Technology Innovation and Strategy

TE 565

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INTRODUCTION
This course is designed to help students develop strong conceptual foundations for understanding technological innovations. It will introduce concepts and frameworks for analyzing how firms can create, commercialize and capture value from technology-based products and services. It will also highlight why some firms that have successfully commercialized technology products as a new entrant, fail to sustain their success as technology changes and evolves around them.

KEY CONCEPTS
1. Sustaining vs. Disruptive Innovation. Christensen’s disruptive innovation framework helps explain why successful companies, while being good at sustaining innovation, often lose out in the face of disruptive innovation. Too often successful companies introduce new products whose performance overshoots market need. They do this via sustaining innovations, in search of higher margins and to keep current customer happy. They often engage in sustaining innovation at the expense of developing disruptive products that have lower performance and cheaper but target emerging markets with high growth potential.

2. Crossing the chasm. Not all innovations go on to become mainstream products and services that are adopted by majority of customers. Think about the Apple iPhone which is a mainstream consume product. In fact, technology ideas often fail to transition from a promising, nascent early adopter phase to mass market adoption. This gap between these two phases (the early market and the mainstream, mass market) is called the chasm. What is the secret to crossing the chasm? Identify a single beachhead (product application) of pragmatist customers in a mainstream market segment and accelerate the formation of 100% of their “whole” product needs. The typical product development prioritization process usually results in new features (something) for everyone, but a complete solution for no one.

3. Technological innovation and business strategy. How do innovating firms extract economic returns from an innovation and what are some of the barriers to it? Introduce the ideas of business strategy, core competence, and industry analysis aimed at understanding ways to capture the biggest slice of the value that is generated. In addition to the traditional ideas of strategy, the importance of fostering dynamic firm capabilities in environments of rapid technological change will also be introduced.

4. Technology evolution and dominant design: In the early stages of industry development, product designs are in a state of flux. At some point after considerable trial and error in the marketplace a design emerges that meets a whole set of user needs in a relatively complete fashion. This is called the dominant design, which by its very nature is product-defining. No one asks whether a car has a steering wheel or electric wipers! Once a dominant design emerges, the dynamics of competition change dramatically from the fluid phase to competition focused on price, quality and some differentiation leading companies to focus on different types of activities.

5. The technology S-Curve. S-Curve is a useful framework describing the substitution of new for old technologies at the industry level. According to the S-curve, in early stages of a technology the rate of progress in performance is relatively slow. As the technology becomes better understood, controlled, and diffused, the rate of technological improvement increases. In its mature stages, the technology
will asymptotically approach a natural or physical limit. The S-curve framework can be used in both component as well as architectural level technology development.

6. Lead user research. Lead users are not the same as early adopters. Lead users have a need and a strong desire to create their own solution to that need, if a product doesn’t already exist. A wealth of information pertaining to emerging market trends, solution to problems you are trying to solve and ideas for product development resides with lead users. However, it is not easy to find them and there are challenges in using this methodology.

7. Network externalities and standards: Adoption of new technology may be influenced by Network Effects (the utility derived from the consumption of a service/good for a given user of a network depends upon the number of other users on the same network). Various consumer applications (Web, mobile, and community) often exhibit positive network externalities. First mover advantage, assembling allies, and availability of complementary products can help establish technology standards in market with strong network effects.

COURSE OBJECTIVES
Through case studies, a student project, and several analytical frameworks explored in class, this course aims to equip students with a broad perspective on the central issues involved in innovation throughout the product lifecycle. It aims to help students become even better leaders of technology and innovation.

COURSE MATERIALS

REQUIRED:
- ENG 565 Course Packet
- Additional readings and Harvard Business School cases will be handed out throughout the semester.

REFERENCES:
- Innovator’s Dilemma, Clayton M. Christensen, 2003, ISBN 0060521996

REQUIREMENTS AND GRADING

Contact hours:
Two 50 minute video lectures per week. A 50-minute session is counted as 1 contact hour. Thus, there are 2 contact hours per week x 14 weeks = 28 total contact hours.

Grades:
Grades for online students will be determined on the basis of homework assignments, midterm exam and a final project that is to be completed either individually or in groups.

1. Homework assignment:
It is advisable that on-line students complete each session’s reading (included in the course packet), before viewing the class video, in order to get the most benefit from the course material. Students will be expected to complete homework assignment covering the content of each major module of the course.
2. Midterm:
There will be a 90-minute midterm exam (closed book, closed notes). This will consist of a set of short-answer questions and/or short cases to be read, analyzed, and turned in at the end of the period. The midterm will be distributed electronically to students.

3. Individual/Group project:
On-line students will also be required to complete an individual or a group project. This will consist of student(s) exploring a topic related to the dynamics of technical innovation. You will be required to turn in a 10-12 pages written report with your analysis and recommendations.

Project options include:
- Analyze a contemporary (or anticipated near future, 0-5 year) disruptive innovation, and present action plan(s) for one or more key players involved (Music and video distribution over the web, IPTV, Inorganic semiconductors, hybrid automobiles, Active suspension technologies, Alternative Energy, Mashups, WiMax, Mobile TV streaming, On-line education, Online peer to peer lending, etc.)
- Other options that tie directly to the course material

Above all else, I want this project to be directly relevant, interesting and beneficial to you. As such, I am prepared to give considerable topic leeway, provided you establish a direct connection to the topics presented by the course in both your proposal and final deliverables. For instance, if you have an idea for a new process or product innovation in a new firm or within an existing entity, and want to use this as an opportunity to explore and further refine it, by all means do so.

There are three deliverables for this project:
a. Short 1-2 page proposal.
b. Written report (approximately 10-12 pages in length) for online students

Grades for on-line students are determined as follows;
- Homework assignments (1-page write-up) 30%
- Midterm exam 40%
- Group project/Individual project 30%
ABOUT THE INSTRUCTOR

Sanjiv Chopra has worked in the technology industry in various Engineering and Management roles for over twenty years. Since 2005, as Entrepreneur-in-Residence in the College of Engineering at the University of Illinois, Chopra has taught two popular courses titled “Technology Innovation and Strategy” and “Venture Funded Startups”. As a “practicing” entrepreneur Chopra provides a balanced understanding of strategic and tactical issues that confront engineers and entrepreneurs in designing and commercializing technology-based products.

Chopra currently serves as a Senior Director of Cloud Business Value an Industry Strategy at Oracle Corporation. In this role he advises potential clients on the business benefits of technology-enabled transformations such as Cloud, Artificial intelligence / Machine learning, block-chain, etc. Chopra has also served in key management roles and advisory board of several venture funded technology startups. From 2006 until 2008, Chopra served as a business development executive for Xelerated, Inc. Xelerated is a Communications Processor company funded by pre-eminent venture capitalists, including Accel Partners, Sweden based A/P Fund. The company is now part of Marvell Technology. From 2001 until January 2006 Chopra served as the Chief Operating Officer of Intersymbol Communications. Intersymbol is a venture-backed technology company developing disruptive, mixed signal integrated circuits for optical communications industry. Intersymbol was acquired by Finisar Corporation (NASDAQ: FNSR) in March 2006. Prior to Intersymbol Chopra was the Vice President of Business Development for CapacityWeb, Inc, a venture backed supply chain software and technology provider. From 1991-1997 he worked in Silicon Valley, California for Integrated Device Technology (NASDAQ: IDTI) designing and developing semiconductor integrated circuits for the personal computer and communications industry. Chopra has also worked as a management consultant at Booz, Allen & Hamilton, a premier management consulting firm.

Chopra holds a B.S. in Electrical Engineering from BIT, India, a Master of Science degree in Electrical Engineering from Iowa State University, and an MBA from Northwestern University, Evanston, IL.
LECTURE TOPICS AND READING LIST FOR ON-LINE STUDENTS

WEEK 1:

COURSE OVERVIEW
READING:

WEEK 2:

DISRUPTIVE INNOVATION
READING:

MANAGING TECHNOLOGICAL TRANSITIONS
READING:

CASE:
Continuous Casting at USX Corporation
WEEK 3:

CROSSING THE CHASM

READING:

CASE:
Documentum, Inc.

WEEK 4:

INTRODUCTION TO STRATEGY

READING:
5. Honda, in a Funk, Tries to Revive the Civic’s Virtues, Wall Street Journal, 2005

PROJECT PROPOSALS DUE:
Due in class: One page proposal for final project and identification of team members.

READING:
Strategy issues in environments of rapid technological change

CASE
Power Play (A): Nintendo in 8-bit Video Games
WEEK 5:

TECHNOLOGY EVOLUTION

READING:
Technology Evolution and Dominant Design
   3. As Hybrid Cars Gain Traction, Industry Battles Over Designs, Wall Street Journal

WEEK 6:

TECHNOLOGY EVOLUTION, CONT.

READING:
S-Curves for component and architectural technologies

CASE:
Hewlett-Packard’s Merced Decision

WEEK 7:

MIDTERM EXAM

WEEK 8:

PROFITING FROM TECHNOLOGY INNOVATION

READING:

CASE:
Abgenix and the Xenomouse
WEEK 9:

LEAD USER RESEARCH

READING:

CASE:
Innovation at 3M Corporation (A)

FINAL PROJECT REPORT
HOMEWORK ASSIGNMENT FOR ONLINE STUDENTS

All online students are required to submit their homework assignment by the due date mentioned below. The homework must be submitted (email to the instructor) in the form of a 1-2 page word or pdf document.

Homework # 1 – Due Week 2
1. Why do most large successful companies lose the ability to enter small emerging markets?

Homework # 2 – Due Week 2
Case - Continuous Casting at USX Corporation
1. Do you think Kappmeyer should sign the proposal, and why?

Homework # 3 – Due Week 3
Case - Documentum, Inc.
1. Should Documentum accept the Marsh and McLennan deal?
2. What is your reaction to Moore’s method of selecting the target market?

Homework # 4 – Due Week 4
1. Why is Operational Effectiveness alone not sufficient to achieve superior profitability?
2. What are the three key elements that drive competitive advantage through strategy?
3. What is the growth trap? What do companies typically do when they are in the growth trap? How can they avoid the growth trap?

Project Proposals Due Week 4

Homework # 5 – Due Week 5
Case - Power Play (A): Nintendo in 8-bit Video Games
1. How was Nintendo able to capture value from the home video game business?

Homework # 6 – Due Week 6
Case - Hewlett-Packard’s Merced Decision
1. Does the market need the Merced chip?
2. What should Jim Davis recommend?

Homework # 7 – Due Week 7
Case - Abgenix and the Xenomouse
1. What should Scott Greer do and why?

Homework # 8 – Due Week 8
Case - Innovation at 3M Corporation (A)
1. How does Lead user research process differ from and complement other traditional market research methods?
2. What are the risks to the new lead user process at 3M?