GPS, UC San Diego

Syllabus

Innovation Policy & Management
GPIM 472
Tuesdays & Thursdays 9:30-10:50 am

Elizabeth Lyons
She/her
lizlyons@ucsd.edu

1. Administrative Information

Office hours: Wednesdays 9:30-11:30 am

- Please sign-up here if you plan to attend
- Please indicate whether you will attend in person or on Zoom
- A Zoom link for office hours is provided on Canvas and here

If you cannot attend office hours, please email me to schedule a meeting. Please do not drop by my office for an unscheduled meeting.

Course Materials:

- The majority of readings should be downloaded from the UCSD Library. Google Scholar is a fast way to locate most of them. Note that you may have to be logged into UCSD wireless or VPN to access some of the readings.
- The three Harvard Business School case studies we will cover can be purchased for $12.75 through this link: https://hbsp.harvard.edu/import/1082683.
- Data and information for your assignments are available online, through interviews with experts, and through the UCSD library. We will have a presentation on taking advantage of the library's excellent firm and industry databases.

2. Course Scope and Objectives

This course examines the microeconomics of technological change and innovation. What drives innovation, and what determines its speed? What are the interactions between technology and industry changes? How should organizations manage the invention and innovation process? What role can and should policy play in trying to influence the rate and direction of technological change? To address these and related questions, we will cover topics in industrial organization, industrial and technology evolution, and the economics of innovation.

This course aims to provide students with the capabilities required to analyze interactions between industries, policy, and technological development. It will equip you to perform thoughtful and rigorous assessments of new technologies to assist organizational strategies, government policies, and investment and consumption decisions. In addition to learning through lectures, readings, and class discussions, in your course project you will have the opportunity to perform a thorough evaluation of an existing or emerging technology in the context of an organization and industry.

By the end of this course, students should be able to:

- Understand the link between basic science and technologies introduced to market, and identify policies and firm strategies that support the transition of ideas from science labs to useable products and processes.
- Understand hurdles firms face in profiting from R&D investments, and strategies for overcoming these hurdles.
- Understand the interaction between innovation and competition in industries.
- Evaluate expected social and commercial values of new innovations, and quantify current social and commercial values of widely available technologies.
- Evaluate and develop policy to support welfare enhancing scientific discovery and innovation.

3. Course Guidelines and Policies

General Class Rules and Expectations:

Though attendance is not graded, I strongly encourage students who are able to attend class to do so.

As in all classes I expect everyone to treat everyone else with respect. This includes classmates, guest speakers, and myself. Name-calling, threats, discriminatory language (e.g. racist, sexist, or homophobic), and any kind of harassment will not be tolerated. It is critical for successful learning in this class that everyone be open-minded and tolerant of other people's points of view. Please come and speak to me or to student services if you experience or observe a disrespectful encounter.

For short and easy-to-answer questions not answerable by the syllabus, please email me. I will not respond to emails that ask for information that is available in the syllabus. I will do my best to reply to emails within 48 hours. For questions and comments that require lengthy answers or discussion, please attend my office hours or schedule a meeting with me.

Office Hours

If you have signed up for an office hour's slot, please arrive on time. Please attend via the mode you indicated in the sign-up sheet (in-person or over Zoom). If you signed up for an office hour slot but can no longer attend, please email me as soon as possible so that I can open the slot for someone else.

I will not be able to stay after class for questions, so please ask any questions during class time or during office hours or scheduled meetings.

Accommodations

Students requesting accommodations for this course due to a disability must have a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD: http://disabilities.ucsd.edu), which is now located on the 3rd Floor of Pepper Canyon Hall. AFA letters are now provided to Faculty electronically by OSD, per student request. Requests for accommodation must be made at least two weeks in advance of the exam. Contact Nancy Gilson (ngilson@ucsd.edu) for further information.

4. Academic Integrity

As a student in this course, you are agreeing to uphold academic integrity. This includes committing to do the work assigned to you without the use of unauthorized aids and to report any suspected abuses of this principle by any of your peers. Discussion about course topics and assignments among peers is strongly encouraged. However, permission and proper documentation are required if you are referencing other people's ideas and research in your assignments. Other people's ideas and research includes class slides, any other material you receive from me or other professors, and your peers' work. You may not submit work of your own that has been submitted to another course for a grade without explicit approval from both me and the professor of that class. Proper citation of references requires both quotation marks when words are used verbatim, and exact citations to the text and page number. The ability to analyze the work of others demonstrates your understanding of the topic being addressed. Discussion or sharing of ideas of any kind during the in-class written assignment is not permitted.

The goal of this course is to ensure that you learn and that you contribute to the education of others in the course. Academic misconduct undermines these goals and will be taken very seriously.

All written assignments will be submitted through Turnitin. **If any of your assignments have one complete sentence or more copied from someone else's work and are not properly cited, I will report this to the University administration as academic misconduct.** If you are not sure how to reference outside sources please come and speak to me before your first

assignment is due. Enrollment in this course signals your willingness to submit your work to Turnitin.

5. **Course Assignments and Evaluation**

Your course grade will be based on class participation including oral discussions and presentations (25%), a project proposal (10%), a firm overview (5%), an innovation evaluation (15%), and a final paper and presentation (45%). **To facilitate fast turnaround of grades and feedback, please submit all assignments both through Turnitin and by email to me.**

Assignments turned in within 5 hours following the deadline will be docked 15% of the grade you receive on the assignment. No assignments will be accepted more than 5 hours after the due date without an approved and documented excuse.

Class participation (25%): Active participation in class is critical for you to benefit from this course. There are three ways to receive participation points in the course. You will be able to accumulate all your participation points whether you are able to attend class or not.

1. **Speaking during class discussions:** Participation points will be given to students who ask questions, contribute to class discussions, and provide suggestions or answers to questions asked by others during class time. Comments and questions should relate to the course content and should contribute to the relevant discussions. Your participation will be graded on both the quantity and quality of your contributions. Quality is measured based on how well your comments and questions move the class discussion forward, how accurately you reference class readings, how novel your comments and questions are, and how logical your reasoning is. Attendance on its own will not contribute to your participation grade, nor will questions asked during office hours.
2. **Short presentations to stimulate class discussion:** On occasion, as specified in the class schedule, you will be asked to prepare short presentations to stimulate class discussion. Each short presentation can earn you up to three percentage points toward your participation grade. Your presentations will be graded based on 1) how well they address the question I have asked you to address; 2) how true or well-researched the points you make are; and 3) how creative your topic choice is.
3. **Reflection Notes:** You can receive three percentage points towards participation for writing one-page maximum reflection notes on the readings assigned for a given week. The deadline for these notes is **9 am on the Tuesday of the week we will be discussing the readings** about which you have written. For instance, if you choose to write a reflection on Week 1 readings, the deadline for your reflection note is Tuesday, October 3 at 9 am. You can choose to write about what you learned from the readings what you did not like about them, or what questions or puzzles they brought to mind and why. These notes should not be simple summaries of the readings, they need to include some actual

reflection. They should be no more than a page but can be less. You can write about one particular reading or a combination of more than one. A grading guide on these notes can be found here and on Canvas. **Please email me your reflection note by the deadline.**

If you are attempting to participate but feel that I am not giving you the opportunity to do so, please let me know. It is your responsibility to let me know that you want to participate during class, I will not systematically call on students to speak during class if they have not indicated they would like to speak.

Final Paper and Presentation (45%):

Final projects will analyze a technology in the context of a single industry and the firm bringing the technology to market. Your analysis can be retrospective; explaining and analyzing how the firm and technology within the industry evolved and what led to their situation today. Alternatively, it can be prospective: explaining the firm and technology's current state in the industry and analyzing the possible trajectories for the technology and firm in that industry going forward. All projects must discuss the firm taking the technology to market (including its ownership, how the technology fits into its strategy, and long-term objectives for the technology), the industry the technology is being introduced into (including participants, structure, and competition), and the technology (including origins, key attributes, and distinctive performance). However, different projects may weight these topics very differently.

The technology you analyze need not be mature, and it may not be clear how well it will work or how much technical and economic success it will have. However, it should be real, and have reached some level of real-world penetration, at least in niche markets so that you can meaningfully analyze it. I will provide additional assistance in choosing appropriate firms, industries and technologies during office hours. You are responsible for finding firm/industry/technology combinations that are interesting to you personally and tractable in a one quarter course.

In order to assist you in achieving a final project that you are proud of and have learned from, all your written assignments in the course will be inputs to your final output. I encourage you to discuss your project with me during our office hours or scheduled meetings throughout the term. Your final paper is due **December 4 at 10 pm.**

Project Specifics:

- The goal is to provide an in-depth analysis of a specific technology within the context of firm strategy. Given this, projects must consider both the firm and its position in an industry, and how the technology is intended to or does contribute to the firm's objectives.
- Teams of two may collaborate on a single project subject to my approval at the proposal stage.

- Projects can be retrospective or prospective but must consider the current state of the technology within the firm and industry in either case.
- Project proposals are due in the third week of class. I strongly recommend you meet with me to discuss your ideas before submitting your proposal.
- Final reports must be at most 20 pages in length excluding appendices.
- Class time on December 5 and 7 will be reserved for project presentations.
- Your final paper is due on the Monday of the tenth week of class at 10 pm.
- Your presentation slides are due at 6 pm the day before your scheduled presentation.
- A Grading Guide for your projects can be found here, and on Canvas.

Research sources: Your project should demonstrate an ability to use a variety of sources and methods, both quantitative and qualitative. Your sources should include at least one of each of the following: interviews with experts, academic articles about the industry, academic articles about the technology, and business (trade) press. Quantitative data should be used at a minimum for description, such as market shares, market sizes, and technology performance over time. Quality of sources is very important. New technologies in particular tend to be accompanied by uncertainty and controversy, and much of the material turned up in casual Google searches consists of thinly disguised press releases. Understand the biases, backgrounds, and expertise of all of your sources.

Notes on your presentation: Please make sure you rehearse your presentation and you can complete it within your allocated time. Focus on what is most important and interesting about your analysis. Clarity, depth, conciseness, insight, and interest from your audience will contribute to the grade. By submitting your slides the night before your presentation, you will have a window of time during which your slides cannot be edited. Your time should instead be spent on practicing what you will say.

Project Proposal (10%): You will prepare a three-page maximum excluding appendices proposal identifying a technology and corresponding firm for your course project. Note that you should focus on a single application of the technology such that your analysis of the firm and technology is within the context of a single industry/market. This proposal should describe why the topic is interesting, and identify key sources that you intend to use. **Proposals are due at 9 am on Tuesday of the third full week of class (October 17).**

Firm Overview (5%): You will prepare a two-page maximum report that describes the firm your project is focused on. This report should include a description of the good or service provided by the firm, an analysis of the industry the firm is competing in (including competitors, relative market share, and industry evolution), what differentiates the firm from any real or potential competitors, firm profitability and growth before the technology was introduced to the market

and after. This report should also describe and motivate the audience for your final report. Appendices, including charts, supplementary information, and references are not included in the two-page limit. **Reports are due at 9 am on Tuesday of the fifth full week of class (October 31).**

Innovation Evaluation (15%): You will prepare a four-page maximum report that describes how your firm is bringing/has brought the innovation to market. The report should include the types of investments the firm made in research and development of the technology (e.g. acquisitions, patents, research staff, etc.). In addition, you should analyze how the technology advanced and the functionality and performance of the technology at the time it was brought to market. You should also discuss how this technology is an advancement over the prior state of the art in your industry and how the firm can/has profited from it. Lastly, you should include a description of the real and potential barriers to the technology's success (for instance specific; regulatory, technological limits, or cultural barriers, etc.) and how the firm is trying to/has/has not overcome these barriers. Charts, supplementary information, references, and appendices are not included in the three-page limit. **Reports are due at noon on Tuesday of the seventh full week of class (November 14).**

6. Class Schedule

Readings for the course are included in this table. Please ensure that you have read the required readings before Tuesday's class each week. We will begin the course by reviewing core ideas in technological change and innovation. We will then cover how innovation relates to industry competition, and how firms manage innovation in response to competitive pressures. Weeks 7 and 8 will focus on policy considerations for science and technology given what we have already covered on firm incentives. Week 9 will be a special topic discussion on AI. Final project presentations will be held during the last week of class.

Class Dates	Topic	Readings	Notes
September 28	Course Introduction • Big picture motivation	Course Syllabus "Where R&D Came From." Chapter 2 in Lerner, Joshua *The Architecture of Innovation*, 2008. Cook, L. & Gerson, J. "The implications of U.S. gender and racial disparities in income and wealth inequality at each stage of the innovation process." 2019. • https://equitablegrowth.org/the-implications-of-u-	

		s-gender-and-racial-disparities-in-income-and-wealth-inequality-at-each-stage-of-the-innovation-process/ "Preparing for Disruption: Technological Readiness Ranking." *Economist Intelligence Unit*, 2018. • http://pages.eiu.com/rs/753-RIQ-438/images/Technological_readiness_report.pdf.	
October 3 & 5	Creative Destruction: Industrial Organization and Technological Change • Relationship between industry and technology	Abernathy, W. & K. Clark. "Innovation: Mapping the winds of creative destruction." *Research Policy*, 1985. Covarrrubias et al. "From Good to Bad Concentration? U.S. Industries over the Past 30 Years." *NBER Working Paper*, June 2019. • Pages 1-6 only (up to "Related Literature") Li, X., Lo, A. W., & Thakor, R. T. "Paying off the Competition: Market Power and Innovation Incentives" *NBER Working Paper*, June 2021. • Introduction only Shih, Willy (2013) "Competency-Destroying Technology Transitions: Why the Transition to Digital is Particularly Challenging." *HBS Case Study*** <u>Optional:</u>	October 3: Guest lecture from Business and Economics UCSD librarians.

		Gutierrez, G. & T. Philippon. "The Failure of Free Entry." *NBER Working Paper*, June, 2019.	
October 10 & 12	Origins of New Technologies in Industry • Basic and Applied Research • Technology champions in industry • History of Silicon Valley	UCSD library guides including https://ucsd.libguides.com/business "The Role of the National Science Foundation in the Innovation Ecosystem" *NSF Directorate for Engineering*, 2010. "The Dual Frontier: Patented Inventions and Prior Scientific Advance." Mohammad Ahmadpoor & Benjamin Jones. *Science*, 2017. "Are Ideas Getting Harder to Find?" Nicholas Bloom, Charles I. Jones, John Van Reenen, Michael Webb NBER Working Paper No. 23782. • Sections 1, 2, 5, 6.1, 7, 9 "How Did Silicon Valley become Silicon Valley?" *Endeavor*, 2014.	Short presentations on October 10 - Find a technology that failed in the market and tell the class why it might have succeeded and why it did not.
October 17 & 19	Innovation and Industry Evolution • Radical vs Incremental Innovation • Incumbents vs New Entrants	"The Life Cycle of a Competitive Industry." Boyan Jovanovic & Glenn McDonald. *Journal of Political Economy*, 1994. • Read pages 322-beginning of 331 & conclusion, don't worry about understanding math in theory Segal, I. & M. Whinston. "Antitrust in Innovative	**Project proposals, due October 17 by 9 am**

		Industries." *American Economic Review*, 2007. • Read introduction and conclusion. Hill, C. W. L. & Rothaermel, F. T. 2003. "The Performance of Incumbent Firms in the Face of Radical Technological Innovation" *Academy of Management Review* 28.2. "D-Wave Systems: Building a Quantum Computer." (2004). *HBS Case Study*. **	
October 24 & 26	Innovation Strategy • Incentives for firm R&D Investment • Make vs Buy vs License	Pisano, G. "You Need an Innovation Strategy." *Harvard Business Review*, 2015. Eggers, J. P. & A. Kaul. "When Big Firms are Most Likely to Innovate." *Harvard Business Review*, 2016. Cassiman, B. & R. Veugelers. "In Search of Complementarity in Innovation Strategy: Internal R&D & External Knowledge Acquisition." *Management Science*, 2006. • Sections 1, 2, 3, and 6. "Racing into the 5G Era: Generational Technological Change and Firm Strategy in Mobile Telecommunications." *HBS Case Study***.	Short presentations on October 24 – Which firm's innovation strategy do you admire? What makes it so successful?
October 31 & November 2	Capturing Commercial Value of Technologies • Execution vs. Monopoly Power	Gans & Stern (2003) "The product market and the market for "ideas": commercialization strategies for technology entrepreneurs." *Research Policy*.	**Firm overview reports, due October 31 by 9 am.**

	• Market Evaluation	Ching, Gans, & Stern (2017) "Control Versus Execution: Endogenous Appropriability and Entrepreneurial Strategy." Sections 1, 2, 3 (ignore equations), 5. Mezzanotti, Filippo, and Timothy Simcoe. *Innovation and Appropriability: Revisiting the Role of Intellectual Property*. No. w31428. National Bureau of Economic Research, 2023. • Introduction and figures at the end of the paper Arora, A., Cohen, W., Lee, H., & Sebastian, D. (2023). "Invention value, inventive capability and the large firm advantage." *Research Policy*, 52(1), 104650. • Introduction & conclusion only *Optional if not familiar with Theranos:* Theranos Case: "Blood, Simpler: One Woman's Drive to Upend Medical Testing." New Yorker (December 2014).	
November 7 & 9	Science and Technology Policy • Patents • Innovation promotion and regulation	Azoulay, P. & Li, D. "Scientific Grant Funding." *NBER Working Paper*, 2020. Williams, H. "How do Patents Affect Research Investments?" *NBER Working Paper*, 2017. • Read sections 1, 2, 3, and 6 and skim empirical evidence presented in sections 4.2 and 5.2. "FDA Wants to Help Unproductive Drugmakers." *Economist*, 2018.	Short presentations on November 7 – What's an example of a policy or regulation that you think successfully increased high impact R&D?

		<u>Optional:</u> Azoulay, P et al. "Funding Breakthrough Research: Promises and Challenges of the "ARPA Model". *NBER Working Paper*, 2018.	
November 14 & 16	Evaluating Social Value of Technologies • Estimating social welfare gains and losses • Skill bias and inequality • Policy & social value of technology	Autor, David. "The labor market impacts of technological change: From unbridled enthusiasm to qualified optimism to vast uncertainty." No. w30074. *National Bureau of Economic Research*, 2022. Kremer, M. et al "Designing Advance Market Commitments for New Vaccines." *NBER Working Paper*, December 2020. • Intro and conclusion only Goolsbee, Austan. "Public Policy in an AI Economy." NBER Working Paper, 2018. Frakt, A. "How Patent Law Can Block Even Lifesaving Drugs" *New York Times* (September 2015**)**	**Innovation Evaluations, due November 14 by 9 am.**
November 21, 28 & 30	Special Focus on AI	"Notes from the AI Frontier: Applications and Value of Deep Learning." *McKinsey Global Institute Discussion Paper*, 2018. Varian, H. "Artificial Intelligence, Economics, and Industrial Organization." *NBER Working Paper*, 2018. Kleinberg et al. "Discrimination in the Age of Algorithms" *NBER Working Paper*, February 2019.	Guest Lecture: Don Rosenberg, former executive VP, general counsel, and corporate secretary at Qualcomm (guest lecture date subject to change).

		• This paper is quite long, but all sections are excellent and worth reading.	
December 5 & 7	Presentations		**Final Papers due December 4 by 10 pm.**