



15.965 Technology & Strategy

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Introduction to the course

Michael A M Davies



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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



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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 group¹
2. a technological process, invention, method or the like²
3. the practical application of science to commerce or industry³
4. the branch of knowledge that deals with the creation and use of technical means and their interrelation with life, society and the environment²
5. the sum of the ways in which social groups provide themselves with the material objects of their civilization

1: American Heritage® Dictionary, © 2000 Houghton Mifflin

2: Random House Unabridged Dictionary, © Random House Inc. 2006

3: WordNet®, © 2005 Princeton University





Strategy

noun

1. a plan, method or series of maneuvers or strategems for obtaining a specific goal or result¹
2. the science and art of military command as applied to the overall planning and conduct of large-scale combat operations²
3. the art or skill of using strategems in endeavors such as politics and business²

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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



iTunes

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

- not so much biotech or pharmaceuticals

- Products are comprised of multiple (sub-)systems





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?



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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 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

Lexar
JumpDrive®
Mercury

Sony®
Portable Reader System
PRS-500

CONNECT
eBooks downloads powered by Sony
www.connect.com

MOTOFONE

http://www.boston.com/business/technology/articles/2007/03/28/e_paper_comes_of_age/





Amazon Kindle

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



Polymer Vision Radius

- Primarily an e-book reader
- Can be rolled up
- Also a mobile phone

The process of *theory*-building

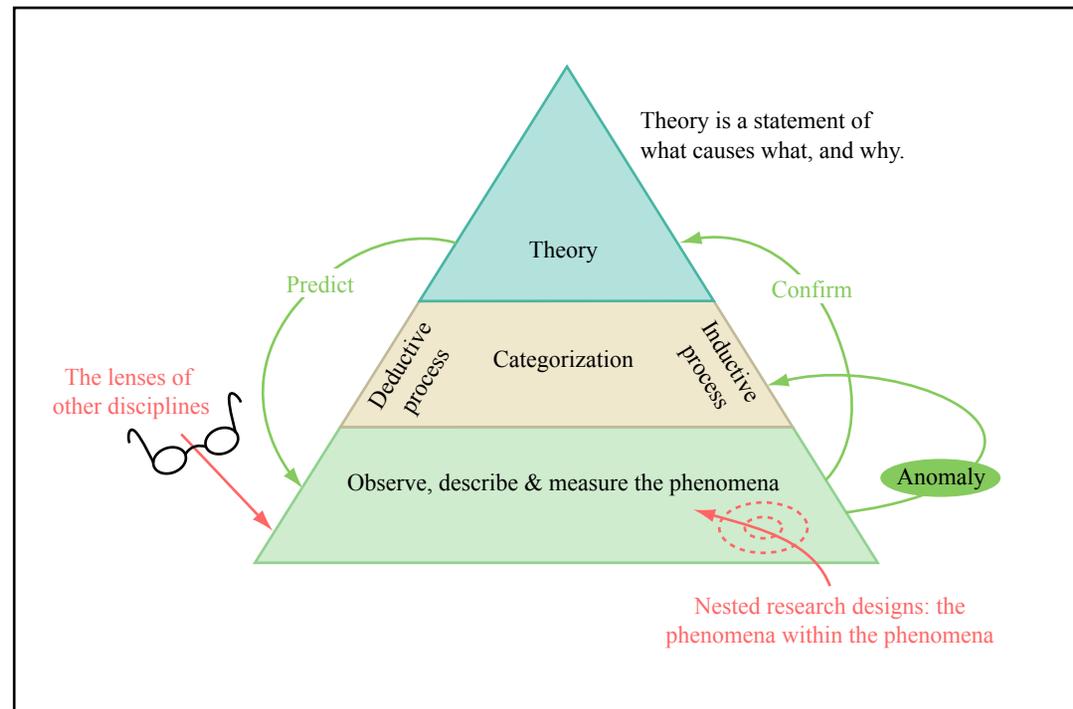


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Clayton Christensen and Michael Raynor,
"Why Hard-Nosed Executives Should Care About Management Theory",
Harvard Business Review, September 2003, pages 66-74



Theory

noun

1. a belief or principle that guides action or assists comprehension or judgment¹
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 phenomena¹
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

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2: WordNet®, © 2005 Princeton University





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Domain

noun

1. a knowledge domain that you are interested in or communicating about¹
2. a field of action, thought or influence²
3. a realm or range of personal knowledge, responsibility and so on²
4. a sphere of activity, concern or function; a field³

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2: Random House Unabridged Dictionary, © Random House Inc. 2006

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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

Michael Porter, “What is Strategy”, Harvard Business Review, November-December 1996, pages 61-78

Henry Mintzberg, “Crafting Strategy”, July-August 1987, pages 66-74

Sarah Kaplan, “The Real Value of Strategic Planning”, MIT Sloan Management Review, Winter 2003, pages 71-76





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 as 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.”*

Paul Romer, “Endogenous Technological Change”, The Journal of Political Economy, October 1990, pages S71-S102

Paul Romer, “Increasing Returns and Long-Run-Growth”, The Journal of Political Economy, 1986, pages 1002-1037



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

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
<u>Introduction</u>	<u>Patterns of change</u>	<u>Capturing Value</u>	<u>Deciding and Delivering</u>

Demand opportunity

Business ecosystems, niches and co-opetition

Co-evolution, life-cycles, epochs and transitions

Value creation, value capture and inimitability

Ambiguity and scenarios, uncertainty and real options

Technological infrastructure



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