MGT 8803 – Spring 2008
Analysis of Emerging Technologies
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"Prediction is very difficult, especially about the future." - Niels Bohr (1885-1962)

Course Overview

What technologies have you used today? Your mobile phone, the Internet, an ATM, perhaps? How would your life be different without these technologies? How will your life be different in 10 to 20 years, as new, emerging technologies change the possibilities for how we conduct our day-to-day activities?

Emerging technologies have significant implications for us individually, but they also have profound consequences for firms, markets, governmental policy, and society in general. Whether you are an inventor who is developing a new technology, a manager who is considering using an emerging technology within your organization, an analyst who wants to predict the impact of an emerging technology on an industry, or a policy-maker charged with helping society benefit from emerging technologies, knowing how to analyze emerging technologies is critical. This course will help you develop the skills to identify and analyze emerging technologies and their impact on firms, markets, policy, and society.

Emerging technologies is a broad field, and they are many types of technology which could be analyzed. To bound the domain somewhat, special emphasis will be given to emerging technologies that collect and transmit information and the opportunities and challenges associated with this information. Examples include augmented reality and wearable computing, personal health monitors, artificial intelligence, and virtual worlds such as SecondLife and Kaneva.

Course Objectives

After this course, students should be able to:

- Analyze how emerging technologies will affect individuals, firms, markets, policy, and society in the future.
- Predict which emerging technologies will be successful and why.

- Describe the system in which technologies emerge, including catalysts and inhibitors.
- Analyze the impacts of emerging technologies on different stakeholders, including individuals, businesses, government, and the environment.
- Evaluate the opportunities and challenges associated with the information produced by emerging technologies.
- (I'd like to say that you'll also be able to predict the future, but that's a bit of a reach…)

Course Structure

The course consists of two modules. The first module provides a framework for the analysis of emerging technologies. The second module allows us to apply the framework to the analysis of specific emerging technologies.

Module #1: Underlying Principles
In order to analyze emerging technologies, we must have tools to help us predict which technologies will emerge and which will not. As such, we will explore principles and theories related to forecasting, invention, and technology adoption and diffusion. This will give us a theoretical basis for analyzing and making predictions about a variety of emerging technologies.

Module #2: Cases and Applications
In this module, we will apply the underlying principles from the first module to a variety of cases and applications. We will analyze emerging technologies related to virtual worlds, artificial intelligence, augmented reality and wearable computing, and a variety of monitoring applications (personal health monitoring, physical asset monitoring, traffic monitoring, etc.) A theme of this module is to investigate the information produced by emerging technologies and the opportunities and threats associated with that information.

Course Materials

1. Reading packet – Readings listed below in the syllabus.

Grading

- Current Events Presentation (group) – 10%
- Lab Exercises (individual) – 5%
- Mid-Term Exam (individual) – 20%
- Final Exam (individual) – 30%
- Project (group) – 20%
- Class Participation (individual) – 15%

* *Group Composition:* Groups should consist of 3 people. Please determine your group membership by **January 15**, as we will begin group activities relatively early in the semester.

"Current Events" Presentation: Each week, one of the groups will lead a 15-20 minute discussion on an emerging technology that has been reported on in the press. Students are expected to stay current with the news regarding emerging technologies during the semester and may use any source they choose to stay current. A source that I recommend is the Technology section of the New York Times (http://www.nytimes.com/pages/technology/.)

Lab Exercises: There are three lab exercises designed to help you "get your hands dirty" with some of the emerging technologies available on the Internet. We will do one of the labs in class; the other two are homework. There are no right / wrong answers to the labs – I just want you to try some things out.

Mid-Term Exam: The mid-term exam will cover the material from the first half of the course. We will have a review session prior to the mid-term.

Final Exam: The final exam will primarily cover material from the second half of the course, although because the course material is cumulative, some of the materials from the first half of the course will be incorporated into the final exam.

Project: This is a group project. Your group will prepare a brief report (8 – 10 double-spaced pages) on the effect of technology on a business or societal process. For example, you might study the effect of technology on the process of dating, the process of buying a car, the process of getting a college degree, the process of going to the doctor, etc.

The first section of the report will discuss the history of technology's effect on that process, centered on a specific year in the past. You will determine the specific year as follows. First, take your age, and then determine the year when an older relative (e.g., mother, father, aunt, uncle) was that age. For example, if you are 26 and your mother is 50, then your mother would have been 26 in 1984. So you would investigate the effect of technology on your chosen process in 1984.

The second section of the report will discuss your group's predictions for how technology will impact that process in the future. Center your predictions on the year that is as far in the future as your historical year was in the past. For example, if your historical year was 1984 (which was 24 years ago), than your future year will be 2032 (which is 24 years from now.) You must state the logical reasoning behind your predictions using the principles we cover in the course.

In addition to the written report, you will deliver a 15-minute presentation of your project to the class.

Class Participation: Class participation augments the overall learning experience, and you will be evaluated on your participation. We will rely heavily on cases and class discussions based on assigned readings as the primary vehicle for learning. It is your responsibility to carefully prepare for every class session, read the assigned background materials, and be ready to lead and actively participate in the discussions. Some criteria for assessing effective class participation are:

- Do the comments help other students learn?
- Are points that are made relevant to the discussion and linked to the comments of others?
- Is there a willingness to test new ideas, or are all comments "safe?" (e.g., repetition of case facts without analysis or conclusions). It is more important that your comments be backed by good reasoning and analysis

Schedule Overview

Date	Topic	Assignment/Reading/Case
Introduction		
Jan. 8	Course introduction and future scenarios	Read the syllabus (required reading!)
Jan. 10	Examples of emerging technologies and our approach to their analysis	Read: • Top 10 Emerging Technologies List (*Technology Review*, Mar / Apr 2007) • 10 Technologies that flopped (http://etech.eweek.com/slideshow/index.php?directory=tech_flops) • The Emergence of Emerging Technologies (Adner, Levinthal, *California Management Review*, Oct. 2002)
Jan. 15	The Internet "Treasure Hunt" – Familiarize yourself with new and emerging technologies on the World Wide Web	Complete: • The Treasure Hunt at http://www.prism.gatech.edu/~eoverby3/treasurehunt.shtml (lab exercise #1)
Underlying Principles of Emerging Technologies		
Jan. 17	Techniques for *predicting* the future of technology: extrapolating from the past, Delphi method, prediction markets, etc.	Read: • Six Rules for Effective Forecasting (Saffo, Harvard Business Review, July 2007) • The Wisdom of Excerpt Crowds (Duboff, Harvard Business Review, September 2007) Review: • Forecasting Methodology Tree (from www.forecastingprinciples.com)
Jan. 22	Techniques for *creating* the future of technology: TRIZ	Read: • What is TRIZ? (Barry, Domb, Slocum, *TRIZ Journal*) • Excerpts from *Simplified TRIZ* (Rantanen and Domb) Review: • 40 Inventive Principles with Examples (*TRIZ Journal*)
Jan. 24	Characteristics of the Technology: The Technology Acceptance Model and Diffusion of Innovations	Read: • Case: McFarlan and Keil, "Free Internet Initiative in LaGrange, Georgia"

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Jan. 29	Guest Speaker – TBD, Cox Communications	Read: • Cox Enterprises Annual Report (pp. 22-25)
Jan. 31	Characteristics of the Technology: Modularity, flexibility, and other design principles	Read: • Case: O'Mahoney and Raj, "The Mozilla Foundation: Launching Firefox 1.0" • Lessons from Open Source Software Development (O'Reilly, *Communications of the ACM*, Apr 99.)
Feb. 5	Characteristics of the System: An overview	Read: • Chapter 4 and Chapter 9: *The Economics of Information Technology*, Varian, Farrell, Shapiro
Feb. 7	Characteristics of the System: Direct and indirect network effects	Read: • Case: Eisenmann and Willis, Fuel Cells: The Hydrogen Revolution? • Chapter 8: *The Economics of Information Technology*, Varian, Farrell, Shapiro
Feb. 12	Characteristics of the System: Standards and complementary infrastructure	Read: • Case: Viard and Fan, "The Long Battle for an Instant Messaging Standard"
Feb. 14	Characteristics of the System: Legal and regulatory considerations	Read: • Introduction, *Free Culture*, Lessig, pp. 1-13.
Feb. 19	Effects of emerging technologies on stakeholders, including sustainability implications	Read: • Case: Goldberg and Tasker: Delta & Pine Land: Measuring the Value of Transgenic Cotton • Sustainability Science (Clark, National Academy of Sciences, pp. 1737-1738.) • Social Acceptance of Nanotechnology (Thompson, NSF Report, pp. 198-202.)
Feb. 21	Review of framework for the rest of the course	Read: • The Many Faces of Context Awareness, Institute for the Future (www.iftf.org)
Feb. 26	Mid-term exam	
Feb. 28	Guest Speaker – Professor Sundaresan Jayaraman	Read: • Smart Shirt: Intelligent Garment for the 21st Century, Jayaraman
Cases and Application		

Date	Topic	Assignment/Reading/Case
Mar. 4	Information implications of emerging technologies: Creation of new data	Read: • Case: Ferguson, "Have Your Objects Call My Objects" • Information Technology in Organizations: Emerging Issues in Ethics and Policy (Sviokla and Gentile, HBS Note)
Mar. 6	Creation of new data: Personal medical monitors, surveillance and exception detection, "the Internet of things," etc.	Read: • Information Explosion (Sweeney, in *Confidentiality, Disclosure, and Data Access: Theory and Practical Applications for Statistical Agencies*, pp. 1-12) • Brief history of the VIN (http://www.autoinsurancetips.com/history-of-vin-numbers) Do: • Keep journal of your "trackable" activities for a day.
Mar. 11	Security and privacy implications of emerging technologies	Read: • Case: Fusaro, "None of Our Business?" • A Picture of Health, (Hawley, *Technology Review*, pp. 28-29) • Wearable Health Reports (Bourzac, *Technology Review*, pp. 40-41)
Mar. 13	Your digital persona: Federated identity, authentication (e.g., biometric tokens), etc.	Read: • Federated Identity Primer, Ping Identity White Paper, pp. 1-14
	SPRING BREAK	
Mar. 25	Analysis of new data: search, tagging, data visualization, etc.	Read: • A Smarter Web (Borland, *Technology Review*, Mar '07, pp. 64-71) • Complete "Fun with Search Engines" - lab exercise #2
Mar. 27	Guest Speaker, TBD, Manheim	Read: • Cox Enterprises Annual Report, pp. 26-29.
Apr. 1	Artificial intelligence: the semantic web, spiders, bots, and other agents	Read: • The Meaning and Future of the Semantic Web, Spivack, Lifeboat Foundation White Paper (www.lifeboat.com)

Date	Topic	Assignment/Reading/Case
Apr. 3	What your computer knows about you – lab exercise #3	Bring: • Your laptop (if you have one) to class. If not, we will work in groups.
Apr. 8	The virtualization of business and society	Read: • Process Virtualization Theory, (Overby, excerpted from *Organization Science*, pp. 1-28)
Apr. 10	Virtual worlds and metaverses (e.g., SecondLife, Kaneva)	Read: • Reverse Product Placement in Virtual Worlds (Edery, *Harvard Business Review*, Dec. 2006) • Avatar-Based Marketing (Hemp, *Harvard Business Review*, June 2006)
Apr. 15	Augmented reality and wearable computing	Read: • How Augmented Reality Will Work, Bonsor
Apr. 17	Course project presentations	
Apr. 22	Course project presentations	
Apr. 24	Course wrap-up	
	FINAL EXAM	