B20.3362 Emerging Technologies and Business Innovation
Fall 2010
Professor Alex Tuzhilin

*** DRAFT SYLLABUS; SUBJECT TO CHANGE ***

Course Description

The IT revolution is far from over, and, contrary to the well-known claim of Nicolas Carr, IT does matter. In fact, according to Bill Gates, “we’re only beginning to realize computing’s potential” and that “we’re entering an era when software will fundamentally transform almost everything we do,” ranging from the evolutionary to the revolutionary transformations disrupting previously adopted technologies and business models. These transformations should create intelligent real-time enterprises that would conduct business in a significantly more effective, efficient and agile manner, and that could adapt to the changing business conditions and grow “smarter” over time by leveraging the future generations of Information Technologies. These technologies can be the greatest friends or the worst foes in building such “smart businesses,” depending on how well they are adopted and deployed in the enterprises.

In this course, the students will study

- Various principles of technological innovation driving major business transformations and leading to the creation of more intelligent and agile enterprises. Some of these principles include evolution and generations of emerging technologies, different types of technological trajectories, cycles and path dependencies of these technologies, business-pull and technology push, can-do vs. should-do, the “magic” quadrant, crossing-the-chasm and the beagle-and-the-rocket principles. The course will also cover various technological standards, battles between the competing standards, convergence to one or few dominant standards, and commoditization of technologies.

- How innovative technological ideas and business concepts can lead to various entrepreneurship opportunities and what it takes for an innovative technological idea to get funded.
Each of these principles and concepts will be illustrated with various studies of actual technologies. Although a broad range of different technologies will be covered in the course, the main focus will be on

1. Communication technologies, including landline and wireless/mobile
2. Knowledge and content management technologies
3. “Cutting edge” and “smart” technologies for building agile and responsive businesses

We will study these technologies, explore various business opportunities that they create, and gain insights into how they could lead to major transformations in the ways we do business and enable the creation of “smart businesses.” We will also consider examples of how some of the companies deploy these technologies and how these technologies support their critical applications and allow the companies to achieve their business objectives. Moreover, we will discuss possible future directions and trends for the technologies being studied, novel applications that they enable and how high-tech companies can leverage these trends.

What differentiates this course from other related courses is the emphasis on solid understanding of both business problems and underlying technologies and deep understanding of how the two interact. This understanding is becoming increasingly important in decision making and in managing modern businesses. For example, (a) should a wireless phone company adopt a CDMA-based or a GSM-based standard, (b) should a major retailer adopt RFID technologies or not, or (c) can a small startup company leverage its innovative and IP-protected technologies and stay in the value chain or should it get out of the value chain and do something else because some of the major IT vendors try to integrate forward and backward in the value chain and squeeze the small startup out? These and many similar types of decisions are not purely business or purely technological decisions since they involve complex interactions between business and technical issues. The students will also learn that the ability to understand both business and technical issues can often differentiate between the success stories and major blunders, such as Enron’s overly ambitious plan to develop software-based switching hubs to provision high-speed circuits to customers in near real-time.

The students will learn the material through the combination of class lectures, discussions, student presentations, and the case studies. Periodically, experts from the industry will be invited to share their experiences pertaining to the technologies being studied and discuss current trends and future directions for these technologies and corresponding industries. For example, the following guest speakers gave their guest lectures last year:

- **Richard Lynch**, CTO and Executive Vice-President of Verizon
- **Stephanie Mitchko**, Vice President, Interactive Platform Development, Cablevision Systems.
- **Tianyi Jiang**, COO of AvePoint (a successful startup company based in New Jersey)
Intended Audience and Prerequisites

The course should be useful to the students interested in the careers in the high-tech companies, IT consulting, technology entrepreneurship, investment banking in the technology sector, and to the students interested in joining the VC firms.

Although this course does not have any formal prerequisites, I will assume certain very basic familiarity with key technologies, including the basic understanding of

1. communication networks and how Internet works+
2. WWW basics
3. data organization, such as relational databases.

If you have any prior technical background (from the school or work-related), it should be sufficient for this course. If you have no prior technical background, you can still take this course, assuming that you are a fast learner and are willing to put extra time to learn some of the basic technical concepts during the course. If you are not sure whether you have the appropriate knowledge, you can examine the content of the book “How the Internet works,” by Preston Gralla, Que, 2006 to see if you have basic familiarity with key technical concepts covered in that book (or at least the ability to learn this material fast on your own). Finally, if you are still not sure if your background is appropriate for this course, you can contact the instructor (see below).

The Project

The students will be grouped into small teams and asked to analyze a company or a specific technology covered in the course. The deliverables of this analysis are (1) a short in-class presentation and (2) a written report that will be delivered at the end of the course. The purpose of this project is to encourage exploration and independent research and to stimulate thinking about emerging applications and factors contributing to the success or failure thereof.

Requirements and Grading

Besides the project described in the previous section, there will be three quizzes administered in-class to test the knowledge of the material. The purpose of these quizzes is to encourage periodic review of the course material and strengthen understanding of the concepts covered in class. Finally, there will be cases studied in this class, and the students will be requested to write an analysis of one of the cases (as a group project).

A student’s overall score will be calculated as the weighted average of the scores computed according to the following distribution:

1. Project 40%
2. Case analysis 21%
3. Quizzes (3) 24%
4. Class participation 15%

Some of the factors affecting class participation include showing interest in the subject and active participation in the class discussions, regular class attendance, and preparedness for the classes, including familiarity with the reading materials assigned for the class.

**Case Studies**

Some of the following cases will be covered in class (note: some of the cases may be changed in the final syllabus):

- S. Bradley et al. NTT DoCoMo, Inc.: Mobile FeliCa
- R Henderson. Ember Corporation: Developing the Next Ubiquitous Network Standard
- T. Eisenmann and D. Vivero. Visions of Web 3.0
- T. Eisenmann and F. K. Herman, Google, Inc.

Students are expected to read these cases *before* the class and be well-prepared to discuss them in class. They will also be asked to write an analysis of one of the cases as a group project.

**Reading Materials**

1. The Reading Packet (electronically distributed by XanEdu)
2. Handouts and on-line materials

**Contact Information and Office Hours**

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Course Outline

*** THIS IS A TENTATIVE OUTLINE. THE ACTUAL ONE CAN BE SOMEWHAT DIFFERENT. ***


Discussion of how innovative technologies emerge, evolve and are adapted by businesses, and how technical and business issues are intertwined in making business decisions. The students will also learn about various types of technological innovation and the value of emerging technologies. Finally, we will discuss how intelligent adoption of modern emerging technologies leads to the creation of “smart” real-time enterprises.

The students will learn how these principles are applied in real-life business situations by doing four case studies of various technology companies. These cases (unlike typical Harvard Business School cases) will have a heavy dosage of technical content. Therefore, the students will learn some of the technologies covered in these cases and how they are used in business. In particular, the students will learn the following technologies.

2. Communication Technologies.

Overview of the communication infrastructure, basic communication concepts, types of networks, network devices and broadband technologies. Voice and data networks; circuit switching and packet switching. Overview of some of the packet-based communication protocols, including TCP/IP, overview of the Internet and its structure, including the backbone, local loop technologies, and the “last mile” problem.

Foundations of wireless technologies, different generations of wireless technologies (1G through 4G), and corresponding standards (e.g., GSM, GPRS, EDGE, W-CDMA, CDMA2000, HSPA, and OFDM); making sense of these standards and studies of transition paths. Wireless LANs, personal area networks, and the corresponding standards

Pervasive and smart wireless technologies, including smart sensors; the paradigm of mobile wireless devices connected into smart wireless networks communicating to each other and to the outside world; location-based wireless technologies. Overview of the mesh networks and digital convergence.

These technologies will be studied in the context of various business applications where they can be deployed. Familiarity with these technologies and prior knowledge of the basic principles of emerging technologies will help the students understand the two cases covered in the course: Ember Corporation and Mobile FeliCa from NTT DoCoMo.

Discussion of what knowledge and content management are and in which applications these technologies can be used and how. Overview of various knowledge management technologies, including search, retrieval, discovery and taxonomy generation technologies. Overview of the content management concepts. Discussion of how different types of content can be created, collected, transformed and stored in content management systems.

4. “Cutting Edge” Technologies and Entrepreneurship Opportunities Pertaining to them

Overview of various “cutting edge” and “smart” technologies, including (but not limited to) real-time monitoring, business intelligence, web services, and business process management and integration technologies, for creating agile, integrated and highly automated sense-and-response enterprises. Discussion of various entrepreneurship opportunities pertaining to such cutting edge technologies.