherwise diminish the value of the class, will be penalized.
- Assessment of participation will have three components: (i) Attendance and sufficient preparation to answer factual queries; (ii) the instructor's assessment of your contributions to class-discussion; (iii) your peer's assessment of your contribution to their in-class learning. (The process for collecting student input for participation grades will be explained in detail in class.) Around the mid-point in the course, all students will receive feedback from the instructor on their standing with regard to class participation.

Burning Platform Exercise (Teams)

- Before coming to the session where this case will be discussed, students working in assigned teams will prepare a report analyzing the strategic options open to Nokia in early 2011. The team should discuss the advantages and disadvantages of each option, and then come up with a recommendation to Mr. Elop. Specific instructions and a worksheet for analysis will be given out before the in-class exercise. Limit: 2,000 words.

Live Cases (Individual)

- You will be asked to submit a short slide deck (up to five powerpoint slides) containing a value-added analysis of a "live" example of a company or industry illustrating the previous session's topic and concepts. Each of you will be randomly assigned a specific session to cover, and a date to give your 5

minute presentation of these slides to the class. You should post your slides on Questom Tools before the start of the next class session when you are presenting. A "live" example is something taken from your reading of the media or your personal experience (within the past few weeks), and your presentation should feature some analysis/evaluation of the issue as well as reportage, with clear links to the relevant class session's material.

Back Bay Battery Simulation Report (Individual)

- In the middle of the semester, students will have the opportunity to experiment hand-on with what it is to manage a technology firm, through the Back Bay Battery simulation. Specific instructions for the simulation will be posted in the Questrom Tools course site. The simulation is run individually, during class time. After the simulation is done, each student should prepare a 1,000 words (max) report with a summary table of her/his simulation runs and an analysis of what she/he learned from running the simulation. Students should make sure to use some of the frameworks and insights from class when writing their report.

Final Research Project (Teams)

- Each team will focus on one technology market and one new venture (a start-up company, or a product initiative by an existing company) in that space. Using the concepts discussed in class, the students should hand out, in the last session of the course, a report on their analysis of the current strategic position of the venture, and recommendations of what the firm should do next.
- In order to receive feedback for their project, the teams will have time to discuss their selected technology market and venture during Session #8. Teams are asked to justify their selection: What makes this technology market interesting for a project? Why focus on this particular start-up? Teams are expected to incorporate the feedback they receive from the professor and the students into their work and final project report and presentation.
- During the last two sessions, teams will present their final projects. It is not necessary for all team members to present, but everybody should be upfront to answer questions after the presentation.
- There will be a team grade, but individual grades may divert from this team grade in up to one letter grade up or down, depending on the individual contribution to the team. Individual contributions will be assessed via an intra-team individual evaluation form that students will have to fill out.

Academic Accommodations for students with special needs: In keeping with University policy, any student with a disability who needs or thinks they need academic accommodations must call the Office of Disability Services at 353-3658 or stop by 19 Deerfield Street to arrange a confidential appointment with a Disability Services staff member. Accommodation letters must be delivered to the instructor in a timely fashion (within two weeks of the date on the letter and not later than two weeks before any major examination). Please note that accommodations will not be delivered absent an official letter for that purpose.

Semester Overview

	Date	Topic	Case	Readings
1	Sep-7	Introduction	Cree, Inc.	Baumol; Scherer
2	Sep-14	Diffusion	Performance Indicator	Gawande; Griliches; Audio
3	Sep-21	Disruption	Britannica	Bower & Christensen; King & Baatartogtokh; Audio.
4	Sep-28	Industry Life Cycle	Nokia	Foster; Simcoe; Uterback & Suarez; Gates
5	Oct-5	R&D Management	Back Bay Battery	Wheelwright & Clark; Spector et al.
6	Oct-12	Intellectual Property	Qualcomm	Shapiro; Planet Money; uBeam posts
7	Oct-19	Value Chain	A123	Teece
8	Oct-26	Product & Idea Markets	Millenium	Gans & Stern; Simcoe YouTube
9	Nov-2	Platform Dynamics	LEED	Eisenmann et al.; Shapiro & Varian
10	Nov-9	Co-opetition	GREE	Yoffie & Kwak; Brandenburger & Nalebuff
11	Nov-16	Industry Standards	Atheros	Farrell & Simcoe; Planet Money
	Nov-23	**Thanksgiving Holiday**		
12	Nov-30	Tech Policy	Streaming Video	Greenstein et al.; Online readings (TBD)
13	Dec-7	Conclusions*		CEA; Mowery & Simcoe; Porter & Stern; Romer; Atkinson

READINGS & CLASS PREPARATION DETAILS

Readings marked with a "*" are contained in the course reader.

Session 1: Introduction

- *Case: "Cree, Inc.: Which Bright Future?" (HBS 9-711-457)
- *Baumol, W. "Introduction: The Engine of Free Market Growth," Chapter 1 in *The Free Market Innovation Machine*, Princeton University Press, 2002.
- Scherer, F. M. "The Innovation Lottery," Chapter 1 in R. Dreyfuss et al., *Expanding the Boundaries of Intellectual Property*, Oxford University Press, 2001.

Session 2: Diffusion

- *Case: Performance Indicator (HBS 9-702-480)
- *Gawande, A. "Slow Ideas", *The New Yorker,* July 29, 2013.
- Wikipedia pages on "Diffusion of Innovations" and "Crossing the Chasm" https://en.wikipedia.org/wiki/Diffusion_of_innovations https://en.wikipedia.org/wiki/Crossing_the_Chasm
- Listen to NPR Planet Money Episode #630 "Free Parking"

- Griliches, Z. "Hybrid Corn and the Economics of Innovation" *Science*, July 1960, pp. 275-280.

Session 3: Disruption

- *Case: The Crisis at Encyclopaedia Britannica (KEL251)
- *Bower, J. and C. Christensen, "Disruptive Technologies: Catching the Wave", *Harvard Business Review*, 1995.
- *King, A. and Baatartogtokh, B. "How Useful is the Theory of Disruptive Innovation?" MIT Sloan Management Review, Fall 2015.
- Listen to NPR This American Life Episode #403 "NUMMI"
- Steven Davidoff Solomon, "$1 Billion for Dollar Shave Club: Why Every Company Should Worry," New York Times, July 26, 2016.
- (Optional) Henderson, R. and K. Clark, "Architectural Innovation: The Reconfiguration Of Existing Product Technologies and the Failure of Established Firms," Administrative Science Quarterly; March 1990.

Session 4: Industry Life Cycle

- Case: Nokia: The Burning Platform (BU iBooks case available from amazon.com)
- *Foster, R. "The S-Curve: A New Forecasting Tool," in *Innovation: The Attacker's Advantage*, New York: Summit Books, 1986, Chapter 4, 88-111.
- Class Note: Business Stealing and Replacement Effects
- Utterback J. and F. Suarez, "Innovation, Competition, and Industry Structure," *Research Policy*, 1993.
- Gates, W. "The Internet Tidal Wave" Microsoft Internal Memo (1995).
- (Optional): Utterback, J. "Invasion of a Stable Business by Radical Innovation: the Natural Ice Industry."

Session 5: R&D Management

- *Back Bay Battery (detailed instructions will be provided)
- *Wheelwright, S. and K. Clark "Creating Project Plans to Focus Product Development" Harvard Business Review (March 1992)
- Spector, A., P. Norvig and S. Petrov, "Google's Hybrid Approach to Research" http://static.googleusercontent.com/media/research.google.com/en//pubs/archive/38149.pdf
- (Optional) Urban and von Hippel. "Lead User Analyses for the Development of New Industrial Products." *Management Science* 1988.

Session 6: Intellectual Property

- *Case: Qualcomm Incorporated 2009 (HBS 9-710-433)
- Shapiro, C. "The Design and Use of Patents," http://faculty.haas.berkeley.edu/shapiro/madrid.pdf
- Listen to NPR Planet Money Episode #399 "Meat Patents"
- Web posts on uBeam:
    - https://www.engadget.com/2014/08/07/ubeam-wireless-charger-ultrasound/
    - https://techcrunch.com/2015/04/26/kill-the-cord/
    - https://techcrunch.com/2016/05/11/charged/
    - Find at least 1 uBeam patent at the USPTO web site and read it

Session 7: Value Chain Strategy

- *Case: A123 Systems Powering a Sustainable Future: Strategizing in the Advanced Battery Market (Univ. of Michigan ERB Institute, Case W93C02)
- *Teece, D., "Capturing Value from Technological Innovation: Integration, Strategic Partnering and Licensing Decisions," *Interfaces*, 1988.

Session 8: Product vs. Idea Markets

- *Case: Millennium Pharmaceuticals, Inc. (HBS 9-600-033)
- *Gans, J. and S. Stern, "The Product Market and the Market for Ideas: Commercialization Strategies for Technology Entrepreneurs," *Research Policy* 2002.
- Watch Streaming Lecture on YouTube

Session 9: Platform Dynamics

- Case: "Building LEED" (Materials to be supplied by instructor)
- *Eisenmann, T., G. Parker and M. Van Alstyne, "Strategies for two-sided markets," *Harvard Business Review*, 2006.
- *Shapiro, C. and H. Varian, "The Art of Standards Wars*," California Management Review*, 1999.

Session 10: Co-opetition

- *Case: Gree, Inc. (HBS 9-713-447)
- *Yoffie, D. and M. Kwak, "With Friends Like These, The Art of Managing Complementors," Harvard Business Review, September 2006.
- *Brandenburger, A. and B. Nalebuff, "The Right Game: Use Game Theory to Shape Strategy" Harvard Business Review (July-August 1995)
- http://www.wired.com/2013/02/facebooks-the-winner-in-the-platform-hunger-games/
- (Optional) Corts, K. and M. Lederman, "Software Exclusivity and the Scope of Indirect Network Effects in the U.S. Home Video Game Market." International Journal of Industrial Organization, March 2009, Pages 121–136.

Session 11: Industry Standards

- *Case: Atheros (HBS 9-806-093)
- Farrell, J. and T. Simcoe, "Four Paths to Compatibility," chapter in *Oxford Handbook of the Digital Economy* (see instructor's web site).
- Listen to NPR Planet Money Episode 500 "The Humble Innovation at the Heart of the Global Economy"

Session 12: Technology Policy

- *Case: "Streaming Over Broadband: Why Doesn't My Netflix Work?" (HBS 9-616-007)
- Greenstein, S., M. Peitz and T. Valletti, "Net Neutrality: A Fast Lane to Understanding the Trade-Offs" Journal of Economic Perspectives, Spring 2016.
- FCC Open Internet web site.
- "Internet Tolls and the Case for Strong Net Neutrality," NetFlix Blog Post.
- Comcast Open Internet web site.
- "Do the FDA's Regulation Governing Medical Devices Need to be Overhauled?" Wall Street Journal online, March 13, 2015. (online)

- "Mobile Medical Applications: Guidance for Industry and FDA Staff" February 9. 2015. (online)

Session 13: Conclusions

- "The Economic Report of the President, 2014" Council of Economic Advisers. Pages 179-212.
- Mowery and Simcoe "Was the Internet a US Invention?" Research Policy
- M-Porter & S-Stern, "Innovation: Location Matters" Sloan Management Review
- Romer, P. "Why, Indeed, in America?" American Economic Review, Section IV Only.