



MANAGEMENT 2140: TECHNOLOGY STRATEGY
FALL 2022

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SHDH 107

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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. Firms in such industries compete through technological innovations and face significant uncertainty with respect to emerging technologies and business models. The emphasis in the course 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. The course will take a perspective of both established and emerging firms competing through technological innovations and focus on the key strategic drivers of value creation and appropriation in the context of business ecosystems.

Some overarching questions that the course will help answer are:

- Why many promising technological innovations fail to create value, and what can firms do to manage the challenges of commercializing technological innovations?
- What are the different types of business models that firms can use to appropriate value from their technological innovations, and how should firms choose which business model to use?
- Why do established firms struggle to compete in a changing technology landscape, and what can they do to increase the odds of success?
- How can technology start-ups disrupt mature industries?
- How to create value in a platform-based ecosystem, and manage the shift from a product-based to a platform-based technology strategy?

The course uses a combination of interactive lectures, case analyses and simulations. It draws on the rich and emerging stream of research in technology management and strategy that moves beyond “one size fits all” approach to technology firms and instead focuses on the choices that managers and entrepreneurs face in a specific strategic situation. Cases and simulations will offer an opportunity to integrate and apply the theories and frameworks in a practical way and are drawn from a diverse range of technology-based industries and emerging technology trends. Class discussions are mainly based on strategic (not technical) issues. Hence, a technical background is not required for fruitful participation. In addition, guest speakers will be invited to share their perspectives on specific and contemporary issues related to the course.

EVALUATION

Individual

Participation

- Attendance (15 points)
- In-class contribution (20 points)
- Pre-class poll assignments (10 points) due the day of class @8am.
- Current events analysis (7.5 points) due on 11/10.
- Case write-up (7.5 points) due the day before the scheduled class for that case.
- Back Bay Battery write-up (7.5 points) due on 10/24.

Group

Technology Strategy Analysis Project

- Proposal (5 points) due on 10/30.
- Upload Analysis for Peer Group Feedback on 12/01.
- Peer Group Feedback (7.5 points) due on 12/04.
- Final Analysis (20 points) due on 12/06 @ 9am

Note: Assignments are all due at midnight on the day listed unless noted otherwise. All deliverables and evaluation components are carefully structured to maximize the learning opportunities for the course participants and to ensure high quality in-class interactions, while attempting to keep the workload reasonable for a full credit course, uniformly distributed across participants and over time.

PARTICIPATION

This is designed to be an interactive discussion-based course. Hence, participation is a crucial component of not only the evaluation but more importantly the learning in the course. It is expected that you are well- prepared for each class session. To help you prepare, discussion questions and online polls related to the specific topics and cases will be provided in advance on the course website. Everyone will be individually responsible for responding to the poll. Answering the poll will not take much time beyond normal preparation for the class. If you do not respond to the poll, I will assume that you have not prepared for the class. I may call upon you to discuss your answer in the poll.

In general, three factors determine high quality contribution in the class. First, is a given comment clearly related to the case and/or topic being discussed? Second, does the comment help move the class discussion forward? Third, does the comment draw on specific facts from the case or readings or personal experience to support the assertion? Note that quality, not quantity, will determine the effectiveness of your comments.

For case discussion, it is helpful to identify the key choices facing the protagonists, to evaluate alternatives (including what additional information you might need to gather to make a clear decision), and to think about the course of action you would recommend and why.

Of course, the underlying condition for class participation is attendance. I will be taking attendance. Arriving late is treated as a distinct event from being present at the start of class. Note that unexcused absences and tardiness will adversely affect class participation marks. A maximum of three excused absences will be accepted. Please note that slides will be posted after each class in the course web site set up for this course.

USE OF ELECTRONICS IN THE CLASSROOM

Research has shown that such use of electronic devices significantly disrupts learning, both for the students using the device and for others in the class. Phones must be turned off and put away, except in

the case of personal emergency. The use of laptops and tablets for note taking and referring to the case is allowed. While I will hopefully not be policing this within the classroom, the use of technology by students for purposes unrelated to the class is distracting to me (and more obvious than students often realize). Please be thoughtful of this. If use of technology becomes a distraction for the student or others, the student will lose participation points for that class.

CASE WRITE-UP

To help you develop a richer perspective on the cases, you will work on an individual assignment of answering the study questions associated with one of the cases that we discuss in the class. The study questions are available on Canvas under the specific class session. You will also be the class “leader” for that case discussion. This provides an opportunity for each student to “stand out.” A sign-up sheet to choose the case will be provided on the first day of class. The case write-up should be a maximum of 1,200 words of text. Additionally, you may attach 1 or 2 exhibits based on your analysis if they directly support your arguments/recommendations. The write-up is due by the evening prior to the day the case is discussed in class. Strong write-ups will develop logical arguments using course concepts/frameworks and the relevant information (quantitative/qualitative) from the case.

BACK BAY BATTERY SIMULATION WRITE-UP

Firms face many challenges and tradeoffs with respect to their technology investment decisions. The case of Back Bay Battery will help us engage deeply with such challenges and tradeoffs in 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. Your decisions are of course subject to corporate-level financial constraints. You are required to play a single run of the simulation and submit the individual write-up. You will play another slightly modified run in groups in class. Note that each run includes making decisions over an eight-year period. The write-up is meant to capture your thinking over the course of the simulation. It should be a maximum of 1,200 words of text and an optional 1 page of exhibits.

The write-up should address the following questions (either in a Q&A form or an essay form):

- What was the initial strategy and the logic underlying that strategy? Please be explicit about the assumptions that formed the basis for the initial strategy
- How did the strategy change over time (i.e., between the first and the eighth year), and what were the reasons for those changes?
- What were the main challenges that you faced while making decisions?
- What additional information you would have liked to have before making decisions? Please be explicit about how might that information be collected and how would it improve decision-making
- What did you take away from the simulation?

CURRENT EVENTS ANALYSIS

To help you develop expertise in technology strategy analysis, you will work on an individual reaction paper during the course of the semester. The reaction paper will analyze and interpret a relevant current event, within the past year, through the lens of the course. The current event could involve a technological change or a technological innovation by an established firm or a start-up that’s in the news. It could be an event whose outcome has recently been resolved (commercial success or failure), or it is ongoing. For example, Google’s or GM’s pursuit of autonomous vehicles, traditional banks managing the threat from mobile payments, Netflix’s loss of subscribers.

Specifically, the reaction paper should:

- 1) Analyze the event, focusing on the firms' strategic choices (technology, market, ecosystem, business model), and critically evaluating those choices in terms of their effectiveness. Your opinions should be based on theory/frameworks and supporting data (quantitative or qualitative).
- 2) Provide conclusions/recommendations with respect to the focal firms in terms of alternative choices that may be (have been) more effective.
- 3) Highlight how the insights (i.e., conclusions, recommendations) generated from your analysis compare with the views expressed by practitioners/analysts/journalists in the media.

Here are some sources for identifying relevant current events:

- [Fast Company](#)
- [MIT Technology Review](#)
- [The Verge](#)
- [Recode](#)
- Technology Sections of [BBC](#), [Economist](#), [WSJ](#), and [NYT](#)

The reaction paper should be a maximum of 1,500 words of text. Additionally, you may attach 1 or 2 exhibits based on your analysis if they directly support your arguments/conclusions/recommendations.

Strong reaction papers leverage 1-2 frameworks in-depth rather than mention many frameworks and make cursory connections. Strong reaction papers also do not spend more than 1-2 paragraphs on describing the firm's technology and the strategic choices, but instead focus on the student's analysis of those choices.

TECHNOLOGY STRATEGY ANALYSIS PROJECT

As the culmination of the course, we will draw on each other to explore the frontier of technology strategy by engaging deeply with current and emerging episodes of firms competing through their technological innovations. For this project, you will work in a group of 5 or 6 students. As part of the project, you would identify two firms, start-up or established, in the same industry domain pursuing different strategies with respect to their technological innovations, and which are at the early stage of implementation (e.g., Tesla and Waymo on Autonomous Vehicles, Charles Schwab and Betterment on Robo-Advising, Facebook and Magic Leap on Virtual Reality; Space X and Blue Origin on Space Launch). Your objective would be to:

- identify key differences in the strategies
- consider the assumptions behind those strategies
- undertake a systematic analysis and provide a conclusion in terms of which firm's strategy is likely to be more successful five years out
- provide recommendations to the firm whose strategy is deemed to be less successful five years out

The project should be well-researched, based on an extensive review of publicly-available information as well as specialized databases available through Penn Libraries. I encourage you to attempt to gain access to the firms being studied to collect data and conduct interviews, since this can lead to a uniquely rich and insightful analysis.

Each group would first provide a 1-2 page proposal and an optional 1 page of exhibits that would be evaluated for fit and provided with initial feedback. We will meet in the following week to discuss the proposals. The proposal should include the following information:

- Project motivation
- Brief synopsis of focal firms
- Brief synopsis of focal technological innovations
- General list of sources of data that the group expects to use (for private firms, please clearly identify at least one data source)

The analysis should be completed in the form of a slide deck with a maximum of 12 slides (excluding the title slide) and can include presentation notes for sharing additional details underlying the analysis.

Each group will be assigned to provide feedback on another group's analysis. The feedback should be provided in the form of a slide deck with three slides (excluding the title slide). The first slide would focus on the strengths of the analysis, the second slide would focus on the opportunities for clarification and improvements with the analysis, and the third slide would include a wish list of what else could be considered to make the analysis more compelling and insightful.

As a general note, a litmus test for a strong analysis is a clear articulation and logic for the choices being made by the focal firm, the assumptions under which those choices make sense, and the root cause (the why of why!) of why they will (not) work. Of course, all of this should be backed by data (quantitative and/or qualitative) and guided by the concepts and frameworks covered in the course.

Each group will have an opportunity to update the analysis based on the feedback received from the peer group and present their analysis to the class.

GRADING SCHEMA FOR WRITE-UPS AND ANALYSIS

Because course deliverables (write-ups, analysis) are designed for the purpose of both facilitating and evaluating your learning and are not based on quantitative problem-solving, they will be evaluated through a simplified schema -- "check," "check plus" and "check minus." In general, you should interpret these as the following:

- Check ~ 80-85% points (you have answered all questions and/or addressed the key issues, and demonstrated a good understanding of the course concepts and frameworks)
- Check plus ~ 95-100% points (you have answered all questions and/or addressed the key issues, and have used the concepts and frameworks in the course in a precise and careful manner to generate outstanding theoretical/practical insights)
- Check minus ~ 65-70% points (you have not yet fully demonstrated that you understand the frameworks and concepts from the course and how they are applied, and/or your write-up does not address all of the questions or key issues)

For the strategy analysis project, each group member will be evaluated by all group members at the end of the semester. Evidence that group work has been unevenly completed will count against the individual's score for the project.

NOTE ON CITATIONS

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.

FEEDBACK

I would like to help in every way that I can to enhance your learning experience, and I am also always looking for ways to improve the course. Hence, I strongly encourage anyone with specific or general questions/suggestions regarding the course structure, content or discussions to reach out to me.

COURSE OUTLINE

08/30 Session 01 – Course Introduction and Logistics

Technology Development and Commercialization

09/01 Session 02 – Technology Development

Reading: Foster, R. (1986), "The S-curve: A New Forecasting Tool," Chapter 4 in *Innovation, The Attacker's Advantage*

09/06 Session 03 – Technology Adoption

Reading: Moore, G. (2014), "High-tech Market Illusion," Chapter 1 in *Crossing the Chasm 3rd Edition*

09/08 Session 04 – Technology Ecosystem

Readings:

- (1) Adner, R. and Kapoor, R. (2016), "Right Tech, Wrong Time: How to Make Sure Your Ecosystem is Ready for the Newest Technologies," *Harvard Business Review*, 94(11): 60-67
- (2) Kapoor, R. (2018) "Ecosystems: Broadening the Locus of Value Creation," *Journal of Organization Design*

09/13 Session 05 – Technology Business Model

Readings:

- (1) Teece, D.J., Linden, G. (2017) "Business models, value capture, and the digital enterprise," *Journal of Organization Design*
- (2) Rahul Kapoor and Thomas Klueter (2020), "The Uncertainty Factor," *MIT Sloan Management Review*, 61(4): 1-7

09/15 Session 06 – E Ink Case Discussion

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

09/20 Session 07 – Abgenix Case Discussion

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

09/22 Session 08 – Tesla Case Discussion

Case: Tesla: Fueling the Electric Car Revolution (Wharton Case Study)

Technology Disruption

09/27 Session 09 – Understanding and Managing Industry Disruption

Readings:

- (1) Christensen, C. M., Raynor, M., & McDonald, R. (2015). What is Disruptive Innovation?. *Harvard Business Review*, 93(12), 44-53;
- (2) McGahan, Anita (2004), "How Industries Change," *Harvard Business Review*, 82(10):86-94

09/29 Session 10 – Kodak Case Discussion

Case: Kodak's Digital Transformation Journey (Wharton Case Study)

10/04 Session 11 – Microsoft Case Discussion

Case: Microsoft: From Cloudy Outlook to the cloud? (Wharton Case Study)

10/11 Session 12 – Netflix Case Discussion

Case: Netflix in 2011 (HBS 9-615-007)

*We will take a break from the Technology Disruption section of the course during MBA core exams and MBA opportunity week.

10/13 Session 13 – Q&A Session with Private Equity Principal at a Technology-Oriented Fund

10/18 Session 14 – TBD

10/20 Session 15 – Q&A Session with Web 3.0 Consultant.

10/25 Session 16 – Back Bay Battery Simulation (In-class Group Work)

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

Assignment: Back Bay Battery write-up (due at midnight on 10/24).

10/27 Session 17 – Back Bay Battery Simulation (Debrief)

11/01 Session 18 – Discussion of Project Proposals

Assignment: Project proposal (due at midnight on 10/30).

11/03 Session 19 – Discussion of Project Proposals

Technology Platforms

11/08 Session 20 – From Products to Platforms

Reading: Van Alstyne, M.V., Parker, G. G., & Choudary, S. P. (2016). Pipelines, Platforms, and the New Rules of Strategy. Harvard Business Review, 94(4), 54-62

11/10 Session 21 – Platform Strategy Simulation

Simulation: MIT Platform Wars

Assignment: Current Events Analysis (due at midnight on 11/10).

11/15 Session 22 – Spotify Case Discussion

Case: Spotify (HBS 9-516-046)

11/17 Session 23 – Apple and Google Case Discussion

Case: Apple, Google and the Smartphone Revolution (Wharton Case Study)

11/29 Session 24 – Facebook Case Discussion

Case: Facebook’s Quest Towards Metaverse (Wharton Case Study)

12/01 Session 25 – No Class (Time for working on final project)

Assignment: Analysis for peer group feedback (due at midnight on 12/01); peer group feedback (due at midnight on 12/04).

12/06 Session 26 – Presentations

Assignment: Final analysis (due at 9am on 12/06).

12/08 Session 27 – Presentations and Wrap-up