

2008 Signature Series

SYLLABUS: Technology Development and Management in a Global Environment

INSTRUCTOR: Massoud Amin

DATE: Tuesday, October 21, 2008

Description and Objectives

The learning objectives for this course are to increase understanding of the issues in the development and internationalization of technology and business, examining technology management with a special focus on opportunities in India and China for Minnesota organizations in the international management of technology (MOT).

This class is focused on exploring and understanding implications of **“The World is Flat” for science- and technology-intensive organizations and what that means for individuals, organizations, innovation, R&D, and opportunities for new product/business development.**

The course objectives are:

1. Understanding emergent and accelerated global trends/shifts in energy, education, population/workforce, IP, Medical/Biotech, Information Technologies (IT), Defense, Infrastructure Development, R&D centers and Innovation;
2. Assessing opportunities in the above technological/business sectors (combined with economic, policy and cultural interests/goals);
3. Analyzing opportunities that organizations/companies in Minnesota can lead as new business development or forming global alliances.
4. Expanding your view of the global MOT, investigating and discussing immediate to short/mid-term as well as longer-term collaboration and innovation opportunities in the above areas, along with pros/cons, associated risks, cost/benefit, and strategic/tactical/urgent issues.

Pre-Session Assignment

Please choose a focus area within the technology and business sectors (combined with economic/policy/cultural interests) working individually or together on your selected area:

- 1) Established technology sectors (e.g., information technologies including services, software and hardware, or manufacturing), or
- 2) Emerging sectors (e.g., medical devices/biotech/pharma; aerospace and defense; renewable energy, R&D centers and innovation), etc.

After you select one of these, here are a few questions that will help you frame your ideas as you plan your project. Please consider the following questions and map out your thoughts:

Question 1) The history and context in your organization or in your “business” sector for **technology development and management in global environments**. How has it evolved over time and where are the likely destinations in the next 5-20 years?

Question 2) What are the key processes, models and the whole "system" for this shift: Inputs, outputs, stimuli, dynamics, players and actors, processes, incentives, and control mechanisms (blockers and accelerators)?

Question 3) How does it affect you individually, your organizations, and technology/market sectors?

Question 4) Who is the target audience? Who are your analyses geared to?
The target audience can include the following:

- Companies (large, midsize or small start ups): Global Strategists, CEOs, Sr VPs (for NBD, sales or marketing), CIOs or CTOs, VCs and Entrepreneurs
- Minnesota: Governor Pawlenty and the Minnesota Trade Office (includes policy) and
- Federal: Congressmen and Senators, and U.S. Department of Commerce (includes policy) please include other "stakeholders" as target audience as you see fit.
- Basically “what does all this mean to you and to our organizations in Minnesota?”

Question 5) What is your leadership role?

- Find, highlight and analyze part(s) of the above opportunities that you or your organizations/companies in Minnesota can potentially lead as new business development or forming alliances.

After you have explored the above questions, please complete the “SWOT” analyses table shown below for your selected area and bring it to class (as an example a sample is provided in the table below). To begin with, please adopt this for your selected area, on your own, or form a 3-5 member team to complete this for your chosen area of interest:

	India	China	Minnesota
Strengths	E.g. Cost competitive advantage Highly educated workforce High savings rate offset need for insurance Manufacturing capabilities – labor intensive assembly Mobile workforce enables innovation English speaking, call-center capabilities, collaborative development experience	Low cost Available workforce Access to deep talent, low costs, and vast markets. Growing middle-class market to leverage for localizing products	Strong medical device company base: Medtronic, St. Jude, Boston Scientific Global regulatory expertise Laboratory testing – Beckman Coulter
Weakness	Cost pressures	IP protection	High labor costs

	Job competition with IT sector Intellectual property laws Lack of strong infrastructure		High development costs
Opportunity	Partnership? High Foreign Direct Investment (FDI) can help develop new businesses Medical tourism Acquisition of Minnesota start-ups	Partnerships?	Partnership with Indian/Chinese hospitals and universities Partner with Indian/Chinese medical device companies New health delivery business models

Further Questions:

- What did you learn?
- What surprised you?
- How did you feel?
- What did you think?

Session Schedule

- Internationalization of high technology enterprises, R&D, and technology commercialization trends in the global context
- Regional, Government and institutional factors affecting technological and business development
- Intellectual property policy, law, management and strategy
- Technological products:
 - Historical Events and Technological Change: Continuum of science from IT/cyber to bio and nano
 - Difficult process technologies (can it be reverse engineered?) – can't be duplicated from end product
 - Demographics: Suitable workforce
 - Multiple-use good (usable by everyone)
 - Economic factors, including capital and workforce
 - Rarity, status value, non-perishable, transportable
 - Timelines to get to market, and remain sustained in the market
 - Product is known for decades before widespread use
- Case studies: Information Technology, Energy, biosciences/pharma, IP and other selected areas focused on India and China
- Marketing analyses-- How do the market factors look?
- Infrastructure for power/energy and transportation
- Work force retention and escalating salaries
- Cost factors vs. emphasis on expertise
- Lessons learned, time lines, surprises, threats and opportunities
- Blockers, Accelerators, and the Next Steps: Possible road ahead for innovations in global technology environment

Suggested Readings

- Friedman, Thomas L. *Hot, Flat, and Crowded: Why We Need a Green Revolution--and How It Can Renew America*, Hardcover – Sept. 8, 2008

- Friedman, Thomas L. *The World Is Flat 3.0: A Brief History of the Twenty-first Century*, Paperback - July 24, 2007
- If you have the opportunity to read more, an excellent book on India is "The Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits" by C.K. Prahalad.
- Wharton's school: What's Next for India Beyond the Back Office, along with a few more articles from their website. (<http://www.bcg.com>; <http://knowledge.wharton.upenn.edu>);
- McKinsey Quarterly (PDF file is attached)
- McKinsey presentation:
<http://www.exportminnesota.com/PDFs/The%20Indian%20Economy%20-%20McKinsey.pdf>
- MN Trade Delegation <http://www.exportminnesota.com/minnesota-india.html>

Background

This class is based on two of the courses taught by Prof. Massoud Amin (the Int'l MOT project, MOT 8950, and Science and Technology Policy, MOT 8940). Each year, for the past fourteen years, the MOT international project committee in CDTL explores possible global locations. The committee considers options to meet the planned goals of “developing an international perspective on management of technology and contrasting emerging and established companies, countries, technology, foreign-owned versus local, and government versus private sector, among other factors, in concert with the Center’s mission,” says Prof. Amin.

“It also provides an ability to develop a coherent intellectual structure within this region/country and an understanding of complex issues in the global management of technology.” The international MOT project plays an important role in preparing managers in science and technology-intensive organizations to assume greater leadership responsibilities in the global market and it lays a foundation for students to tap throughout their careers. “It gives them an important perspective on the management of technology,” says Dr. Amin. “It helps them in a systematic and integrated manner to see and investigate the impact of a strategic global vision.”

In recent years, we have shared executive summaries of the above, lessons learned and our findings with the Minnesota Trade Office, Gov. Tim Pawlenty, and pertinent organizations in our international host nations and in Minnesota.

In preparation for the Governor’s and Minnesota delegation’s trip to India in October 2007, Mr. Tony Lorusso, executive director of the Minnesota Trade Office, also attended the executive presentations in May 2007, and in May 2008 Commissioner Gopal Khanna, chief information officer for the state of Minnesota, participated in the final executive debriefing on behalf of Governor Tim Pawlenty. The state of Minnesota is establishing partnerships in four key trade initiatives: food processing and distribution, IT, medical technology, and renewable energy.

About the Instructor

Dr. Massoud Amin, Professor of Electrical and Computer Engineering, holds the Honeywell/Harold W. Sweatt Chair in Technological Leadership, and is the Director of the Center for the Development of Technological Leadership (CDTL) at the University of Minnesota in Twin Cities. In addition to his administrative and research responsibilities, he serves as the director of graduate studies for the management of technology (MOT) program and teaches several courses including 8224 (Pivotal & Emerging Technologies), MOT 8920 (Science & Technology Policy), MOT 8940 (Intellectual Property Valuation & Strategy), MOT 8950 (International MOT Project), MOT8234 (Capstone Project), and ISE 5302 (Critical Infrastructure Security and Protection).

His research focuses on two areas: 1) Global transition dynamics to enhance resilience, agility, security and efficiency of complex dynamic systems. These systems include national critical infrastructures for interdependent energy, computer networks, communications, transportation and economic systems. 2) Technology scanning, mapping, and valuation to identify new science and technology-based opportunities that meet the needs and aspirations of today's consumers, companies and the broader society. This thrust builds coherence between short- and longer-term R&D opportunities and their potential impact.

Prior to joining the University of Minnesota in March 2003, Dr. Amin held positions of increased responsibility including Area Manager of Infrastructure Security, Grid Operations/Planning, Markets, Risk and Policy Assessment at the Electric Power Research Institute (EPRI) in Palo Alto, California. In the aftermath of tragic events of 9/11 he directed all security-related research and development at EPRI. Prior to October 2001, he served as manager of mathematics and information science at EPRI, where he led strategic R&D in modeling, simulation, optimization, and control of national infrastructures for energy, telecommunication, transportation, and finance. Dr. Amin pioneered R&D into smart electric power grids, coined the term 'self-healing grid' and led the development of more than 24 advanced technologies transferred to the industry.

Dr. Amin is the author or co-author of more than 150 research papers and the editor of seven collections of manuscripts, and serves on the editorial boards of six academic journals. At Washington University, students voted him three times Professor of the Year (voted annually by seniors in the School of Engineering and Applied Science at Washington University, 1992-1995), Mentor-of-The-Year (Assoc. of Graduate Engineering Students, Feb. 1996), and the Leadership Award (voted by the senior engineering class, May 1995). At EPRI he received several awards including the 2002 President's Award for the Infrastructure Security Initiative, 2000 and 2002 Chauncey Awards (the highest annual EPRI Award, in March 2001 and 2003), and six EPRI Performance Recognition Awards during 1999-2002 for leadership in three areas.

He is a member several boards including the Board on Infrastructure and the Constructed Environment (BICE) at the U.S. National Academy of Engineering, Board on Mathematical Sciences and Applications (BMSA) at the National Academy of Sciences, and is a member of Sigma Xi, Tau Beta Pi, Eta Kappa Nu, and NY Academy of Sciences. Dr. Amin holds B.S. (cum laude) and M.S. degrees in electrical and computer engineering from the University of Massachusetts-Amherst, and M.S. and D.Sc. degrees in systems science and mathematics from Washington University in St. Louis, Missouri. For more information please see <http://umn.edu/~amin>.