ELEC 694
COMP 694

Disruptive Technologies

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1/16/2013

Events of the Week

- Windows 8 PCs, Tablets Take CES by Storm
- Microsoft Exec Defends Windows 8 Sales Pace
- HP Tops Lenovo in Lackluster PC Market
- Microsoft's Surface Pro Tablet Changes the Game
- Intel Hits CES Stage With Atom, Core Chips for Mobile Devices
- Nvidia Shows Off Tegra 4 Mobile Chip at CES
- AT&T Offers U-verse Customers $5 Unlimited Movies
- T-Mobile Offers Unlimited 4G Data Plan With No Contract
- Is your refrigerator running -- on Android?
- Apple slashing iPhone 5 component orders
- Homeland Security warns to disable Java amid zero-day flaw
- Facebook takes on Google with Graph Search
- Official: 2014 Cadillac ELR is making green sexy in Detroit
- 2014 Chevrolet Corvette Stingray: Everything there is to know

Next Week's Mini-Discussion

- Some weeks, we will have a short group discussion on a topic rather than Events of the Week.
- Purpose is an exercise in thinking beyond the top level issues of a topic.
- I expect roughly 30 minutes of research and thought

- Our first mini-discussion will be next week:

Intel vs. Nvidia.

How much trouble is Intel facing now and in the near future?

Current Roster

- Ryan Artecona

- Jianbo Chen

- Rob Bauer

- Ahmed Haque

- Enoch Chang

- Zhiyong Tan

Learning a New Topic

- It is often daunting to learn a new topic.
- Get a broad overview of the new topic
  - Be careful not to get vested into one area until you have a broader perspective. It is very easy to be influenced by the first things you read.
- The next step is to Prune and Focus
- Gain depth on the area of focus
  - Go back to previous step if things don't progress as you had hoped.
- Start formulating your conclusions
- Organize your talk to support your conclusions and prune elements that do not add to the conclusion
  - Practice your talk in front of a friend

Seminar Preparation Meetings

- 6 one-on-one preparation meetings prior to seminar.
  - First meeting five weeks before seminar to discuss general area and potential readings. (~15 minutes)
  - Second meeting, four weeks before seminar, reviews outline of presentation (~1 hour)
    - PowerPoint outline with slide titles and no content
  - Third meeting, three weeks before seminar reviews a first draft of presentation (~1 hour)
    - Draft contains some content, < 50% complete
    - Solid flow of topic presentation
  - Fourth meeting, two weeks before seminar reviews a first draft of presentation (~1 hour)
    - Draft contains significant content, 90% complete
    - Strong conclusion fully supported by body of presentation
  - Fifth meeting, one week before seminar reviews final draft of presentation. (~1 hour)
    - Completed presentation
  - Sixth meeting, communications review scheduled for Friday prior to presentation with Dr. Tracy Volz (~1.5 hours)

Logistics

- **Typical technology seminar format**
  - 0:25 status update and current topics
  - 0:45 presentation on technology including discussion
  - 0:05 preview of next topic and selected papers to read
  - 0:15 often used for initial 15 minute meeting
- Office hours: DH 2063, typically on Wednesday with some Tuesday or Thursday sessions as needed.
- Website: http://www.ece.rice.edu/Courses/694.html
- Email: Cutler@rice.edu
- Phone:281-364-0210 (or Rice office 713 348-2526)

Candidate Topics – Spring 2013

- Advanced Computer Inputs – Kinect, Touch Screens
- ARM vs. x86 for mainstream usage and/or Intel vs. NVIDIA
- Automotive Electronics beyond the engine including GPS, XM audio, XM data, cellular data
- Cloud Computing
- ~~Consumer Medical Devices / Electronic Medical Records (consumer)~~
- Digital Living Room - AirPlay and dLNA, networked receivers
- ~~HTML 5~~
- ~~Identity theft / phishing~~
- Intellectual Property, patent trolls, law suits, DRM for movies / TV ad revenue model
- ~~Internet of things, Embedded cellular data modems, Ultra low powered computing~~
- ~~Internet Video / Netflix / Google TV, Apple TV, repurposed game machines~~
- Main Stream Processors and Chipsets / Parallel, multi-core technology for consumer uses
- NFC and Mobile Payments
- Shared Metered 4G LTE Data Plans
- Social Media – specifically Facebook long term or quick rise/fall or Twitter business model
- ~~Storage – SATA, Solid State Drives, Flash, RAID, Backup, disk in the clouds~~
- Voice Recognition Assistants
- Windows 8 / 8RT

Schedule for Spring 2013

- **01/09/13** **Introduction and Accelerating Technology***(Cutler)*
- **01/16/13** **Disruptive Technologies** *(Cutler)*
- **01/23/13** **Creating and Delivering Great Presentations** *(Volz)*
- **01/30/13** **Consumer Medical Electronics** *(Ahmed Haque)*
- **02/06/13** **Identity Theft / Phishing** *(Enoch Chang)*
- **02/13/13** **Internet of Things** *(Ryan Artecona)*
- **02/20/13** **Storage** *(Jianbo Chen)*
- 02/27/13 *No Class - Rice midterm recess*
- **03/06/13** **HTML 5** *(Zhiyong Tan)*
- **03/13/13** **Internet Video** *(Rob Bauer)*
- **03/20/13** **TBD** *()*
- **03/27/13** **Topics Not Chosen** *()*
- **04/03/13** **Ecosystem Group Discussion** *(All)*
- **04/10/13** **Prep for Final Projects** *(All)*
- **04/17/13** **Final Projects - Final Papers Due** *(All)*
- 04/21/13? Possible Optional Off-site (a.k.a. end of semester party)

Preparation Schedule

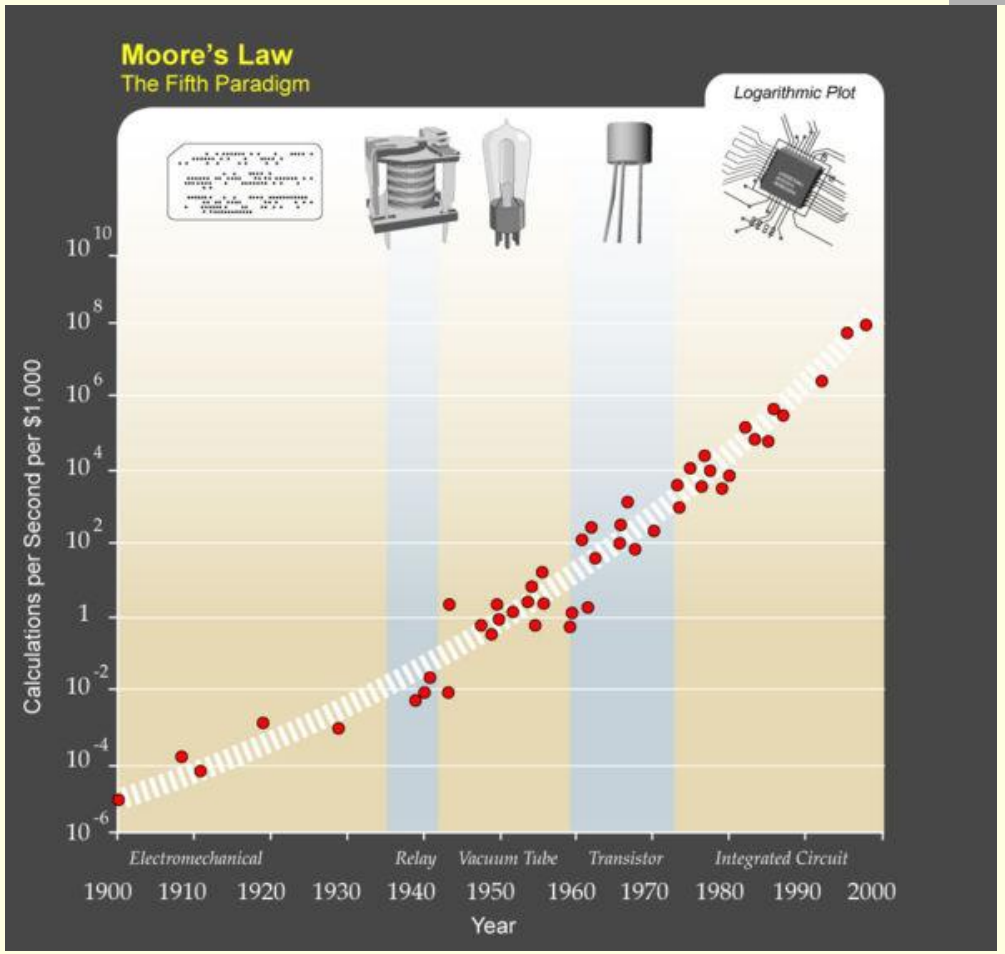
Date	Class	Topic#	Topic Name	Presenter	Preparation Meetings					
					Volz	Final Draft	2nd Draft	1st Draft	Outline	Initial
12/26/2012										Haque
1/2/2013									Haque	Chang
1/9/2013	1		Introduction and Technology Acceleration	Cutler				Haque	Chang	Artecona
1/16/2013	2		Disruptive Technologies	Cutler			Haque	Chang	Artecona	Chen
1/23/2013	3		Creating and Giving Great Presentations	Volz	Haque	Haque	Chang	Artecona	Chen	Tan
1/30/2013	4	1	Consumer Medical Devices	Haque	Chang	Chang	Artecona	Chen	Tan	Bauer
2/6/2013	5	2	Identity Theft / Phishing	Chang	Artecona	Artecona	Chen	Tan	Bauer	
2/13/2013	6	3	Internet of Things	Artecona	Chen	Chen	Tan	Bauer		
2/20/2013	7	4	Storage	Chen	Tan	Tan	Bauer			
2/27/2013										
3/6/2013	8	5	HTML 5	Tan	Bauer	Bauer				
3/13/2013	9	6	Internet Video	Bauer						
3/20/2013	10		TBD							
3/27/2013	11		Topics Not Chosen	Cutler						
4/3/2013	12		Group Discussion	All						
4/10/2013	13		Prep for Group Projects	All						
4/17/2013	14		Final Group Projects	All						
4/21/2013			Tentative date for Off-Site (Optional)							

The Law of Accelerating Returns

The Law of Accelerating Returns

- Great Paper by Ray Kurzweil
- http://www.kurzweilai.net/articles/art0134.html?printable=1
- Rate of technology change is accelerating
  - Will achieve 100 years of "2000" technology progress in 25 years.
- Moore's law (doubling transistor count of IC's every 24 months) has lasted 60 years
  - Continuing, but will flatten (transistors a few atoms wide by 2019)
  - Was the 5th, not 1st technology wave
  - Likely to be replaced by 6th wave via paradigm shift

Moore's Law was the 5th Paradigm to Provide Exponential Growth of Computing



Kurzweil Computer Brain Calculations

- Human brain
  - 100 billion neurons
  - Averaging 1,000 connections/neuron
  - 200 calculations / sec / neuron
  - Human Brain Capability $2*10^{16th}$ CPS
- Achieve 1 Human Brain Capability
  - For $1,000 in 2023
  - For $0.01 in 2037
- Achieve 1 Human Race Capability $2*10^{26th}$ CPS
  - For $1,000 in 2049
  - For $0.01 in 2059

Disruptive Technologies

Original Dow Jones Industrial Average

- American Cotton Oil
- American Sugar
- American Tobacco
- Chicago Gas
- Distilling & Cattle Feeding
- General Electric
- Laclede Gas
- National Lead
- North American
- Tennessee Coal & Iron
- U.S. Leather (preferred)
- U.S. Rubber

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Companies for which I have worked

- General Electric

- Tandy Electronics

- Chips and Technologies

- Digital Equipment Corporation

- Compaq Computers

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- General Electric

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- Chips and Technologies

- Digital Equipment Corporation

- Compaq Computers

Unstoppable Brands No Longer Around

- Spreadsheets
  - VisiCalc
  - Lotus 123
- Airlines
  - TWA
  - Eastern
  - Pan Am
- Financial
  - PaineWebber
  - EF Hutton
  - Arthur Andersen
- Others
  - Merry-Go-Round
  - MCI WorldCom
  - Enron
  - Woolworths
  - Standard Oil
  - The Pullman Co.
  - General Foods
  - Compaq Computers

Disruptive Technologies

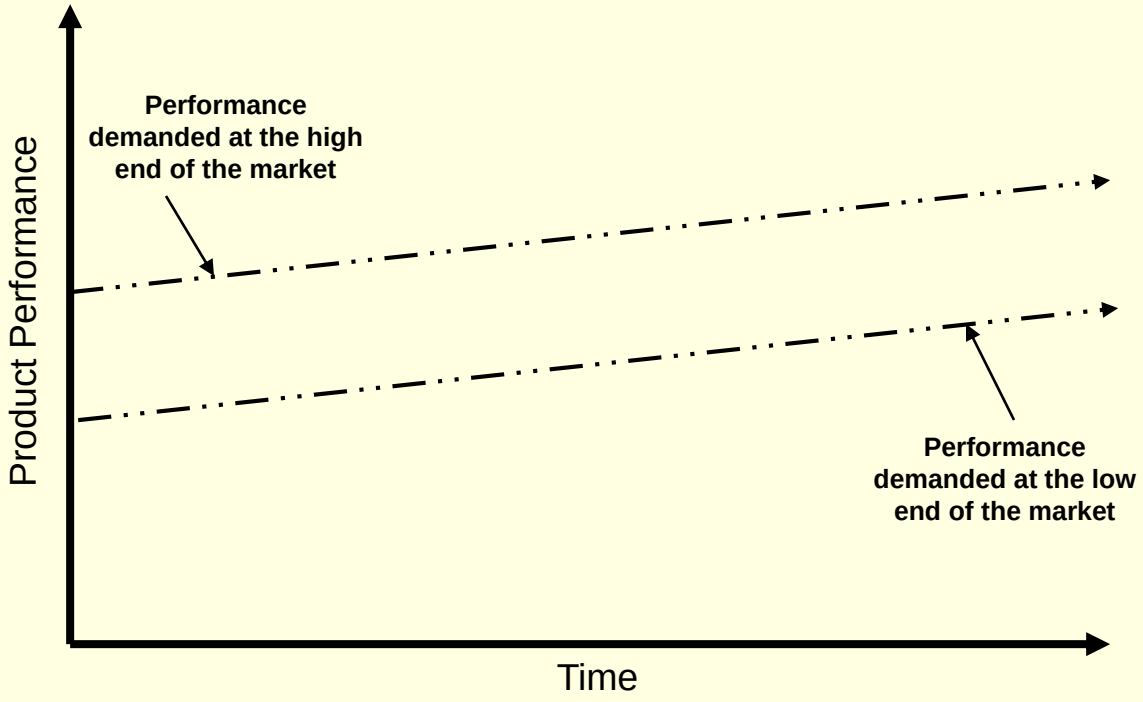
- The Innovator's Dilemma: *When New Technologies Cause Great Firms to Fail*
  - Great book by Harvard Professor Clayton M. Christensen
  - Large part of it available on books.google.com
  - Wikipedia Article (http://en.wikipedia.org/wiki/Disruptive_technology)
  - Excellent Stanford Lecture video

Pathways for Disruptive Technologies

- Companies depend on customers and investors for resources
- Small markets don’t solve the growth needs of large companies
- Markets that don’t exist can’t be analyzed
- Technology supply may not equal market demand

Source: Christensen - ***The Innovator’s Dilemma***

Impact of Sustaining and Disruptive Technological Change



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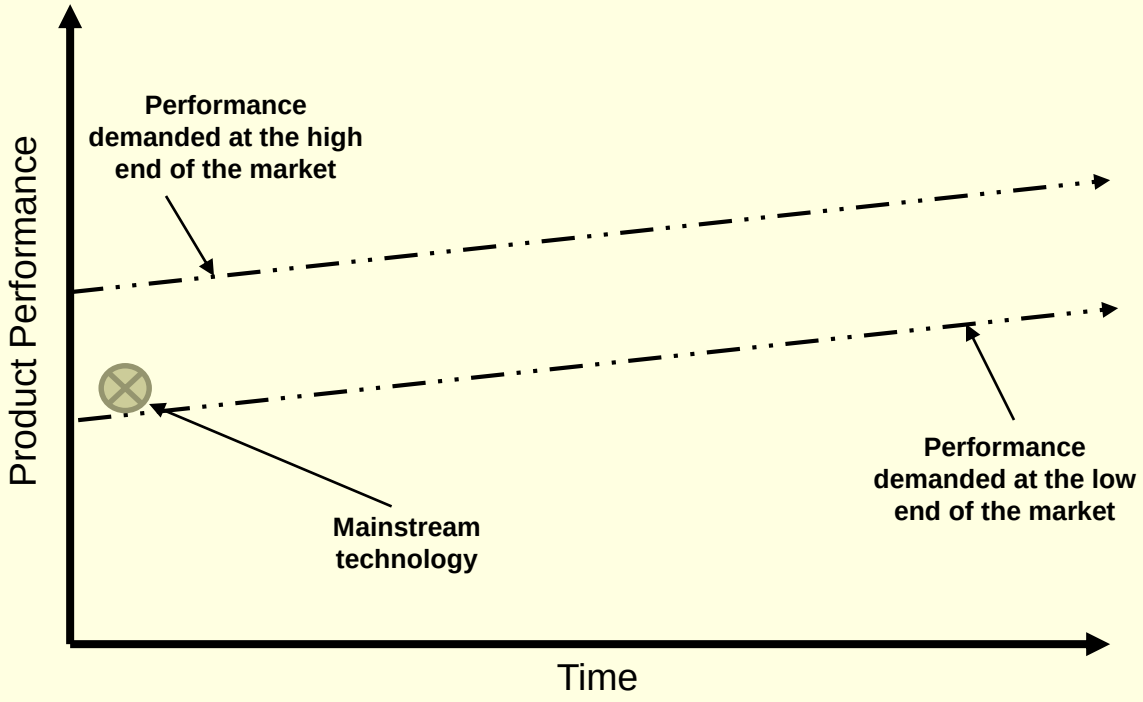

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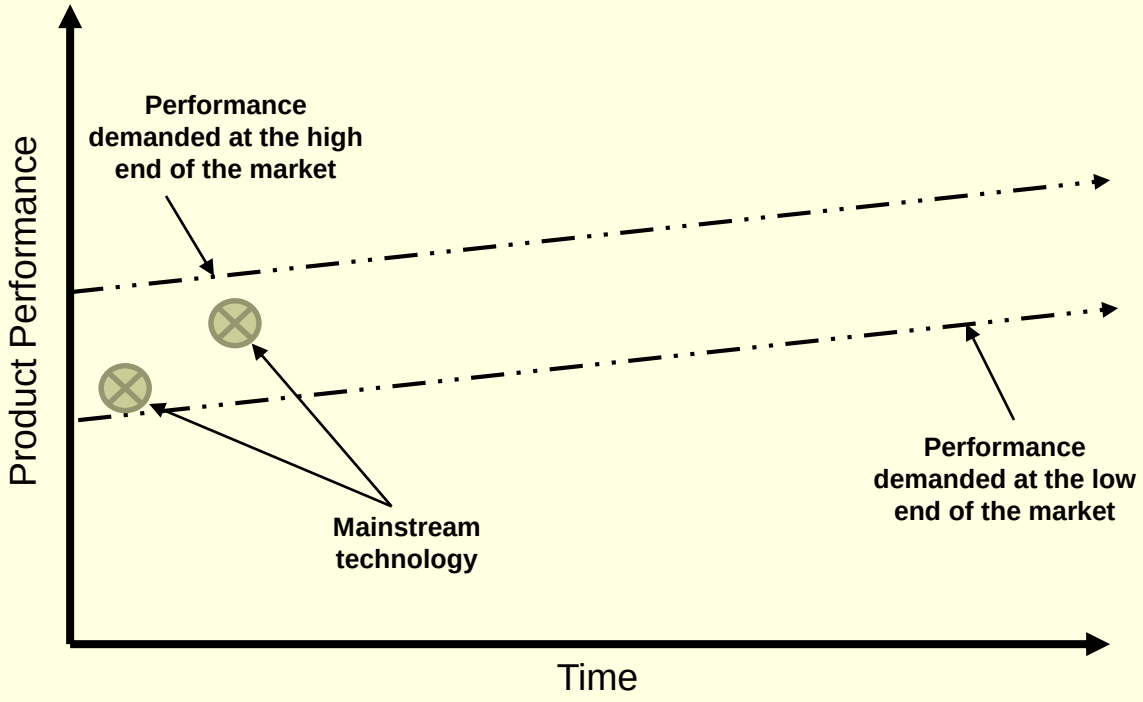

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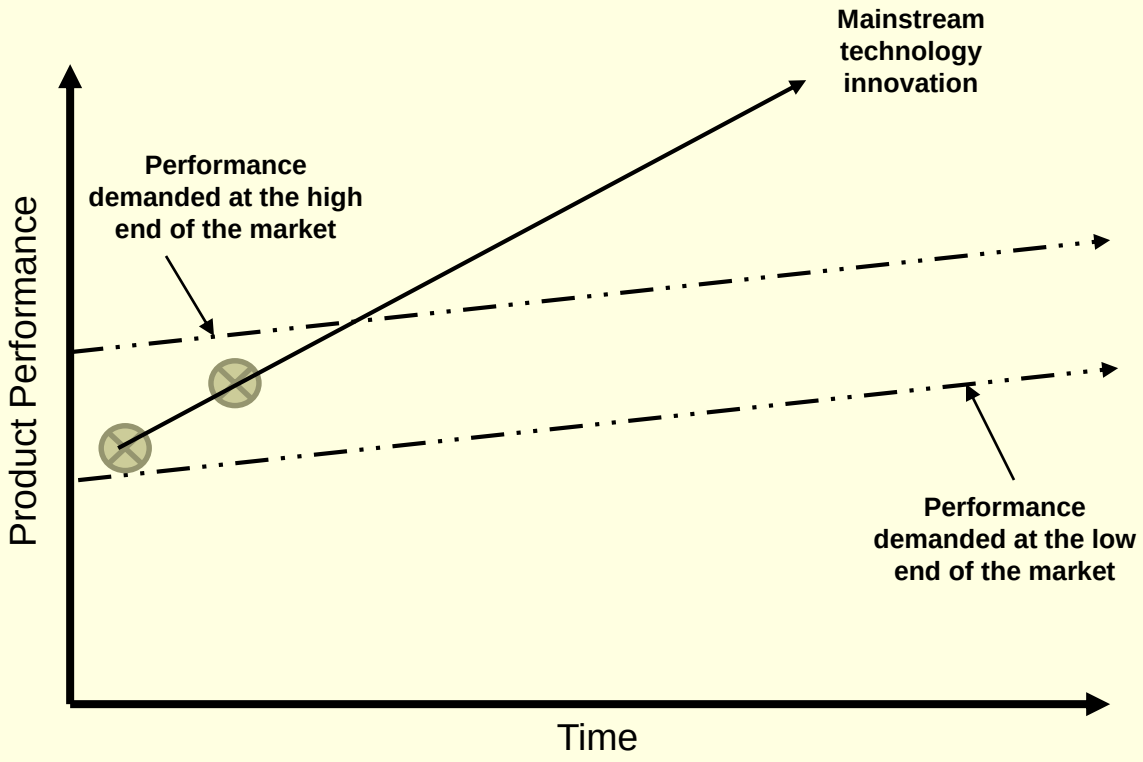

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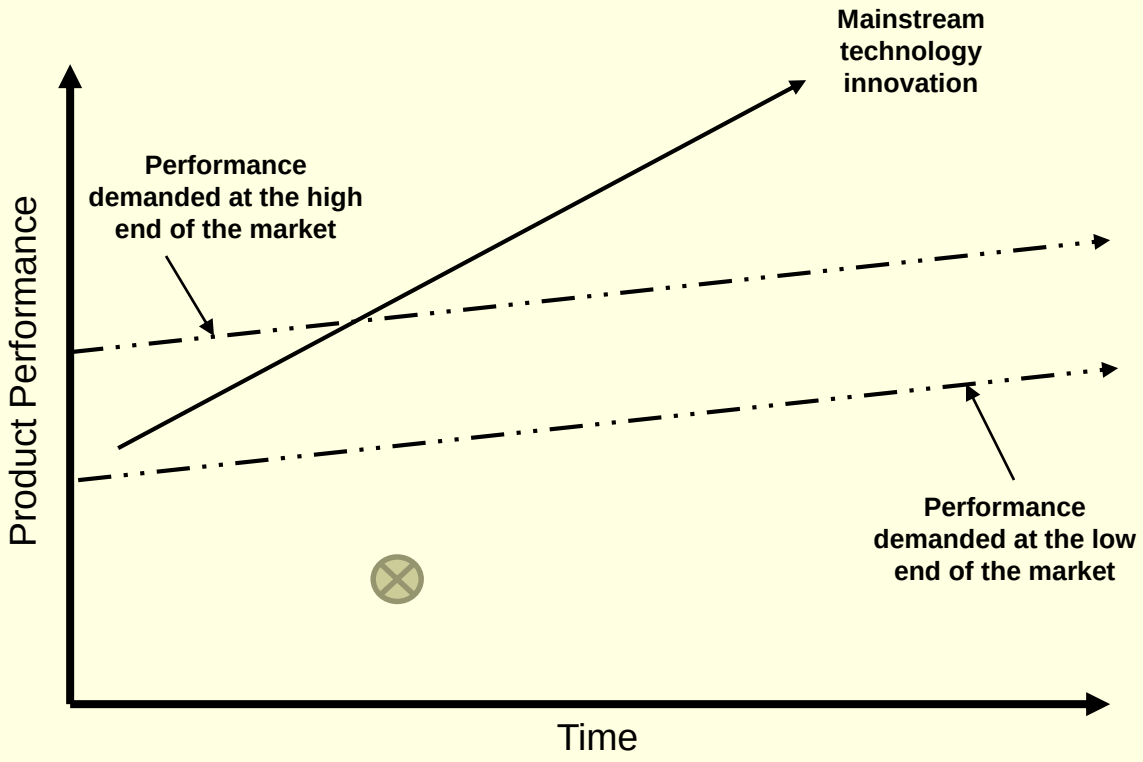

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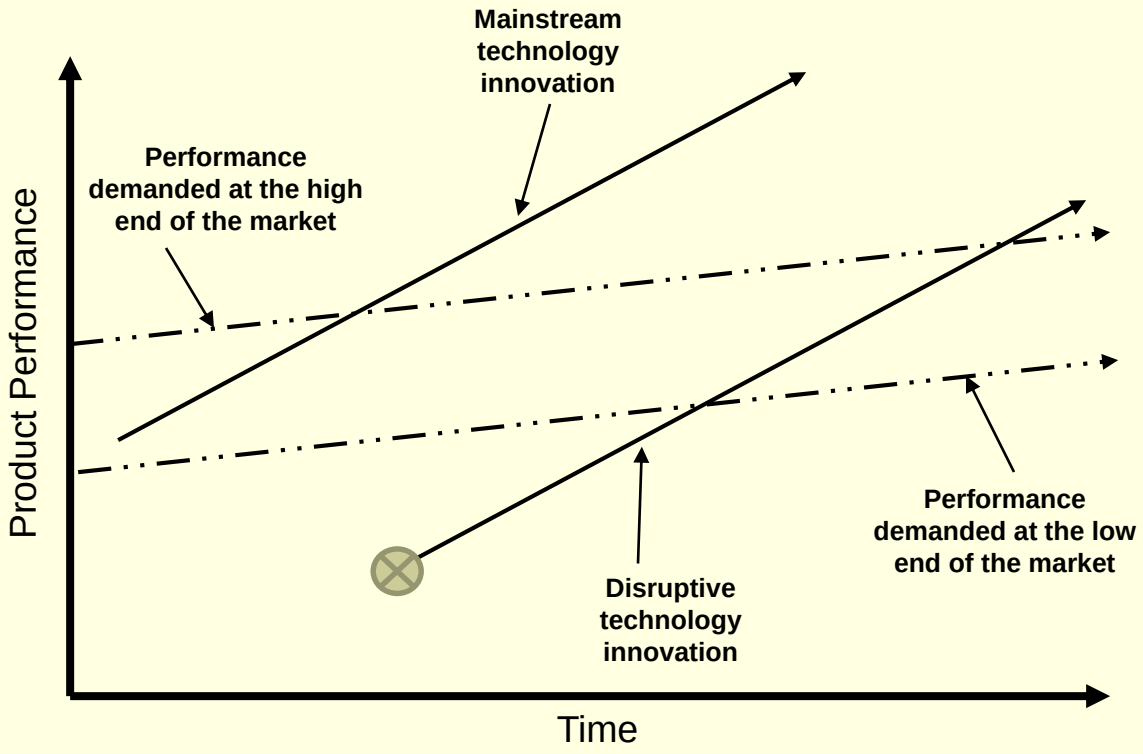

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Clayton M. Christensen Talk at MIT

- http://video.mit.edu/watch/the-innovators-prescription-a-disruptive-solution-to-the-healthcare-crisis-9380/

Christensen Disruption Examples (5/15/06)

Yesterday	Today	Tomorrow
Ford	Toyota	Chery
Dept. Stores	Wal-Mart	Internet retail
Digital Equipment	Dell	RIM Blackberry
Delta	Southwest Air	SkyWest, Air taxis
JP Morgan	Fidelity	ETFs
Xerox	Canon	Zink
IBM	Microsoft	Linux
Cullinet	Oracle	Salesforce.com
AT&T	Cingular	Skype
Japan	Korea, Taiwan	China, India
Sony DiskMan	Apple iPod	Cell Phones

Disruptive Technology Impact on PCs

- Examples
  - Microprocessor
  - Internet
  - Dynamic Memory
  - Hard Drives
  - LCD Displays, Plasma and HDTV
  - Digital Media
    - Cameras
    - MP3
    - TiVo
  - Tablets

Today's Meetings

- Ahmed Haque 11:00 – 12:00
- Enoch Chang 1:00 – 2:00
- Ryan Artecona 2:30 – 3:30
- Jianbo Chen 10:45 – 11:00

Seminar #3

- Great Presentations – Tracy Volz
  - Logistics
    - Wednesday, January 23, 9:30 – 11:00, DH-2014
- Mini-Discussion – Intel vs. Nvidia: How much trouble is Intel facing now and in the near future?
- One-on-One meetings:
  - Prep for Topic #1 (Final Presentation, Communications review)
    - Ahmed Haque
    - Consumer Medical Electronics – January 30, 2013
  - Prep for Topic #2 (Second Draft Presentation, schedule Communications review)
    - Enoch Chang
    - Identity Theft / Phishing– February 6, 2013
  - Prep for Topic #3 (First Draft)
    - Ryan Artecona
    - Internet of Things – February 13, 2013
  - Prep for Topic #4 (Presentation Outline)
    - Jianbo Chen
    - Storage – February 20, 2013
  - Prep for Topic #5 (Initial Discussion)
    - Zhiyong Tan
    - HTML 5 – March 16, 2013