Introduction to the course
Michael A M Davies
Agenda for today

~13:00  • Brief introduction to the course
      – introductions
      – objectives
      – overview

~13:15  • E Ink
      – 1998: initial challenges for Jim Iuliano
      – 1999: money and partners
      – …

~14:15  • Brief summary of learnings from the case
Michael A M Davies

- From New Zealand, educated in the UK, lived in US >10 years
- 2 Masters in Engineering

- ~20 years ago, got very interested in how high-tech businesses make strategic decisions
- ...did an MBA at London Business School

- Worked in industry
- Founded (and sold) consulting business that works for tech businesses

- Recently working closely with faculty from MIT Sloan (and elsewhere)
- ...and teach New Technology Ventures, consult, and start-up CTO
E384: New Technology Ventures

- Joint program with University College London, largest science and technology university in the United Kingdom
- Participants from science, technology and business
  - PhD’s, post-Doc’s and Professors
  - MBAs
  - Sloan Fellows
- Core element is a group project to evaluate the commercial potential of a real-world technology:
  - automatic visualization of emotional content of music
  - np-problem application to business
  - plastic semiconductors
  - smart sensing technologies applied to elite athletes
  - stem cells for better breast enhancement
Winning technology for horses

- Top equine athletes are very valuable, very fragile and can’t communicate
- High precision, high speed real-world, real-time measurements using multiple sensors on horse and rider
- Relentless focus on ease of use
- Modular and flexible
- Development with lead users: Colorado State University and the Royal Veterinary College
- Outsourcing much R&D - virtual development organization
- Control architecture, RF, core algorithms and user experience
Technology

noun

1. electronic or digital products and systems considered as a group
2. a technological process, invention, method or the like
3. the practical application of science to commerce or industry
4. the branch of knowledge that deals with the creation and use of technical means and their interrelation with life, society and the environment
5. the sum of the ways in which social groups provide themselves with the material objects of their civilization

3: WordNet®, © 2005 Princeton University
Strategy

noun

1. a plan, method or series of maneuvers or strategems for obtaining a specific goal or result\(^1\)
2. the science and art of military command as applied to the overall planning and conduct of large-scale combat operations\(^2\)
3. the art or skill of using strategems in endeavors such as politics and business\(^2\)

---

This course provides a framework for the strategic management of technology businesses.

**Technology businesses**
- Complex
- Dynamic - and unstable
- Uncertain
- Co-evolution of technological innovation, demand opportunities and business ecosystems
- Value creation and value capture

**This course**
- Ways of thinking
- Mental models
- Bring clarity to complexity
- Insights and anticipation
- Better decisions
- Improve (significantly) the odds of success
It uses both cases and presentations, focused on domains in which systems are important

- Products part of larger and more complex systems
  - Apple iPod

- Products are comprised of multiple (sub-)systems
  - iTunes

- Computing
  - Communications
    - mobile
    - IP
  - Consumer electronics
  - Industrial networking
  - Automotive
  - Aerospace

- not so much biotech or pharmaceuticals
Guidelines and grades, deliverables and deadlines

• **Be ready to start on time**
• **Please sit in the same seats**
• **Do not disrupt the class**
  – **cellphones off**
  – **no laptops**

• Read and review the cases so that you can participate
• Read and review the readings, so that you can generate insight
• Group work is not just acceptable, but encouraged

• **30%** for class participation
  – quality not quantity
• **30%** for 4 short papers
  – first one due Lec #5

• **40%** for final paper
  – in groups of three to five people
  – ideas on Lec #12
  – **due Lec # 24**

• Marks for late papers reduced by a sliding scale
E Ink (1)

- What are the key characteristics of electrophoretic displays?
- What implications do the novel characteristics of electrophoretic displays have for the systems of which they are a component?
- What are your views on E Ink's approach to commercializing the technology?
E Ink (2)

• Which of the possible applications for electrophoretic displays do YOU think E Ink should be targeting?
• How do you think E Ink should prioritize and sequence the demand opportunities that it decides to pursue?
• In particular, it is targeting a small niche initially - is this the right thing to do, and is this the right niche?
15.965 Technology & Strategy

E Ink outcome, and thoughts on Technology & Strategy
Michael A M Davies
Lessons from E Ink

- Which parameters characterize the technology
- Consider all competing technologies, including incumbent technologies
- Look at the complete system
- Timing is critical: commercialization always take longer than expected
- Is an opportunity is a step towards your destination, or a fork in the road, diverting time and resources
- Recognize and consider very carefully your dependence upon partners, and on their commercial success
E Ink beyond 2005

- Lexar uses eInk in its JumpDrive
- Sony announces and then launches its Portable Reader System
- Motorola uses a **segmented** eInk display for its low cost Motofone
  - great standby time
  - outside viewable

Amazon Kindle

- Connected e-book reader, using Whispernet (Sprint)
- Proprietary format
- >88,000 digital titles
- Sold out fast
Polymer Vision Readius

• Primarily an e-book reader
• Can be rolled up
• Also a mobile phone
The process of theory-building

Theory is a statement of what causes what, and why.

Observe, describe & measure the phenomena

Categorization

Inductive process

Deductive process

The lenses of other disciplines

Predict

Confirm

Nested research designs: the phenomena within the phenomena

Anomaly

Clayton Christensen and Michael Raynor,
“Why Hard-Nosed Executives Should Care About Management Theory”,

Image by MIT OpenCourseWare.
Theory

noun

1. a belief or principle that guides action or assists comprehension or judgment
2. a set of statements or principles devised to explain a group of facts or phenomena, especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena
3. a well-substantiated explanation of some aspect of the natural world; an organized system of accepted knowledge that applies in a variety of circumstances to explain a specific set of phenomena

2: WordNet®, © 2005 Princeton University
Technology

noun

1. electronic or digital products and systems considered as a group
2. a technological process, invention, method or the like
3. the practical application of science to commerce or industry
4. the branch of knowledge that deals with the creation and use of technical means and their interrelation with life, society and the environment
5. the sum of the ways in which social groups provide themselves with the material objects of their civilization

3: WordNet®, © 2005 Princeton University
Strategy

noun

1. a plan, method or series of maneuvers or strategems for obtaining a specific goal or result

2. the science and art of military command as applied to the overall planning and conduct of large-scale combat operations

3. the art or skill of using strategems in endeavors such as politics and business

Domain

*noun*

1. a knowledge domain that you are interested in or communicating about\(^1\)
2. a field of action, thought or influence\(^2\)
3. a realm or range of personal knowledge, responsibility and so on\(^2\)
4. a sphere of activity, concern or function; a field\(^3\)

---

1: WordNet®, © 2005 Princeton University
What is business strategy?

• Pursuing choices amongst competing options
  – a different system of activities that creates unique value and captures it
  – not operational effectiveness or improvement
• Planned and intended, pursued and realized
  – deliberate
  – emergent
• Pattern recognition
  – building the prepared mind
  – capable of making sound decisions

15.965 Technology & Strategy

Why is technology (really, really) important?

- Technological innovation drives economic growth
  - why we can be here today
  - why we no longer live in caves
  - escaping the Malthusian trap
  - explaining how economies grow

- Get it wrong - waste a lot of money and people’s lives

- Get it right - create (a lot of) wealth, capture (some of) it - and have fun
And knowledge and technological innovation are now recognized as the engines driving growth

- “Output per hour worked in the United States [in 1990] is 10 times a valuable as output per hour worked 100 years ago.”
- “Technological change - improvement in the instructions for mixing together raw materials - lies at the heart of economic growth”
- “Technological change arises in large part because of intentional actions taken by people who respond to market incentives.”
- “[I]nstructions for working with raw materials are inherently different from other economic goods. Once the cost of creating a new set of instructions has been incurred, the instructions can be used over and over again at no additional cost.”

Technology & Strategy (very often) determines who survives and thrives

- IBM (mainframe computers)
- Sun Microsystems
- Matsushita, and many others (VHS)
- Sony (transistor radios)
- Nikon (in semiconductor capital equipment)
- Canon (in photocopiers)
- Canon, Nikon and others
- Nokia
- DEC, Wang, Unisys and many others
- Apollo Computer and others
- Sony (Betamax)
- RCA
- Cobilt, Canon, Perkin-Elmer and GCA
- Xerox
- Polaroid and Kodak
- Motorola
Nine key concepts

1. Technological infrastructure, technologies, innovation, parameters and trajectories
2. Demand opportunity, adoption and diffusion
3. Business ecosystems, niches and co-opetition
4. Co-evolution, life-cycles, epochs and transitions
5. Value creation, value capture and inimitability
6. Systems, architecture, modules, interfaces, standards, platforms, portfolios and pipelines
7. Activities, tasks, competences and capabilities
8. Ambiguity and scenarios, uncertainty and real options
9. Simple rules, prepared mind, active waiting
# A roadmap for the course

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Patterns of change</td>
<td>Capturing Value</td>
<td>Deciding and Delivering</td>
</tr>
</tbody>
</table>

## A. Introduction
- Demand opportunity
  - Business ecosystems, niches and co-opetition
  - Technological infrastructure

## B. Patterns of change
- Co-evolution, life-cycles, epochs and transitions

## C. Capturing Value
- Value creation, value capture and inimitability

## D. Deciding and Delivering
- Ambiguity and scenarios, uncertainty and real options