95723 – Managing Disruptive Technologies

Course Overview

We live in a rapidly changing world dominated by technology-enabled disruptions. As a consequence, there is a strong need for individuals who understand the nature of these innovations and how they affect markets. In line with this need, this course is about understanding disruption from both a technical and a managerial point of view. The course will focus on understanding the differentiation between incremental and revolutionary innovations. Students will study some of the technologies behind these innovations and their implications for business models and for the geometry of markets. This course will combine a number of lectures introducing fundamental concepts of economics and management applied to technology-enabled markets, such as network externalities, two-sided markets, first mover advantage and two-part tariff pricing models. This will be supplemented by case studies looking at specific real world companies such as Facebook, e-Bay, Akamai and Hulu focusing on innovative technologies like the Internet, content distribution networks, virtualization, mobile-payments and cloud computing. Students will learn how to anticipate disruptive technologies and will be exposed to frameworks and tools to characterize and manage these technologies in the workplace. The course will also include a number of invited lectures by prominent speakers from the industry and academia.

Learning Objectives

The course has four primary learning objectives.

1. Learning frameworks to differentiate between disruptive and incremental innovations by examining market and technological forces.

2. Learning about economic frameworks to evaluate how these innovations bring about changes in the market by altering its geometry and/or by prompting new business models.

3. Ability to identify disruptive innovations and predict their impact on different markets. A secondary goal is to identify market gaps and develop technological innovations that can address these gaps.

4. Ability to assimilate prior coursework on programming, economics and statistics and apply all their learning in specific real world contexts.

Case Studies

Case studies are used to cover the most important concepts in technology disruption and management. Each team of randomly assigned 4-5 students is required to present one case in class and lead the case discussion. This will be done with a number of questions in mind that are
identified ahead of time for each case. Each team has 75 minutes to present the case and lead the discussion in class with help from the Instructor. In addition, all students in the class are required to read the cases beforehand and contribute to the discussion. The course instructor will lead the discussion of the first case as an example of what is expected for the discussion of the subsequent cases.

Below is a preliminary schedule for the cases to be discussed along the semester. Additional relevant documents and references for each case will be posted on Blackboard as we go along. If you have any questions about the case studies, do not hesitate to get in touch with either the Instructor or the Teaching Assistants. Our contact information is provided on Blackboard. Finally, note that each case represents a fee that will show up in the account of each student. In most cases, these case studies are property of the Harvard Business School (HBS) and can only be used for teaching purposes if acquired directly from HBS. We will order the cases directly from HBS as a group to benefit from group discounts. However, each student is then required to pay for each case. Photocopying cases is an infringement of copyright law. Such an offense can be seriously prosecuted. The cost of each case varies between $5 and $10. We will order cases for every student registered in the course unless we hear otherwise from you.

Grading

The grading comprises five parts:

1. **Assignments**: There are 5 required assignments for the course. These assignments will be posted on Blackboard one week in advance. These assignments must be answered individually without any discussion or help from anyone else. The assignments are worth 20 points of your overall grade.

2. **Team Presentations**: Each team of 4-5 students is supposed to present one of the cases in this class. Team assignment will be announced in the first week of the course and also posted on Blackboard. Cases will also be assigned to teams on a random basis. We will post questions and material that might help you in preparing the presentation. Each team will have 75 minutes for presentation. These presentations contribute 15 points towards your final grade.

3. **Final Project**: This course requires a final group project with 5-6 students per team. The objective of the project is to identify a market or social need using the frameworks discussed in class, and propose a technological solution to address this need. The final project will include three main components:

   1. An initial write-up of the idea that clearly identifies the need, your solution to address that need and a plan of how your team will go about creating the technical prototype.

   2. A presentation including a demonstration of the technological solution at the end of the course.

   3. A final report in the form of a webpage detailing your analysis of the need you identified, the solution you propose and a preliminary plan for how to launch it in the appropriate markets.
The final project is worth 35 points.

4. **Class Participation**: All students are expected to **come prepared** for the class and **volunteer answers**. If I do not see enough class participation, I will **cold call** for answers. However, credit will be given for the quality of answers, not the quantity. Class participation counts 10 points towards your final grade.

5. **Surprise Quiz**: There will be **two surprise quizzes** worth 10 points each. You are expected to come prepared to class everyday for these quizzes.

**All assignments are due at the time indicated on Blackboard.**

Finally, grades are given on the curve, which means that grades are relative across students. In other words, if you score 10 out of 60 in the final essay you will get an A in the essay if everybody else scored, for example, 9 or below. Also, if you score 55 out of 60 in the essay, you will get a C in the essay if everybody else scored, for example, 59 or above. For a core course at the Heinz College, such as this one, roughly a third of the class will have a grade A- or above.

**Plagiarism and Proper Attribution**

Plagiarism and cheating is strictly forbidden when you write your case analysis. This includes both copying your classmate’s case analysis and idea of other writers without crediting source. The following potential punishment will be enforced according to CMU policy.

Plagiarism is considered a serious offense in any academic or professional field. In school, the instructor of the course in which the act occurs determines the penalties for a specific act of plagiarism. You could receive an “F” for the paper or project in question, fail the course, or even be brought up for university disciplinary action, possibly resulting in expulsion.\(^1\)

To plagiarize as defined by Webster’s Dictionary is: To steal and pass off as one’s own (the ideas or writings of another): use (a created production) without crediting source...: to commit literary theft: present as new and original an idea or product derived from an existing source. Plagiarism is a very serious offense and will not be tolerated. It can result in immediate loss of support and even expulsion from the University. If you are unsure of how to cite a source, or not sure if you need to cite a source ask the TAs or the course instructor. Please review it carefully. For more on plagiarism and University policy, see: [http://www.cmu.edu/policies/documents/Cheating.html](http://www.cmu.edu/policies/documents/Cheating.html).

Here are some basic rules: If you use any text written by someone else in any of your work, you must place it in quotation marks and provide a citation for the source. Thus, for example, you may say:

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\(^1\) Source: [http://www.cmu.edu/acadev/fastfact/Plagiarism08.pdf](http://www.cmu.edu/acadev/fastfact/Plagiarism08.pdf)
It has now been demonstrated that: "Large-scale use of wind power can alter transport in the atmospheric boundary layer." (Keith et al., 2004)

But you may not say:

It has now been demonstrated that large-scale use of wind power can alter local and global climate by extracting kinetic energy and altering turbulent transport in the atmospheric boundary layer.

You can of course also use numbered footnotes or endnotes. If you use the (Author, date) form of citation, then these should be paired with full references, sufficient for a reader to find the source. If the reference is a web source, include the web address.

Under the "fair use" terms of U.S. copyright law, it is perfectly fine to quote, with proper attribution, short excerpts from copyrighted works. If you start using very large portions of copyrighted text, you may need to obtain permission from the holder of the copyright (typically the journal, not the author) if you are going to publish the piece or distribute it widely. Obtaining such permission is generally not required for government documents.

Facts or ideas that are not general knowledge also need to be referenced. E.g: Foreign student enrollments at LaRoche College in the Pittsburgh area dropped by 23.7% between 2002-3 and 2003-4 (Schackner, 2004). The same goes for figures taken from other sources, including off the Internet. All such figures must carry a citation.

**Suggested Readings**

No one book will cover all the material I plan to cover. I recommend the following books that can act as a useful guide but you must keep in mind that posts on Blackboard and my lecture notes will be crucial for preparing for this course.


There are several online resources that will keep you up to date with the latest news on disruptive technologies. The [New York Times](https://www.nytimes.com) and the [Wall Street Journal](https://www.wsj.com) are excellent source of current and very readable reports on information technology. [Tech Crunch](https://techcrunch.com) and [Venture Beat](https://venturebeat.com) are excellent sources of information on how entrepreneurs are driving disruptive innovation.
Tentative course schedule:

Lecture 1: Introduction to class, course mechanics
Lecture 2: Disruptive technologies - an economic perspective
Lecture 3: Network externalities
Lecture 4: Technology Adoption
Lecture 5: Facebook case
Lecture 6: Pricing models for disruptive technologies
Lecture 7: Two-sided markets
Lecture 8: Online auction markets case
Lecture 9: Guest Lecture on Platform-enabled business models
Sangeet Paul Choudary - Platform Thinking
Lecture 10: The Internet
Lecture 11: CDN Technologies
Lecture 12: Akamai case
Lecture 13: Guest Lecture on Application Delivery Networks:
Manav Ratan Mital - InstartLogic
Lecture 14: NTT DoCoMo: Mobile Felica case
Lecture 15: Midterm Project Presentation
Lecture 16: Linux v/s Windows case study
Lecture 17: VmWare case
Lecture 18: Cloud Computing
Lecture 19: Guest speaker on Cloud Computing
David Barnes, IBM Emerging Technologies Group
Lecture 20: Rhapsody Realplayer case
Lecture 21: Hulu case
Lecture 22: Android case
Lecture 23: The Data Revolution

Lecture 24: Internet of Things

Lecture 25: Guest Lecture on Wearables and Internet of Things
Stuart Crawford, Jawbone

Lecture 26: Course wrap up with additional examples
Airbnb, Uber, Fon, Google Express, IBM Watson

Lecture 27-28: Project presentations