



Management of Technology

Spring 2022

MGMT 620-102

Meeting time: Monday: 6:00 PM – 8:50 PM

Meeting location: Central King Building Room #317

COURSE INFORMATION

Context: Many managers view the challenge of technology and innovation from a functional perspective -- as an engineering problem, a marketing problem, a problem with reward systems and so on. In this course we take a general management perspective. We view the management of technology and innovation as the challenge whose solution requires creative synthesis of the skills and knowledge of finance, organization, markets, engineering and technology.

Focus of this course: This course will focus on the management of technology-based innovations. We will examine how industries are transformed by new technologies, how managerial action shapes product evolution, and how managerial competencies affect the innovation performance of firms. No prior knowledge of engineering and technology is required to take this course.

INSTRUCTOR INFORMATION

Instructor: Ronald S Elowitz

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Adjunct / Professor of Professional Practice

New Jersey Institute of Technology

[Martin Tuchman School of Management](#)

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CONTACT INFORMATION

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Office Hours: Upon Request. Skype: Anytime between 8:30am-5pm M-F; with prior appointment (Skype ID: prof_elowitz)

COURSE MATERIALS:

Text: Strategic Management of Technological Innovation, 6th Edition, by Melissa A. Schilling. <https://connect.mheducation.com/class/r-elowitz-rse2njitedu>

Case packet: All the required cases are available for purchase at:
[NJIT MTSM: Management of Technology - MGMT 620 / Spring 2022](#)

COURSE OBJECTIVES / STUDENT LEARNING OUTCOMES

Upon completing the course, students should be able to:

1. a) How industries are transformed by technological changes,
2. b) How managerial action shapes and creates opportunities for value creation, 3. c) How managerial competencies affect value capture (or appropriation) from new innovations.
4. d) How to decide which technologies to invest in, which technologies not to invest in, and how competitors are likely to respond to technological changes.

COURSE OUTCOMES

This class will also address the following learning outcomes. Students will:

- a) Analyze business situations where a firm is trying to invest its resources to generate new innovative products, and
- b) Evaluate the pros and cons of investing in a new product innovation or a new process innovation. c) To analyze situations that drive firm's choices --- e.g., after taking the course students will be able to explain, "Why does Honda manufactures ASIMO robots but a similar automobile manufacturer, such as General Motors, chooses not to do so?"
- d) To analyze how decisions about whether or not to innovate affect societal and environmental sustainability—e.g., after taking the course students will be able to explain, "Why does the United States lag behind Japan, China, and most of Europe in high-speed train services?"

ASSESSMENT

The learning outcomes will be assessed primarily via tests, papers, business plan, and case discussions.

COURSE POLICIES:

GRADING POLICY: Once assigned, grades will not be changed under any circumstances

unless there is a computational error. There are no exceptions to this rule.

NJIT HONOR CODE: If I believe an exam or test or case has been compromised, I reserve the right to retest the whole class or any individual in the class. Students are expected to comply with the University Honor Code. Violations of the University's academic code include, but are not limited to: possession of or use of unauthorized materials during exams; providing information to another student. Any violations to the Honor Code will be brought to the immediate attention of the Dean of Students, which will result in academic penalties, including receiving an “F” in this course.

STUDENT WITH DISABILITY CODES: Educational access is the provision of classroom accommodations, auxiliary aids and services to ensure equal educational opportunities for all students regardless of their disability. If you are in need of accommodations due to a disability, please contact Scott Janz (oars@njit.edu), Associate Director of the Office of Accessibility Resources & Services (OARS), Kupfrian Hall 201, to discuss your specific needs. A Letter of Accommodation Eligibility from the OARS authorizing your accommodations will be required. Accommodations need to be requested in advance and will not be granted retroactively.

IMPORTANT & ADDITIONAL GROUND RULES:

- All submissions will be checked with Turn it in for plagiarism. Any submission with more than 10% plagiarism score in Turn it in will NOT be eligible for any credit.
- Please do not share course materials or notes with future students or students in other sections. Such behavior will only hurt the learning of others that follow you.
- If there is any disagreement between what I mention in class and what is mentioned in the text, then my description in the class will be valid for all exams, grading, and other purposes.

STUDENTS TASKS / ASSIGNMENTS / REQUIREMENTS

Class conduct: Most sessions will be primarily in the discussion format, with a strong emphasis on the assigned cases and readings for the week. Your preparation for the class should involve a thorough analysis of the case and/or the readings and to develop a personal position. Unless you have thought about the case, it is very difficult to participate and learn from others' contributions in the class. I may call upon you at any time, whether to start the discussion or answer a specific question during the class on any day.

Because of this class format, a major part of your learning will take place in the classroom. Given that this class is largely about the development of your own personal synthesis and perspective and not just about the mastering of various analytical tools per se, *it is not possible to make up for an absence*. If, for some unavoidable reason, you have to miss a class, it is your responsibility to find out from your classmates what materials were covered, what additional assignments were given, and what handouts

STUDENT RESOURCES:

- Tutoring - <https://www5.njit.edu/tlc/>
- MTSM provides tutoring for accounting, statistics and finance courses. The students can book

an appointment [Book an appointment here](#)

- Support on campus:
 - <https://www.njit.edu/studentsuccess/node/5>
 - <https://www.njit.edu/counseling/>
- Barron's registration: The Barron's URL is now ready. School of Management students and faculty below can activate their subscriptions here: [Barron's MTSM](#). The link has been set-up restricted to email domains of [@njit.edu](#).
- Please keep in mind that this link is only for the one-time registration process. Once you have registered, you will need to go directly to Barrons.com or follow any links to Barron's. Then log in using the credentials created during registration to access Barron's content via a computer or the Barron's app on any other devices.
- WSJ - <https://researchguides.njit.edu/factiva>
- FERPA - <https://www5.njit.edu/registrar/privacy.php>
- NJIT map - <https://www.njit.edu/campus-parking-maps>
- Webex Training - <https://ist.njit.edu/webex-video-tutorials>

GRADING: Your grade will be based on the following assignments:

Category	Due Dates	Points	Individual Case Assignments
(15 points per * 2 out of 3 assignments)			On the day mentioned later in this Syllabus 30
Group Case Assignments			
(15 points per * 2 assignments)			On the day mentioned later in this Syllabus 30 Discussion Forum
Posts 10 points per; 6 Forum Posts		60	Mid-term Exam 80 questions; 120 minutes (TBD)
20 Final Exam 80 questions; 120 minutes (TBD)		20	Final Project Report (group) May 9, 2022 40
Total		200	

Grade distribution: A: Top 20% of class; B+: next 30%; B: next 30%; C+ or lower: lowest 20% NOTE: The instructor reserves the right to alter the percentages mentioned above.

• *Individual Homework Assignments:* For some of the cases, you will have to answer the assigned questions that are based on the cases. The questions are mentioned later in this syllabus. Your answers to each question should be roughly 2 pages long, with 1.5 or double line spacing

and 12-point font. The answers will have to be submitted strictly through Canvas only before the class when we discuss the case for the first time. No late submissions or email or hardcopy submissions will be accepted under any circumstances.

There will be more opportunities for homework grades than will be required; in other words, you may be able to skip a few assignments depending on your schedule throughout the quarter or to drop the lowest of the homework grades.

- *Group Homework Assignments:* For some of the cases, you will answer the case questions as a team. Your answers to each question should be a maximum of 2 pages long, with single or double line spacing and 12-point font. The answers will have to be submitted strictly through Canvas only before the class when we discuss the case for the first time.

No late submissions or email or hardcopy submissions will be accepted under any circumstances. There will be more opportunities for homework grades than will be required; in other words, you may be able to skip a few assignments depending on your schedule throughout the quarter or to drop the lowest of the homework grades.

- *Instructional Methods:* I will use a variety of pedagogies in the class, including lectures, class discussion, interactive exercises, video lectures, and so on. Preparation and participation are two keys to success in this class. Prior to each class session, there will generally be a reading assignment, along with some required pre-class preparation. In class, we will engage in a number of learning activities throughout the semester, requiring your full involvement. I will strive to make the class interactive, and you must be involved on a regular and on-going basis.

Final Project: Dehydrated Business Model (DBM)

Broadly, the DBM will include your ideas to create and capture “value” from an innovation. To create value, you need to consider the type of innovation- radical (or incremental), competency destroying (or enhancing) and other ways to categorize your innovation. While capturing value, issues that you need to consider are your competitive advantages, ways to make the competitive advantage sustainable, and the threats to sustainability. These threats include imitation, substitution, and hold-up.

The issues of sustaining (or disruptive innovation) are also important. I have suggested a few sections for your report that touch upon the above-mentioned components of DBM. The relative weightage of each section, for grading purposes, is also mentioned below. A few relevant questions that you may want to explore for each section are also mentioned below. Feel free to explore additional and/or alternative issues within each section to make your report more rigorous. (*Note: If you choose, you may combine the two or more of the following sections into one larger section.*)

1. Value creation (or Technology analyses): Weightage: 25%

- a) What is the nature of the technology and what are its potential advantages and disadvantages?
- b) What is the state of technical development? How do you foresee technology evolving in the next five years?
- c) What is (are) the primary competing technologies? Is that technology mature or still

developing? How big a threat does that competing technology pose? Will your technology become the dominant design? Will it be able to dislodge the current dominant design from the market? What kind of innovation is your technology and/or the product? Explain.

d) What are the various components of value creation that you think are relevant for your product (or service) and why? How do you propose to develop those sources of value creation?

2. Value Capture 1 (Industry and Market analyses): Weightage: 25%

a) What are the potential applications and markets for your technology? Are there particular sub- markets and are some more attractive than others at this stage in the development of the technology?

b) What is the size and growth rate of the market? What factors will influence the development of this market?

3. Value Capture 2 (or Competitor Analysis): Weightage: 25%

a) Who are (or could be) the major competitors? Who are the major players in the field? At what stage is their technology? Assess your technology's and product's advantages and disadvantages compared to those of your competition. What are the uncertainties associated with your product?

For example- does the current performance of your product satisfy your customers? If not, what innovations do you wish to pursue through your R&D? Will you be able to deliver the product at a reasonable cost as compared to your competitor's products?

b) Can your technology/ product disrupt your competitor's business model? If so, what are the implications for your strategy?

4. Value Capture 3 (Strategies to Commercialize): Weightage: 25%

a) What resources and capabilities do you need to establish sustainable competitive advantages over your competitors? How do you propose to overcome the challenges to the sustainability of your competitive advantages- imitation, substitution, and hold-ups, if any? How much technical development is needed to move the project forward toward commercialization?

b) To what extent is there a need to develop complementary technology or supporting services? Would this require major changes in the demands placed on users of that technology, distribution channels, production technologies, or supporting services? How does this strategy affect "value creation" as discussed in point 1.d above?

c) What are the likely vertical and horizontal boundaries of your firm? Why?

5. Additional item: Funding Requirements and Sources (*Note: there are no points for this section. However, if you plan to seriously pursue your project, you will have to think about these*

issues in the near future.)

1. a) To the extent possible, estimate funding requirements for the commercialization process.
2. b) What might be the possible sources of funding? Please note the following with respect to the written paper:

IMPORTANT FORMATTING & RELATED ASSIGNMENT

INSTRUCTIONS: • Submit your final project report through CANVAS only.

- The paper will be typed, a minimum of 12 pages in length (single or double spaced- your choice). All relevant graphs, illustrations, financial information etc. are not considered part of the body of the paper and should be placed in appendices at the end. References are also placed at the conclusion of the paper.

- Outside research is required and the sources will vary depending on the topics chosen. Please utilize the on-line databases available at NJIT library. *Do not plagiarize- all assignments will be checked by Turnitin!* Please mention all the sources of your information, including websites, in the Reference section.

- Your Group Memo is due on Feb. 19 by 10:00PM through Canvas. Please include the following information in your memo:

- ✓ Names of the team members
- ✓ Title of the project
- ✓ Milestones that you want to achieve(as a team, by date)

Important Additional Ground Rules:

- *All submissions will be checked with Turnitin for plagiarism. Any submission with more than 10% plagiarism scores in Turnitin will NOT be eligible for any credit.*
- Please do not pass on course materials or notes to future students or students in other sections. Such behavior will only hurt the learning of others that follow you.
- If there is any disagreement between what I mention in class and what is mentioned in the text, then my description in the class will be valid for all exams, grading, and other purposes.
- Tentative schedule is given below. This is subject to change any time during the semester.
- With regards to the final project, I will answer specific questions related to your proposed new product or service, and your target market. For example, I will gladly help you with questions such as "Is company X our likely competitor?" or "Is the measurement of our y axis in our graph # 1 relevant for our study?" or "can southern California be a relevant market for our product or service?"

However, I will NOT go through your paper, comment on the length of the paper, its contents, the number of charts, and/or similar queries prior to your submission of the final project.

- Late by more than 10 minutes for a class (either physically for face-to-face class or logging in for online ones) will be counted as 'absence' from the class.
- If you miss the 5-min deadline FOR ANY REASON (including reasons such as "My laptop broke down," and/or "My internet connection froze!") you will miss all the points for the pop-quiz. I may ask you to provide proof of your reason for missing the pop-quiz but accepting that proof will be solely at my discretion. ONLY EXCEPTION to a make-up quiz will be IF you inform me prior to the class begins that you may miss the class on that day.

Tentative schedule of classes: Hybrid in-class / On-campus / Webex dates are highlighted in yellow

Day / Week	Cases (Due Date)	Discussion topics and readings
Week 1 and 2 Jan. 24 (Webex), Jan 31		<p><i>Topic: What/Why/When of Technological Changes</i></p> <p>Chapter 1: Introduction Chapter 2: Sources of innovation Chapter 3: Types and patterns of innovation Discussion Forum Post: Due 1.30.2022</p>
Week 3 Feb. 7		<p>Basic Concepts: Imitation, substitution</p> <p>Group Project Discussion</p> <p>Chapter 4: Standards, Battles and Design Dominance</p> <p><i>Article: The art of standards war (Available with course pack) Analyses of newspaper articles on Blu ray and HD-DVD formats</i></p>

Week 4 Feb. 14	Synthes (Group Assignment)	<p>Chapter 5: Timing of Entry Chapter 6: Defining the organization's strategic direction</p> <p><i>Note: Group memo due Feb. 19 by 10pm ET: should be. A semi-detailed project plan w/ dates and</i></p> <p>Discussion Forum Post: Due 2.13.2022</p>
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Week 5 Feb. 21		<p><i>Mid-term Quiz (Closed book; Closed notes; Multiple choice questions based on text chapters 2-6; Just reading the slides is NOT enough; read the text)</i></p> <p><i>Topic: Make vs. Buy decisions</i> Horizontal and Vertical boundaries of the firm</p>
Week 6 Feb. 28	Intel Corp.: 1968-2003 (Group Assignment)	<p>Chapter 7: Choosing Innovation Projects Chapter 8: Collaboration Strategies Chapter 9: Protecting Innovation</p> <p>Discussion Forum Post: Due 2.27.2022</p>
Week 7 Mar. 7		<p>Topic: Technological Disruption</p> <p><i>Articles: (will be available in the HBS Course-pack and Canvas)</i> <i>a) Disruptive technologies: catching the wave</i> <i>b) Meeting the challenge of disruptive change</i> <i>c) Will disruptive innovations cure health care?</i> <i>d) Patterns of disruption in retailing</i></p>
Week 8 Mar. 14		No Classes / Spring Break

Week 9 Mar. 21		<p>Project Week – No Formal Meeting</p> <p>Chapter 12: Managing New Product Development Teams</p> <p>Chapter 13: Creating a Deployment Strategy</p> <p>Discussion Post Forum: 3.20.2022</p>
Week 10 Mar. 28	<p>HP: The flight of the Kittyhawk</p> <p>(Individual Assignment #1)</p>	<p>Topic: Boundary Conditions of Disruption</p> <p><i>e) Henderson's critique of disruption (JPIM, 2006)- The Ongoing Process of Building a Theory of Disruption</i></p> <p><i>f) Roy, Lampert, and Stoyneva (SEJ, 2018)</i></p> <p><i>g) Roy (TFSC, 2018)</i></p> <p><i>h) New Yorker article, 6/23/14</i> http://www.newyorker.com/magazine/2014/06/23/the-disruption-machine</p>
Week 11 Apr. 4	<p>Disruptive Technology Ecton</p>	<p>Project Discussions</p>

	<p>Inc. (Individual Assignment #2)</p>	<p>Discussion Post Forum: Due 4.3.2022</p>
Week 12 Apr. 11		<p>Chapter 10: Organizing for Innovation</p> <p>Chapter 11: Managing the NPD process</p> <p><i>Battle of X-Planes Battle of the X-Planes</i></p>
Week 13 Apr. 18	<p>Medtronics Cardiac / We've Got Rhythm!</p> <p>(Individual Assignment #3)</p>	<p>Topic: Biotech</p> <p><i>Article: Available from the HBSP Casepack: Can Science be a Business? Lessons from Biotech</i></p>

		Discussion Forum Post: Due 4.17.2022
Week 14 Apr. 25		<p>Wrap up: <i>Who Killed the Electric Car?</i> <u>Who Killed the Electric Car?</u></p> <p>Class Discussion & Course Summary</p>
Week 15 May 2		<p><i>Final Exam (Closed book; Closed notes; Multiple choice questions based on text chapters 7-11; Just reading the slides is NOT enough; read the text)</i></p> <p>Project Wrap Up</p> <p>Note: Final DBM Project Report due May 9, 2022</p>

Questions for Case Studies: Please note:

- i) While answering the questions, please restrict yourselves to the information provided in the case. Also, try to imagine that this is the time when the case was written, and NOT 2022.
- ii) Please do not restate the story as your answer. For example, I am not interested in the information that Intel asked manufacturers to put “Intel Inside” logo on computers with Intel chips. I want to know “why” is that piece of information important for understanding Intel’s sources of competitive advantage?
- iii) Instead of making generic comments (such as “during technological changes, firms got to look at new markets,”), try to use theory from the course and justify “why would a firm look at a new market?”
- iv) All assignments carry 10 or 15 points.
- v) **At every step, think about the assumptions you make in your statements.**
- vi) Page limit: 2 pages per question; 12-size font; 1.5 or double spaced—your choice.
- vii) The 2*2 matrix mentioned below is in the “Meeting the Challenge” article in the disruption discussions.

Case Study Assignment Questions: These are also embedded in the course Canvas modules for MGMT 620. Refer to the assigned Case Study excerpts in the HBSP course-pack for access: [NJIT MTSM: Management of Technology - MGMT 620 / Spring 2022](#)

Question for Synthes case:

What are the different threats to the sustainability of Synthes' competitive advantages? Discuss. (*Hint: Recall that the threats to sustainability of competitive advantage are- Imitation, Substitution, and Hold-up. Also recall that a technology's evolution along the S-curve affects the sources of competitive advantages*).

Question for Intel case:

What were Intel's sources of competitive advantages in DRAM and how were those different from the ones in microprocessors? (*Hint: Recall that the threats to sustainability of competitive advantage are- Imitation, Substitution, and Hold-up*).

Questions for Flight of the Kittyhawk case:

- i) What "mistakes" did HP make in executing the project? *3 points*
- ii) Are these really "mistakes" or are these rational decisions? Explain using the theories discussed in the class. (*Hint: Think about the 2*2 matrix of technological disruption*). *7 points*

Question for Ecton case:

If you were the entrepreneur of Ecton, would you prepare to sell it to a large company or would you prepare to remain independent? Justify using the theories you learnt in this class (*Hint: Think about the 2*2 matrix of technological disruption*).

Questions for We've Got Rhythm case:

Explain how and why the processes of Medtronic create sustainable competitive advantage for Medtronic.