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. This sentiment was shared by Marc Andreessen from the VC firm Andreessen-Horowitz who famously claimed that “software is eating the world.” These IT-driven 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.
The students will also examine how these key principles of technological innovation work in practice by studying several business cases. This semester, the cases include:


These cases will cover different types of technologies, such as

1. Communication technologies, including landline and mobile
2. Cloud computing
4. Big Data, Knowledge Management, and Intelligent Assistants technologies.

In order to understand these cases and also to illustrate the principles of technological innovation, the students will examine these technologies and see how they are used in various applications and deployed in real business settings. 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, should a wireless phone company adopt a CDMA-based or a GSM-based standard, or 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 and video recorded 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 in this class over the last few years:

- **Jeff Teper**, Corporate Vice President – OneDrive & Sharepoint, Microsoft
- **Richard Lynch**, CTO and Executive Vice-President of Verizon
- **Brian Higgins**, Vice President for Technology, Verizon Wireless
- **Maria Azua**, Vice President of Cloud Computing, IBM.
- **Narinder Singh**, Chief Strategy Officer and Co-founder, Appirio Inc.
- **Stephanie Mitchko**, Chief Technology Officer, Cross MediaWorks.
- **Tianyi Jiang**, CEO of AvePoint (a successful late-stage 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, and investment banking in the technology sector.

Although this course does not have any formal prerequisites, I will assume some *very basic* familiarity with certain key technologies, including the basic understanding of communication networks and how Internet and WWW works, and some very basic familiarity with data organization and 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 and background for this course, you can discuss this matter with the instructor.

**The Projects**

There will be a group term project in this class. In this project, the students will be grouped into small teams and asked to choose an emerging technology and analyze its potential and future prospects using the principles of emerging technologies covered in this class. Alternatively it can be done within a context of a particular company or a group of companies working with this technology. 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 two 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 two 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. Term Project 40%
2. Case analysis (2) 30%
3. Quizzes (2) 20%
4. Class participation 10%

Reading Materials

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

Contact Information

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Course Outline

1. Overview of the Basic Principles of Emerging Technologies and Business Innovation

Discussion of how innovative technologies emerge, evolve and are adapted by businesses. The students will also learn how technical and business issues are intertwined in making certain business decisions and will study how solutions to complex business problems often require deep understanding of interactions between business and technological issues pertaining to the solutions of these problems. Finally, the students will study various types of technological innovation and the value of emerging technologies.
The students will learn how these principles are applied in real-life business situations by doing five 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 following technologies will be covered in this class.

2. Communication Technologies

Overview of the communication infrastructure, basic communication concepts, broadband technologies, and voice and data networks. Overview of packet switching and of some of the packet-switching communication protocols, such as 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 (2G through 5G), and the corresponding standards (e.g., GSM, CDMA, and OFDM). Making sense of these standards and examination of the transition paths across them. Overview of smart wireless technologies, including smart sensors and the location-based services and of the recent developments in mobile Internet.

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 class: “Akamai Technologies” and “Evolving Competitive Dynamics of the Global Mobile Telecommunications Industry…”.

3. Cloud Computing

Overview of the key concepts of the cloud computing and the architectures of the cloud computing systems. Discussion of the performance, security, reliability and economic viability issues, as pertaining to the cloud computing systems.

Familiarity with these technologies will help the students understand the Amazon Web Services and the Akamai cases.

4. Automation, “Smart” Machines and Robots

We are entering the era of the next wave of automation when “smart” machines will be doing numerous everyday tasks for us, including driving, shopping, doing our income taxes and much more. In this module we will examine the underlying technologies making such machines more intelligent and capable of performing these functions and will study business applications where they can be deployed.

Familiarity with these technologies will help the students understand the “3D Robotics: Disrupting the Drone Market” and the Google case.
5. Big Data, Knowledge Management, and Intelligent Assistant Technologies.

Discussion of what Big Data, Knowledge Management and Intelligent Assistants are, overview of these concepts and technologies, and discussion in which applications these technologies can be used and how.

Familiarity with these technologies will help the students understand the Google case.