MGT\ME 3743 Analysis of Emerging Technologies (Elective)

Catalog Description: MGT\ME 3743 (3-0-3)
Prerequisites: None

Analysis of emerging technologies and their impacts for firm practice, market practice, policy, and society.

Textbook: None

Topics Covered:

Introduction
- Impact of technology on business and societal practice
- Future scenarios
- Understanding the past in order to predict the future

Principles of Technological Invention and Design
- Segmentation, Merging, Inversion / Reversal, Recycling, etc.

Principles of Technology Emergence and Adoption
- Characteristics of the Technology
    - The Technology Acceptance Model (performance expectancy, effort expectancy, etc.)
    - Modularity, flexibility, and other design principles
- Characteristics of the system in which the technology emerges
    - Standards
    - Complementary infrastructure
    - Network effects
    - Legal and regulatory considerations
    - Competitive environment
- How stakeholders can influence the technology and the system

Effects (First-Order and Higher-Order) of Emerging Technologies on Stakeholders
- Individuals
- Firms
- Government
- The Environment

The Information Implications of Emerging Technologies
- Creation of information via monitoring technologies (biometric tokens, asset tagging, location-based monitoring, etc.)
- Analysis of newly created information (search algorithms and techniques, tagging, data visualization, etc.)
- Opportunities for analysis and understanding
- The "dark" side – privacy and profiling implications

Course Outcomes:

Outcome 1. To provide students with the ability to analyze how emerging technologies will affect business and society in the future.

Outcome 2. To enable students to predict which emerging technologies will be successful and learn why.

Outcome 3. To enhance a student's ability to describe the system in which technologies emerge, including catalysts and inhibitors.

Outcome 4. To enable students to evaluate the opportunities and challenges associated with the information produced by emerging technologies.

Contribution of course to meeting the requirements of Criterion 5.

MGT\ME 3xxx Analysis of Emerging Technologies												
Mechanical Engineering Program Educational Outcomes												
Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Course Outcome 1	X	X		X	X			X	X	X	X	
Course Outcome 2	X							X		X	X	
Course Outcome 3							X	X				
Course Outcome 4	X			X	X	X		X			X	

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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.

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) – 5%
- Lab Exercises (individual) – 5%
- Quizzes (individual) – 20%
- Mid-Term Exam (individual) – 15%
- Final Exam (individual) – 20%
- Project (group) – 15%
- Class Participation (individual) – 20%

* 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.

Quizzes: We will have two quizzes in addition to the mid-term exam and final exam. There are two reasons for the quizzes. First, they reduce the stress associated with the mid-term and final exam because they reduce how much they affect your final grade. Second, they create additional checkpoints for your learning, which is important because we will build upon concepts throughout the semester.

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 be on 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 20 and your mother is 50, then your mother would have been 20 in 1978. So you would investigate the effect of technology on your chosen process in 1978.

The second section of the report will be your 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 1978 (which was 30 years ago), than your future year will be 2038 (which is 30 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: TBD

Class Policies

tbd

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)
Jan. 15	The Internet "Treasure Hunt" – Familiarizing 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: • Predicting the Future: How History Counts (Stearns, prepared for the National Standards for World History) Review: • Forecasting Methodology Tree (from www.forecastingprinciples.com - operated by Scott Armstong (Wharton))
Jan. 22	Techniques for *creating* the future of technology: TRIZ (how many can we apply to today? Mash-ups)	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	Brief experiment on judgmental confidence (30 minutes) Quiz #1 (45 minutes)	
Jan. 29	Guest Speaker – TBD, Cox Communications	Read: • Cox Enterprises Annual Report (pp. 22-25)
Jan. 31	Characteristics of the Technology: The Technology Acceptance Model and Diffusion of Innovations	Read: • HBS Case: McFarlan and Keil, "Free Internet Initiative in LaGrange, Georgia"
Feb. 5	Characteristics of the Technology: Modularity, flexibility, and other design principles	Read: • Lessons from Open Source Software Development (O'Reilly, *Communications of the ACM*, Apr 99.)
Feb. 7	Characteristics of the System: An overview	Read: • Chapter 4 and Chapter 9: *The Economics of Information Technology*, Varian, Farrell, Shapiro
Feb. 12	Characteristics of the System: Direct and indirect network effects	Read: • Chapter 8: *The Economics of Information Technology*, Varian, Farrell, Shapiro
Feb. 14	Characteristics of the System: Standards and complementary infrastructure	Read: • HBS Case: McFarlan and Belokhvostova, "RosettaNet and ebXML: Betting on the Right eBusiness Standard"
Feb. 19	Characteristics of the System: Legal and regulatory considerations	Read: • Introduction, *Free Culture*, Lessig, pp. 1-13.

Date	Topic	Assignment/Reading/Case
Feb. 21	Effects of emerging technologies on stakeholders	Read: • Sustainability Science (Clark, National Academy of Sciences, pp. 1737-1738.) • Information Technology Based on a Mature Nanotechnology: Some Societal Implications (Theis, NSF Report, pp. 60-68.) • Social Acceptance of Nanotechnology (Thompson, NSF Report, pp. 198-202.)
Feb. 26	Review of framework for the rest of the course	Read: • The Many Faces of Context Awareness, Institute for the Future (www.iftf.org)
Feb. 28	Mid-term exam	
Cases and Application		
Mar. 4	Information implications of emerging technologies: Creation of new data	Read: • HBS Case: Ferguson, "Have Your Objects Call My Objects"
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. 1-26) • 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: • HBS 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)
Apr. 3	What your computer knows about you (30 minutes) – lab exercise #3 Quiz #2 (45 minutes)	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)

Date	Topic	Assignment/Reading/Case
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 (www.howstuffworks.com)
Apr. 17	Course project presentations	
Apr. 22	Course project presentations	
Apr. 24	Course wrap-up	
	FINAL EXAM	

NEW COURSE PROPOSAL

GRADUATE   Level I _____   Level II _____   **UNDERGRADUATE**   X _____

SCHOOL, DEPARTMENT, COLLEGE: College of Management, Mechanical Engineering   **DATE:** 10/11/07 _____

Proposed Course Number: MGT/ME 3744	2. Hours: *LECTURE* **3** *LAB/RECITATION* **0** *SEMESTER CREDIT* **3**

3. Descriptive Title:
Managing Product, Service & Technology Development

4. Recommended Abbreviation for Transcript – (24 characters including spaces):

M	A	N	G	N		P	R	O	D		S	E	R	V		T	E	C	H		D	E	V

5. Catalog Description – (25 words or less)
Analysis of the managerial challenges of the product development process.

6. Basis: **L/G**   P/F   Audit

7. Prerequisites: Student must be enrolled in the T&M Program

Prerequisites with concurrency:

Corequisites:

8. Has the course been taught as a special topic?   If YES,   When   2004-2007   Enrollment 20-50

9. Is this course equivalent to another course (graduate or undergraduate) taught at Ga. Tech? If yes, list course number(s): MGT 4803

10. Are you requesting that this course satisfy: Humanities   Social Science

11. Expected Mode of Presentation:	*MODE*	*% of COURSE*
	Lecture	100%
	Laboratory Supervised Unsupervised	_____
	Discussion	
	Seminar	
	Independent Study	
	Library Work	
	Demonstration	
	Other (Specify)	

12. Planned Frequency of Offering:	*TERM TO BE OFFERED*	*EXPECTED ENROLLMENT*
	Fall	
	Spring	30
	Summer	

13. Probable Instructor(s) – *Please mark with an asterisk any non-tenure track individuals.*

Stylianos Kavadias, Cheryl Gaimon

14. Purpose of Course: Relation to other courses, programs and curricula:
This is one of the courses in the T&M curriculum. The course is designed to offer students a general overview of the process for developing new products, services and technologies. The students receive a mix of lectures, case study discussions and several in classroom "exercises" that aim to convey the difficulties that managers face when they deal with cross disciplined teams of marketing manufacturing and engineering. A key aspect of the course is the ongoing semester project that the students will conduct in strictly enforced cross disciplined teams with the goal to develop an innovative product or service. The course provides the students with the basic fundamentals of different perspectives (marketing vs. engineering) and tries to integrate them into a coherent "theory" of product development.