Technology Roadmapping

Day One

Lecture #1

Technology Roadmapping

New Offering!

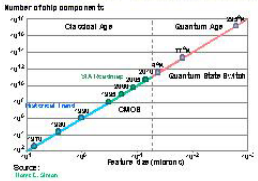
15.795

Professor Charlie Fine :

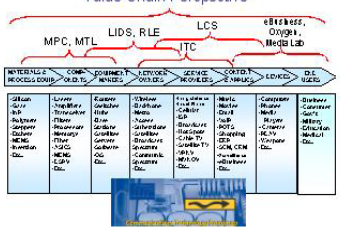
Summary – *Technology Roadmapping* is a 9 unit Fall Semester 2002 Masters Research Seminar on exploring long-term industry dynamics of emerging technologies.

Students perform original work crafting or enhancing a Roadmap in a technology-business domain of their choice. Thesis & Special Project opportunities are offered & encouraged.

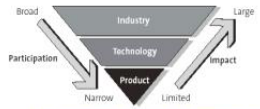
Semiconductor Industry Example:
Moore's Law as a Guiding Hypothesis



Communications Industry Example:
Value Chain Perspective



Potential MIT Technology Roadmap Domains – *Nanotechnology, BioInformatics, Medical Devices, OrganoElectronics, MEMS, MicroPhotonics, Geno/Proteino/Celleomics, NeuroMedical Imaging, Neurotechnology, Penny Diagnostics…*



Source: "Technology Planing for Business Competitiveness"
Commonwealth of Australia, August 2001
http://www.industry.gov.au/library/content_library/13_Technology_Road_Mapping.pdf

Elements of the MIT Technology Roadmapping Initiative –

- ***Business Cycle Dynamics*** – e.g. systems dynamics-like models of the bullwhip effect
- ***Industry Structure Dynamics*** – e.g. the double helix in Clockspeed
- ***Corporate Strategy Dynamics*** – e.g. S-curves & dynamic analyses of players in the value chain
- ***Technology Dynamics*** – e.g. the Semiconductor Industry Association's roadmap built around Moore's law
- ***Regulatory Policy Dynamics*** – e.g. Cross-National, Cross-Sector

Seminar Description – This seminar will explore the purposes and development of Technology Roadmaps for systematically mapping out possible development paths for various technological domains and the industries that build on them.

Data of importance for such Roadmaps include rates of innovation, key bottle-necks, physical limitations, improvement trendlines, corporate intent, and value chain and industry evolutionary paths.

The course will build on ongoing work on the MIT Communications Technology Roadmap project, and begin exploring other domains as well.

Enrollment & Expectations – Open to truly dedicated students who commit to *active attendance, the readings, the necessary independent research, & crafting a high-quality Technology Roadmap in your technology domain of choice.*

15.795 Technology Roadmapping

(A Sloan Research Seminar)

Professor Charlie Fine
Fall 2002

This ***seminar*** will explore the purposes and development of Technology Roadmaps for ***systematically mapping out possible development paths for various technological domains and the industries*** that build on them. Data of importance for such roadmaps include rates of innovation, key bottlenecks, physical limitations, improvement trendlines, corporate intent, and ***value chain and industry evolutionary paths***. The course will build on ongoing work on the MIT Communications Technology Roadmap project, but will explore other domains selected from Nanotechnology, Bio-informatics, Geno/Proteino/Celleomics, Neurotechnology, Imaging & Diagnostics, etc. Thesis and Special Project opportunities will be offered.

TRM Class Goals

- Collaborative efforts among 1-3 students, MIT researchers, & Industry Sponsors
- Across MIT research areas
- Cross Industry Benchmarking
- Partnered with Industrial Sponsors
- Covering Technology AND Business Dynamics
- Attract students passionate about technology sector, however broadly or narrowly defined
- Committed to producing coherent & complete Tech Roadmap (Draft 1.0) during Fall Semester

High TRM Student Expectations

- Serious commitment of time & interest
- Literature review & substantial interviews
- Attend talks & seminar series in that tech sector, that's part of the course
  - E.g. http://web.mit.edu/mphotonics/www/sem-series.shtml
- Data gathering & presentation smithing
- Crafting a draft PPT & DOC by semesters end

Engaging Masters Students in MIT Sloan Research Agendae

- Business school disconnect
- Unfortunate and sub-optimal
- We’re prototyping a new path
- Help show that it works!

Stone Soup analogy

no free riders

Clockspeed as touchstone

value chain dynamics

Roadmap as a verb:
to do collaborative planning

Seriously

- If you're not really serious, free up a slot
- We want this to be a top priority
- The seminar ought to BOTH advance your professional interests AND appeal to our shared roadmapping vision

Seminars & Conferences

- Part of your 9 units is required attendance of relevant technology seminars throughout MIT.
- Find them through http://web.mit.edu Google & so forth. Plus Word-of-Mouth.
- Ask us for suggestions, etc.
- http://web.mit.edu/mphotonics/www/sem-series.shtml

Grading

- 20% based on class participation & attendance,
- 15% on progress report presentations & documentation,
- 45% on the quality & content of the final TRM presentation & documentation,
- 5% for adding novel reference material to our library of links and TRM documentation, and
- 15% discretionary for demonstrably helping classmates improve their roadmapping abilities, sharing lessons-learned, and generally going “above & beyond.”

TRM Syllabus

	Date	Topic	Speaker	Status	Assignment
1	6-Sep	Introduction	Fine	Confirmed	Student email top 3-5 tech sectors of interest & mini-bio
2	13-Sep	TeleCom'n Roadmap	Fine	Confirmed	Luncheon after for mixing
3	20-Sep	Student Presentations	--	--	Students present MiniMaps
4	27-Sep	OPEN	TBD		--
5	4-Oct	Neuro/Medical Imaging	Rosen, Sorenson	confirmed	--
6	11-Oct	Sloan 50th Panel	Brown, Brooks, Lundquist, et al	Confirmed	--
7	18-Oct	CO2 Sequestration / Environmental	Jacoby, Herzog, McFarland	Invited	--
8	25-Oct	MEMS Devices & Economics of Manufacturing	Schmidt	Confirmed	Updates
9	1-Nov	Student Presentations			--
10	8-Nov	Conference	TBD	In Process	Participating in Telecom TRM Conference
11	18-Nov	Aerospace	Bozdogan	Inviting	--
12	22-Nov	Biological Engineering	Lauffenberger	confirmed	--
--	29-Nov	THANKSGIVING	--	--	--
13	6-Dec	Student Presentations	--	--	Complete TRM Finale!
	13-Dec	POST CLASSES?	?	?	?

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TRM Team Formation Process

- Active promotion & recruitment by us
- Ask all students to specify top 3-5 technology sectors of great(est) interest in rank order plus a relevant mini-bio in Week 1
- Some kind of informal luncheon in Week 2
- MiniMap proto-project in the Week 3 to help ID student collaborators; also gives us fast feedback

Teams

- You choose to team up
- We will do our best to introduce, prompt, connect, and so forth
- This is management school; solve your own team problems

MiniMap Project

- Pick an emerging technology theme
- Do a quick’n’dirty search for key historical data and research viz that topic
- 5-10 PPT slide presentation Due in Week 3

Semester Finale

- One to Two full-days foci, at end of semester?
- All teams present
- Draft compendium assembling the most compelling Tech Roadmaps

Potential TRM Academia Speakers

(and Labs to Engage)

- Bob Brown & Alice Gast, MIT's Research Directors
- Ned Thomas, Soldier Nanotech
  - http://web.mit.edu/newsoffice/nr/2002/isnqa.html
- Marty Schmidt, MTL / MEMS
  - http://www-mtl.mit.edu/mtlhome/
- Bruce Rosen, Martinos / NeuroMRI
  - http://hst.mit.edu/martinos/
- Eric Lander, Whitehead / Genomics
  - http://www.wi.mit.edu/news/genome/lander.html
- Bob Langer, Biomaterials, Drug Delivery
  - http://web.mit.edu/cheme/langerlab/langer.html
- Victor Zue & Rod Brooks, LCS/AI Labs, Project Oxygen
  - http://www.lcs.mit.edu/ & http://www.ai.mit.edu/ & http://oxygen.lcs.mit.edu/
- Doug Lauffenberger, Biological Engineering
  - http://web.mit.edu/be/
- E. Sachs, 3D Printing
  - http://web.mit.edu/tdp/www/
- Neil Gershenfeld, Media Lab / Ctr Bits & Atoms
  - http://cba.mit.edu/
- Tom Knight, AI Lab / Computation & Biology
  - http://www.ai.mit.edu/people/tk/tk.html

Other Labs? http://web.mit.edu/research.html &
http://web.media.mit.edu/~davet/notes/emerging-tech-mit.html

Sample Reading: Semiconductor Roadmap

- http://public.itrs.net/Files/2001ITRS/ExecSum.pdf

Adding Links

- Send us ANYTHING that might be of common interest and mutual benefit
- Helping educate one another is basic responsibility