



## **MGMT 731: TECHNOLOGY STRATEGY**

### **FALL 2019**

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Office hours: by appointment

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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, value capture, and competitive advantage.

Some overarching questions that the course will address are:

- What are the different models of industry, technology, and market evolution, and what are the implications for firm strategy and competitive advantage?
- What are the different types of business models that firms can use to innovate and capture value from their technology, and how firms should 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 start-ups disrupt mature industries and when to compete or cooperate with incumbents?
- How to create value in a platform-based ecosystem, and manage the shift from a product-focused to a platform-focused strategy?

#### **INSTRUCTIONAL METHOD**

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 a “one size fits all” approach to technology firms and instead focuses on the choices that managers and entrepreneurs face in specific strategic situations. Cases offer an opportunity to integrate and apply theories and frameworks in a practical way, and are drawn from a diverse range of technology-based industries. Case discussions are mainly based on strategic (not technical) issues, and thus a technical background is not required for fruitful participation. Due to the cumulative nature of the course and complexity of the subject matter, class attendance, advance preparation and active participation are all critical to your success. You will be expected to complete all required readings prior to class and come prepared to discuss the concepts and case analyses.

#### **EVALUATION**

Given the analytical and applied nature of this course, there are no exams. Instead, grades are determined by your ability to apply course concepts to the following individual and experiential team assignments: discussion questions (10 submissions at 2.5pts each, 25pts), emerging trends brief (5pts), Back Bay Battery write-up (10pts), class participation (20pts), a team Insights Conference proposal (5pts), a team Insights Conference presentation (25pts) and peer evaluations of your contributions to the team project (10pts).

## COURSE SCHEDULE

Session	Topic	Readings/Activity
1 - Aug 28	Technology & firm strategy	Introduction class. No readings
2 - Sept 4	Technology trajectories	– “Eager Sellers and Stony Buyers” – HBS Case: Tesla Motors
3 - Sept 9	Technology & industry dynamics	– “Disruptive Technologies: Catching the Wave” – HBS Case: Netflix
4 - Sept 11	Technology ecosystems	– “Matching your innovation strategy to your innovation ecosystem” – HBS Case: HTC Corp in 2012
5 - Sept 16	Responding to new technologies	– HBS Case: IBM Transforming
6 - Sept 18	<b>Emerging trends: Value creation</b>	– Topics: threats to competitive advantage and how to respond
7 - Sept 23	Sources of new technologies	– HBS Case: Surface Logix
8 - Sept 25	Incentivizing innovation	– “On the Folly of Rewarding A, while Hoping for B” (AME 1993) – HBS Case: Wyeth Pharmaceutical: Spurring Scientific Creativity with Metrics
9 - Sept 30	Acquiring new technologies	– Mini cases available on Canvas
10 - Oct 2	<b>Back Bay Battery Simulation</b>	– In-class group exercise
11 - Oct 7	<b>Back Bay Battery Simulation</b>	– Simulation debrief
12 - Oct 9	Employment contracts	– HBS Case: Barry Riceman at NetD (A&B)
13 - Oct 14	Trade secrecy & copyrights	– “Appropriating the Gains from Innovation” – Stanford Case: Cadence vs. Avant!
14 - Oct 16	Patents basics	– News articles available on Canvas
15 - Oct 21	Patent strategies	– TBA
16 - Oct 23	Markets for technology	– “Markets for technology” – HBS Case: Abgenix and the XenoMouse
17 - Oct 28	Technology commercialization strategies	– Technology commercialization strategies note – MIT Case: Bionym
18 - Oct 30	<b>Emerging trends: Value capture</b>	– Topics: appropriability strategies
19 - Nov 4	<b>Presentation proposals</b>	– Meetings with teams (Google sheet sign-up for meeting times)
20 - Nov 6	<b>Presentation proposals</b>	– Meetings with teams (Google sheet sign-up for meeting times)
21 - Nov 11	Network externalities & multisided platforms	– “Strategic Decisions for Multisided Platforms” – HBS Case: Responding to the Wii?
22 - Nov 13	Creating platforms	– “Finding the Platform in your Product” – News articles available on Canvas
23 - Nov 18	<b>Emerging trends: Platforms</b>	– Topics: from products to platforms
24 - Nov 20	<b>Team meetings (optional)</b>	– Also Tuesday & Thursday (Google sheet sign-up)
25 - Nov 25	<b>Team research (no class)</b>	Have a great Thanksgiving!
26 - Dec 2	<b>Insights conference</b>	– Google sheet sign-up for presentation slots
27 - Dec 4	<b>Insights conference</b>	– Google sheet sign-up for presentation slots
28 - Dec 9	<b>Course wrap-up</b>	

## **REQUIRED READINGS**

We will use a combination of readings and cases to form the basis for class discussions. The readings will draw primarily from the popular press and additional concepts and material will be provided through slides and other in-class handouts, while the cases will be used to illustrate key concepts and facilitate discussion. The emphasis in the course will be on interactive in-class discussion rather than lectures, and as such it is imperative that you read all assigned materials and are prepared to participate in each class.

- HBS cases and articles available through Study.net
- Other readings available on the Canvas course website. Please note that short articles from the business press may be added to the required readings.

## **CLASSROOM EXPECTATIONS**

Although a variety of pedagogical methods will be used, classroom time will revolve primarily around discussion of cases and their associated readings. As in all such case-oriented classes, class attendance and participation are not only desired, but required.

Each case varies in its analytic difficulty, ranging from evaluating decisions already made (simple) to recommending a decision for a specific issue (more difficult) to defining the issue(s) to be addressed and then recommending a specific choice (most difficult). For these latter two types of cases, you will often find that your understanding of the issues is improved if you put yourself into the position of the protagonist in the case. Cases also vary in their conceptual difficulty, ranging from a single framework that is easily understood (easy) to multiple frameworks or one challenging framework (more difficult) to multiple and challenging frameworks (most difficult). Understanding the cases along these dimensions will help you to prepare more effectively and to allocate your time appropriately.

Prior to class, you should thoroughly read and prepare for the day's discussion, including submitting answers to the study questions. Please ensure that you have used the frameworks, tools, and ideas from the readings in your analysis as appropriate. Doing the reading(s) first is advised. Also ensure that you have exploited the material in the case exhibits as much as possible. Many cases will have a question or two for which you have to make a specific recommendation. Your recommendation should be realistic, actionable, and supported by analysis (including numerical where appropriate). You should understand the decision criteria, formulate and evaluate (quantitative and qualitative assessments) alternatives, and select a choice. You should also understand the assumptions that underlie your recommendation. Finally, your recommendation should consider implementation: who should carry out your suggestions, when they should do it, and how.

During class, you should be prepared to lead off the discussion of any question in a significant way as well as to discuss salient issues that are not addressed per se in the assigned questions. As in any case discussion, it is crucial that you are well prepared, listen carefully to others, and build on/critique previous comments. Clearly, you must participate in class if you are going to share your ideas with others. There is, however, no need to participate in every class. It is the quality of comments, not the quantity, that is most germane. Occasionally, students find that it is easier to participate effectively from the point of view of a particular person, or to take on the role of devil's advocate or expert (if expertise is possessed) on the topic.

## **USE OF ELECTRONICS IN THE CLASSROOM**

The MBA program disapproves the use of electronic devices during any class for non-educational purposes. Experience has shown that such use significantly disrupts learning, both for the students using the device and for others in the class. Phones must be turned off and put away. If a student must keep a phone on by reason of a personal emergency, the student must inform the instructor before class begins. The use of laptops is not allowed unless for running the simulations in class on designated days. The use of tablets for note taking and referring to the case is allowed. Students not complying with these policies in any class will lose participation points for that

class. If a student is unsure of the electronics policy at any point, he or she should ask me for clarification before the class.

**ASSIGNMENTS & GRADING**

This course is fundamentally about learning how to think strategically about managing technologies for competitive advantage. As such, the emphasis is on learning and applying concepts that will help you to critically assess different situations, analyze information, and make strategic decisions in situations where there is seldom a clear right answer. To this end, assignments in this course are designed to help you apply the concepts through experiential learning exercises and not to test your ability to memorize theories or calculate equations. Nevertheless, assignments do require considerable thought and critical analysis, and thus should not be considered easy or soft.

As Wharton students, I expect the very best from each of you. All assignment should reflect a high level of effort and quality, and assignments that meet these expectations will be graded as “acceptable.” Assignments that exceed expectations by demonstrating an insightful analysis of key issues, an exceptional understanding and application of course concepts, and thoughtful answers and recommendations will be graded up. Assignments that are superficial, fail to accurately apply course concepts, and demonstrate a lack of care and effort will be graded down. Your grade in the course is based on the following individual and team components:

Evaluation Components	Points
<b><i>Individual components</i></b>	
Discussion questions (10 submissions at 2.5pts each, due by 8am on day of class)	25pts
Class participation	20pts
Emerging trends brief	5pts
Back Bay Battery write-up	10pts
Peer evaluations	10pts
<b><i>Team project</i></b>	
Presentation proposal (due Friday, Nov. 1st, at 5:00pm)	5pts
Technology strategy report (due Tuesday, Nov. 26th, at 5:00pm)	25pts

*\* Please contact me with any questions within one week of receiving a grade.*

**Discussion Questions (10 submissions at 2.5 points each, 25pts)** – For each class there will be 2-3 questions. These questions are meant to provide you with an opportunity to integrate and expand upon material from the assigned readings and cases and will form the basis for class discussions. Students should read the assigned articles and/or cases prior to answering the questions. For the vast majority of questions there will not be right or wrong answer. Each response should be approximately a paragraph long, and greater weight will be given to quality rather than length. Although no individual feedback will be provided, I will provide examples of exceptional response from your peers to enhance the overall learning experience and illustrate high-caliber responses. Submission that make a reasonable attempt to answer the questions will receive full credit (4pts), while responses that demonstrate a lack of familiarity with the assigned readings or a poor attempt to answer the questions will receive partial credit (1-3pts; incomplete responses will receive 0pts). You may discuss the study questions with other students, but your responses should reflect your thoughts on the case and should be independent work. Responses that share a substantial degree of similarity in content and language will be examined closely and any violations of the honor code will be reported. **A link to the survey will be provided approximately one week before each class and responses are due by 8:00am on the day of class. No late or make-up responses will be accepted.**

**Class Participation (20pts)** – Active involvement in class discussions plays an integral role in the learning process. Your participation is evaluated based upon the overall quality of your contributions to the classroom learning environment. This includes, but is not limited to, both in-class and out-of-class contributions such as initiation and extension of in-class discussions and the introduction of additional material—either in class, on the course discussion board, or via email—relevant to the day’s topic. Frequent comments that add little to the discussion or demonstrate a lack of familiarity with relevant course material will not be evaluated favorably. In addition, behaviors that detract from the overall class learning experience—such as arriving late, poor attendance, and the use of laptops, and smartphones during class—will negatively impact your class participation grade.

In general, four factors determine high quality comments in the class. First, is a given comment clearly related to the case and/or topic being discussed? Second, does the comment move the class discussion forward? Third, does the comment reflect consistent and logical reasoning or are there gaps in the logic? Fourth, 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 analyses, 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. Class participation will be graded as follows:

- **Outstanding participation (17-20pts):** Contributions in class reflect exceptional preparation, yield one or more major insights, and provide direction to the class. Attends nearly every class (1-2 absences). If this person were not a class member, the quality of discussion would be significantly diminished (top 5% of class).
- **Good participation (12-16pts):** Contributions reflect thorough preparation, provide good insights into the topic under discussion, and sometimes provide direction for the class. Attends nearly every class (1-2 absences). If this person were not a member of the class, the quality of discussion would be diminished (top 6-25% of class).
- **Adequate participation (6-11pts):** Infrequent contributions that reflect satisfactory preparation, but seldom offer a major new direction for discussion (average participation, 40-60% of class).
- **Non-participant (0-5pts):** Little to no contributions to the class discussion and frequent absences. Therefore, there is not an adequate basis for evaluation (bottom 25% of class).

The underlying condition for class participation is attendance. I expect you to attend all sessions. Specifically, according to the MBA office, there is no recruiting reason for which you should miss class. I will be taking attendance. Arriving late is disrespectful to your colleagues and, for attendance purposes, 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.

**Emerging Trends Brief (5pts)** – To help you develop expertise in technology strategy analysis, you will work on an individual brief during the course of the semester. The brief will analyze and interpret a relevant current event, within the past year for a specific topic 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. Students must sign-up for one of three topics that we will cover over the semester. Also, each student will discuss their brief in class and lead a class discussion.

Specifically, the brief should:

- 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).

- Provide conclusions/recommendations with respect to the focal firms in terms of alternative choices that may be (have been) more effective.
- Highlight how the insights (i.e., conclusions, recommendations) generated from your analysis compare with the views expressed by practitioners/analysts/journalists in the media.

The brief should be a maximum of 1,500 words of text (12 pt. Times Roman font, single spaced, with margins no less than 1 inch). Additionally, you may attach 1 or 2 exhibits based on your analysis if they directly support your arguments/conclusions/recommendations.

Strong briefs leverage 1-2 frameworks in-depth rather than mention many frameworks and make cursory connections. Strong briefs also do not spend more than 1-2 paragraphs on describing the firm's technology and the strategic choices. Instead the bulk of the paper is devoted to the student's own analysis of those choices.

***The brief is due by 8:00am on the day of class that we will discuss the briefs.***

***Back Bay Battery Write-up (10pts)*** – 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 an individual write-up on Canvas by Oct. 1<sup>st</sup>.***

You will play another slightly modified run in teams 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 (12 pt. Times Roman font, single spaced, with margins no less than 1 inch), 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?

***Technology Strategy Insights Conference*** – As the culmination of the course, we will draw on each other to explore the frontier of technology strategy in an "insights conference." The purpose of this project is to provide you with an opportunity to apply the concepts and frameworks learned in this course to examine a company of your choice. By the time you finish this project you should possess a greater appreciation for the industry, technology, and firm-level factors pertinent to the management of technology and human capital, as well as demonstrate an understanding of how companies can strategically leverage technologies for competitive advantages. The project consists of a one-page project proposal (5 pts) and a 10-12 slide technology strategy analysis (25 pts).

Your objective for this project is to analyze how a firm strategically manages technology to both create and capture value. Your team may examine a firm or technology of your choice, provided that it is not one covered in an assigned case. The specific focus of the project should address a key strategic aspect of the firm, such as (1) whether and how the firm should enter a new technology market, (2) the strategic rationale behind a recent acquisition of a technology company, or (3) how the firm should compete with rivals in a technology market. Specific questions might include:

- Is Uber's investment in self-driving cars a good strategy for the company? Why or why not?
- What's the strategic rationale behind Amazon's acquisition of Whole Foods, and what strategic benefits have they been able to realize?
- How should FitBit respond to the entry of Apple into the health and fitness monitoring space with the Apple Watch?
- Should Google commercialize its self-driving car technology (Waymo) by licensing it to existing auto manufacturers or make their own car?

The topic 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, as this can lead to a uniquely rich and insightful analysis.

**Teams are self-organized and comprised of 4-6 members from diverse backgrounds.** When selecting a company for the team project, consider both the industry and the competitive environment, as well as the key value capture mechanisms employed by the company. In addition, your team should choose companies for which sufficient information exists to support the projects, either from online databases and the popular press or through interviews of local companies.

The first deliverable is a 1-2 page project proposal in which your team will (1) identify all team members, (2) clearly state the company and strategic issue that you will examine, and (3) identify 1-3 possible recommendations/solutions to address the strategic issue. **The proposal is 5pts and is due Friday, Nov. 1<sup>st</sup>, by 5:00pm.**

The second deliverable is a 10-12 slide deck of your team's complete analysis, which should include a thorough assessment of how the firm creates and captures value from the technology, as well as recommendations for future strategic actions (i.e., how to enter a new market, how to compete with incumbents and/or entrants, etc.). Teams will present the projects in class, with each team allocated 12 minutes for the presentation and 7 minutes for Q&A.

You will be expected to draw upon and synthesis the various concepts and analytical frameworks discussed throughout the course. However, the relevance of each topic varies by company and industry, and thus you are not expected to address all topics covered in the course. Rather, you should identify the most pertinent issues and to perform a thorough analysis of these issues. Although attempts to ingrate concepts from other courses are encouraged, please note that the primary focus of the report should be on the strategic issues of creating and capturing value from technology, with only secondary importance given to other related issues.

**Technology Strategy Project (10-12 slides)** – The final project should include the following:

1. A brief description of the company and/or technology, the industry and competitors, and the key players in the ecosystem (2-3 slides)
2. Identification of the key strategic challenge facing the company and an explicit statement of why it is important. This will be the basis for the analysis and recommendations that follow. (1 slide)
3. Analysis of 1-3 actionable solutions to address the strategic challenge, including the pros and cons of

each and an explicit statement of your team’s recommended strategy (1-2 slides).

4. Development of a strategic plan for your team’s recommendation. This should include an overview of how the company should implement the plan and how it will address the strategic challenge (2-3 slides).

The content of each slide should consist of two components. The first component is the main slide window, which should include the key points of information, tables, images, figures, or graphs. The second component is the note section for each slide, which should contain all supporting information including detailed paragraphs and/or bullets, references, or additional information. The number of slides in the presentation should not exceed 12 (excluding the title slide and any reference slides). For the slides, please use the main window to communicate the main points and use the notes section for each slide to provide additional details, supporting content, and references. You are strongly encouraged to keep the content in the main window simple and clear, using tables, figures, and other visuals where appropriate. In addition, the notes section should be well developed to fully support the analysis. All references should be included at the bottom of the note section for each slide.

The presentation will be evaluated on three dimensions: First, the insight offered by the analysis - does it go beyond describing what happened to shed light on the fundamental causes of strategies/outcomes in a logically consistent manner. Second, the quality of the analysis and how well it integrates the concepts and frameworks discussed in the course. Third, how relevant, useful, and well supported are the lessons and recommendations presented. 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 grade for the insights conference.

A project that is succinct, focused, coherent, and well-supported with data and references will be evaluated far more favorably than a project that mechanically and superficially attempts to cover all topics and/or issues (i.e., depth is more valued than breadth). Finally, you are expected to provide data from external sources on your company and other companies in the industry to support your points.

The criteria for assessing the project are as follows:

**Technology Strategy Project**

<b>Content</b>	<b>Weight</b>
1. Description of company, industry, competitors, and ecosystem	15%
2. Identification of strategic challenge	10%
3. Analysis of 1-3 possible solutions	15%
4. Recommendation and strategic plan	40%
5. Overall synthesis of analysis into comprehensive report	10%
6. Structure of slides and accurate use of concepts and terms	10%

The slides will be evaluated on a 5-point scale according to the set of criteria listed above, with 3 being adequate, 4 being good, and 5 being excellent. As Wharton students, I expect considerable effort and quality from everyone. As such projects, that meet these expectations will receive 4 out of 5 points (i.e., “good”) for each criterion. Projects that exceed expectations with exceptional work receive 4.5 or 5 points, while projects that are inadequate and require additional development typically receive 3.5 points or lower. In other words, 4 out of 5 is the baseline, with outstanding work graded up and work that needs improvement graded down. Outstanding work is determined partly by the depth, thoughtfulness, and creativity of your team’s analysis, as well as by benchmarking your team’s project to the projects of your peers.

While it has been my experience that the majority of projects are quite good and reflect a great deal of effort,



the overall high quality of projects also sets the bar higher for “exceptional” projects. Please recognize that effort alone is not sufficient for a high grade. Starting with a baseline of 4 thus allows for better differentiation between a team’s effort and the quality of their work. These scores are then used to weigh the points for each criterion. For example, a team that scored 4 out of 5 on the recommendation would receive 4.8pts (4/5\*30%\*20pts) out of a maximum 6pts. **Slides should be uploaded to Canvas by Tuesday, Nov. 26<sup>th</sup>, at 5:00pm. No late submissions will be accepted.**

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/made sense ex ante, and the root cause (the why of why!) of why they did/will (not) work(ed). 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.

The presentations should last for **12 minutes followed by 7 minutes for Q&A**. It should provide a brief overview of the industry/technology but mostly focus on analysis, recommendations, and lessons learnt. You can include notes and appendix in the presentation to provide additional details underlying your analysis.

**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 strongly encourage anyone with specific or general questions regarding the course structure, content or discussions to drop by my office or to contact me via email or phone.

**ETHICS**

Below is the Ethics matrix for the course. Please go through it carefully and let me know if you have any questions.

	Materials							People				
MGMT 731 Technology Strategy	Approved calculator	Laptop / other electronics	Summary sheet	Readings/ class notes	Past notes / summaries	Past exams / assignments	Internet content / other outside materials	Learning team / approved work team	Other student(s) in same section	Student(s) in other sections (same term)	Wharton student not taking the class this term	Person outside of Wharton
Readings & Cases	A	A	A	A				W	W	W		
Team Assignments	A	A	A	A			A	W				
Individual Assignments	A	A	A	A			A					
	A = Allowed material Blank Cell = Not allowed							W = Allowed to work together Blank Cell = Not allowed				

The information above covers many common situations but will not cover every circumstance. Remember: The [Wharton MBA Code of Ethics](#) that you accepted requires, among other things, that you represent yourself and your work honestly, don’t try to gain unfair advantage over other students, follow the instructor’s guidelines and respect confidentiality of your work and the work of others.