Lecture 1 – Introduction

Web Application Development

January 13, 2015

Jeffrey L. Eppinger
Professor of the Practice
School of Computer Science

Outline for Today

- Introductions
- Course Overview
- Industry Discussion

Meet Me

Jeff Eppinger (eppinger@cmu.edu, WEH 5124)

Background:

- Ph.D. Computer Science (CMU)
- Asst Professor of Computer Science (Stanford)
- Co-founder of Transarc Corp. (Bought by IBM)
  - Transaction Processing Software
  - Distributed File Systems Software
- IBM Faculty Loan to CMU eCommerce Inst. (99-00)

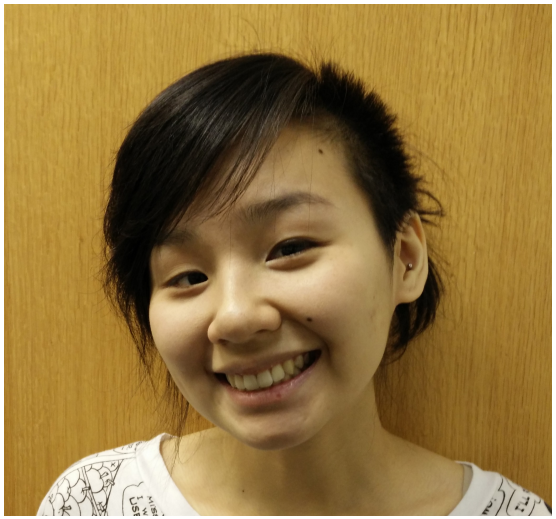
I am now on the faculty in the Institute for Software Research in the School of Computer Science

Famous Transarcians

- Josh Bloch – Java Collections, Effective Java
- Satish Dharmaraj – Java Server Pages
- Scott Dietzen – Web Application Server

Meet the TAs

Divya Mouli
Sundays
6:00pm – 7:00pm
WEH 5120



Shannon Lee
Sundays
8:00pm – 9:00pm
WEH 5120

Karin Tsai
Mondays
4:30pm – 5:30pm
WEH 5120

Jason Sam
Mondays
6:00pm – 7:00pm
WEH 5120

Let’s Meet You

CS

ECE

INI

English

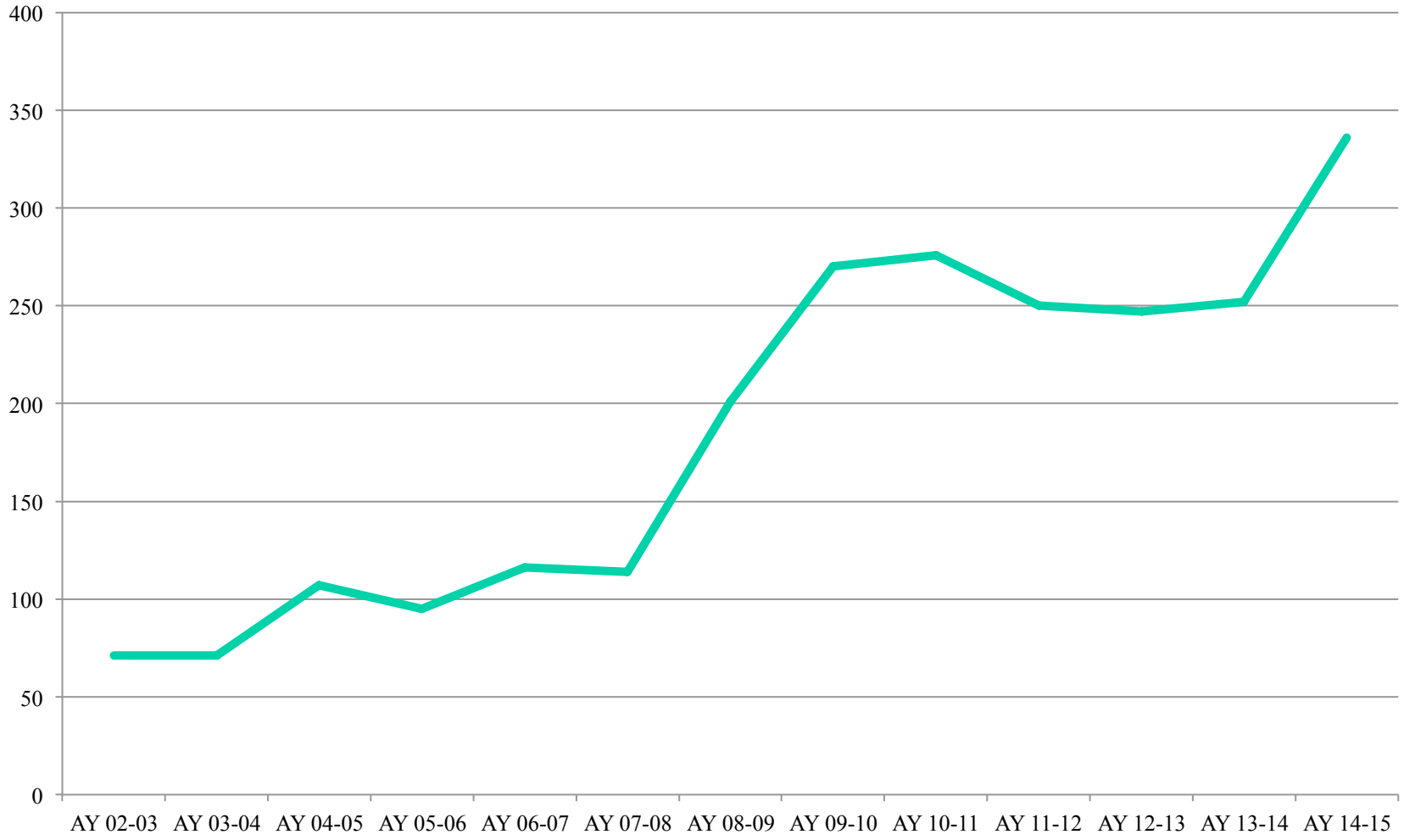
MISM

HCI

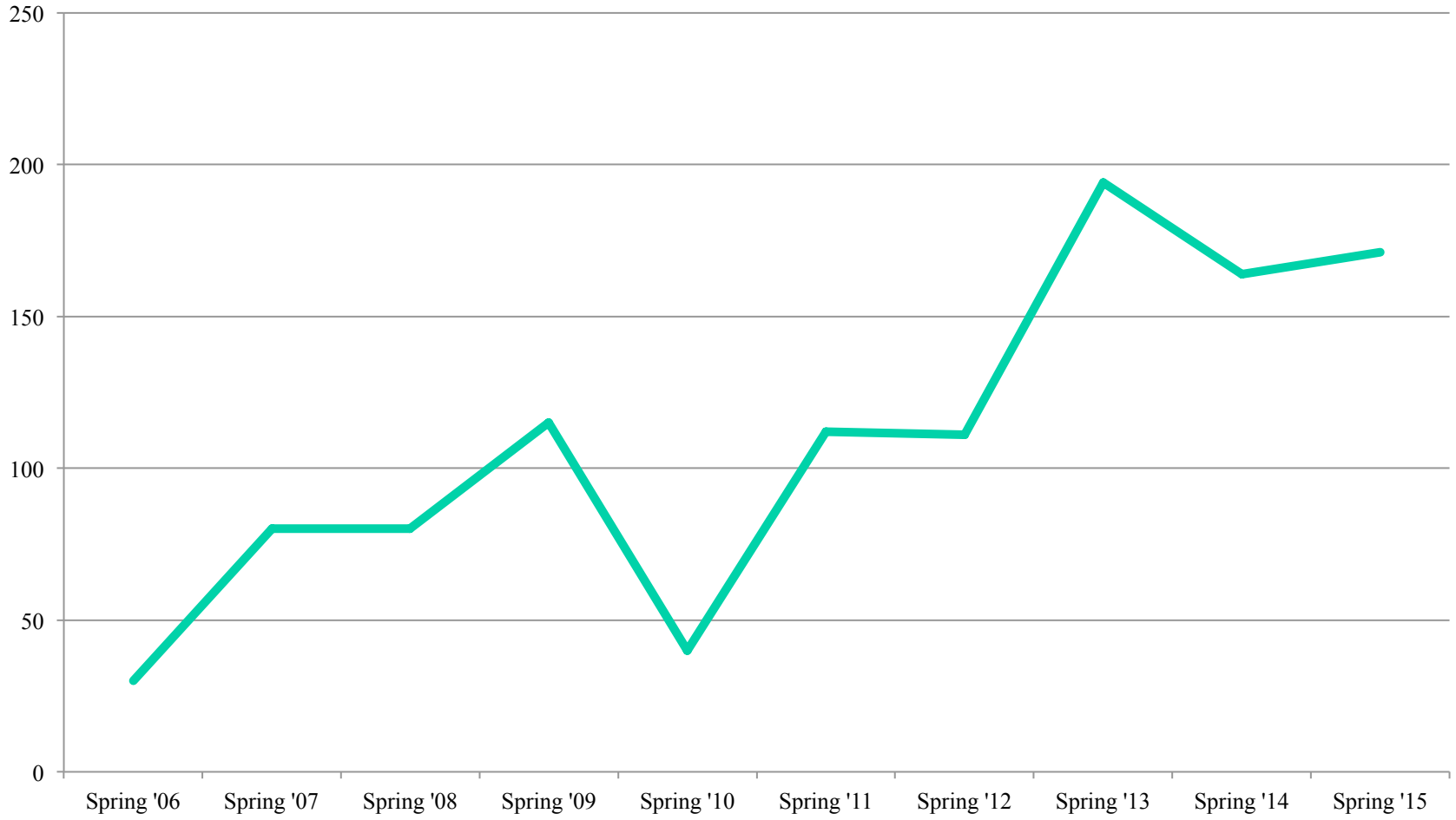
History of this course

- I started teaching this course in 2000
- Taught by me, Anthony Tomasic, and Thierry Sans (Qatar), and Charlie Garrod
  - Undergraduate and graduate course
  - Focus on server-side architecture
  - Taught in Java until last year
  - Very popular?

Students Finishing WebApp Course



Web App Spring Wait List



Can you get into this class?

- Who is not yet enrolled in the class?
- After lecture, please come down and fill out the form
  - That's just if you're not yet in the course

Can’t Get into the Class?

- I am willing to give you access to the course materials
- But
  - No Q&A
  - No homework submissions
  - (No project, no exam, etc)
- To get access, fill out the other form, after class

Structure of Course

- Lectures on Tuesdays & Thursdays
- Homework (1st half)
- Project (2nd half)
- Final Exam

Course Logistics

- All classes will be held in here in WEH 7500
- Up to date info available on course Piazza
  - https://www.piazza.com
  - Our piazza will go live tonight
    - If you are enrolled in the course, you'll get an invitation
- Links to videos & readings will be posted on our Piazza
  - Readings will be web resources

Prerequisites

- Formally:
  - 15-214 (for undergrads)
  - Your own hardware
- Practically:
  - Modern laptop
  - Basic Web Concepts
    - Browsers, HTML, etc
  - Programming Skills
    - Python Programming

Computation of Your Grade

30% Homework

40% Project

30% Final

Note: If we add any class participation components (e.g., quizzes), we may adjust these percentages. But – if we do that, we'll give you fair warning.

Homework Late Policy

Everyone has problems…

...and I get too much e-mail already

So, in advance I am granting you a 2-day extension

The Details

- You may turn in any (or all) homework up to two days late
- Homework turned in 2 or fewer days late will receive full credit
- Except for points usually deducted due to quality of the work
- The catch…
  - People with fewer late days used will be able to sign up sooner project demo slots (i.e., they can take the later slots)
  - We will track late days by rounding up (so no half late days)
- If you turn in homework more than 2 days late, we will try to grade it
  - Penalty applied to your course grade: borderline => lower grade

The Project

- Build any interesting website you like using what you've learned in class
  - Must take user input and store/retrieve it from disk
- You'll have weeks to built it
  - And you can start thinking about it now
- You have flexibility on what technology you choose
- You can work in small groups, groups likely required
- Project proposals must be submitted and reviewed
- Intermediate "Sprint" presentatations

Project Caveats

- You must build something new for the project
  - You cannot turn in something previously done
  - But – with permission – you may be able to extend something previously done
- You cannot be paid by someone to do the project
  - But you can build something for someone for free
- You cannot receive credit from another course for your project in this course

Grading of the Project

- Everyone gives a final presentation (aka the "demo")
- Grading criteria
  - It is interesting? Does it work? Is it substantial?
  - Is it well done? Is it really cool?
  - Does it use the concepts from class correctly?
- Since all the projects are unique…grading is subjective
  - We assign letter grades and rank-order the projects
- Best project demos at the last class
- Prizes potentially worth MILLIONS of dollars will be awarded for the best projects

Collaboration Policy

- Everyone should read and abide by:

  CMU Academic Integrity Policy

  (http://www.cmu.edu/policies/documents/Academic%20Integrity.htm)
- Here is some additional information for this course:
  - You are allowed to talk with/work with other students on homework assignments
    - You can share ideas
    - You can examine/critique each others' solutions
  - You must turn in your own work
    - Your homework solution should be different than others
    - **You may not copy another student's file(s) – or portions thereof**
    - **You may not let another student copy your file(s) – or portions thereof**
  - **Minimum penalty for copying files:**
    - **Zero for that assignment** (penalty also possible for source parties)
    - **You'll get reported to the university administration, too**
  - **See syllabus for details**

Lecture Schedule – 1st Half

(subject to change)

#1	Intro	#9	Django Templates
#2	HTML & CSS	#10	Images
#3	JavaScript	#11	AJAX
#4	Bootstrap	#12	jQuery
#5	HTTP & Django	#13	Databases
#6	Django Models	#14	Cloud Deployment
#7	Cookies & Sessions	#15	SSL
#8	Transactions	#16	Project Proposals

Lecture Schedule – 2nd Half

(subject to change)

#17 Performance
#18 Scalability
#19 Sprint Presentations
#20 Sprint Presentations
#21 TBD
#22 TBD
#23 Sprint Presentations
#24 Sprint Presentations

#25 TBD
#26 Spring Carnival
#27 Project Demos
#28 Project Demos
#29 Best Project Awards
#30 Review for Final

Final Exam

Outline for Today

- ✓ Introductions
- ✓ Course Overview
- → Industry Discussion

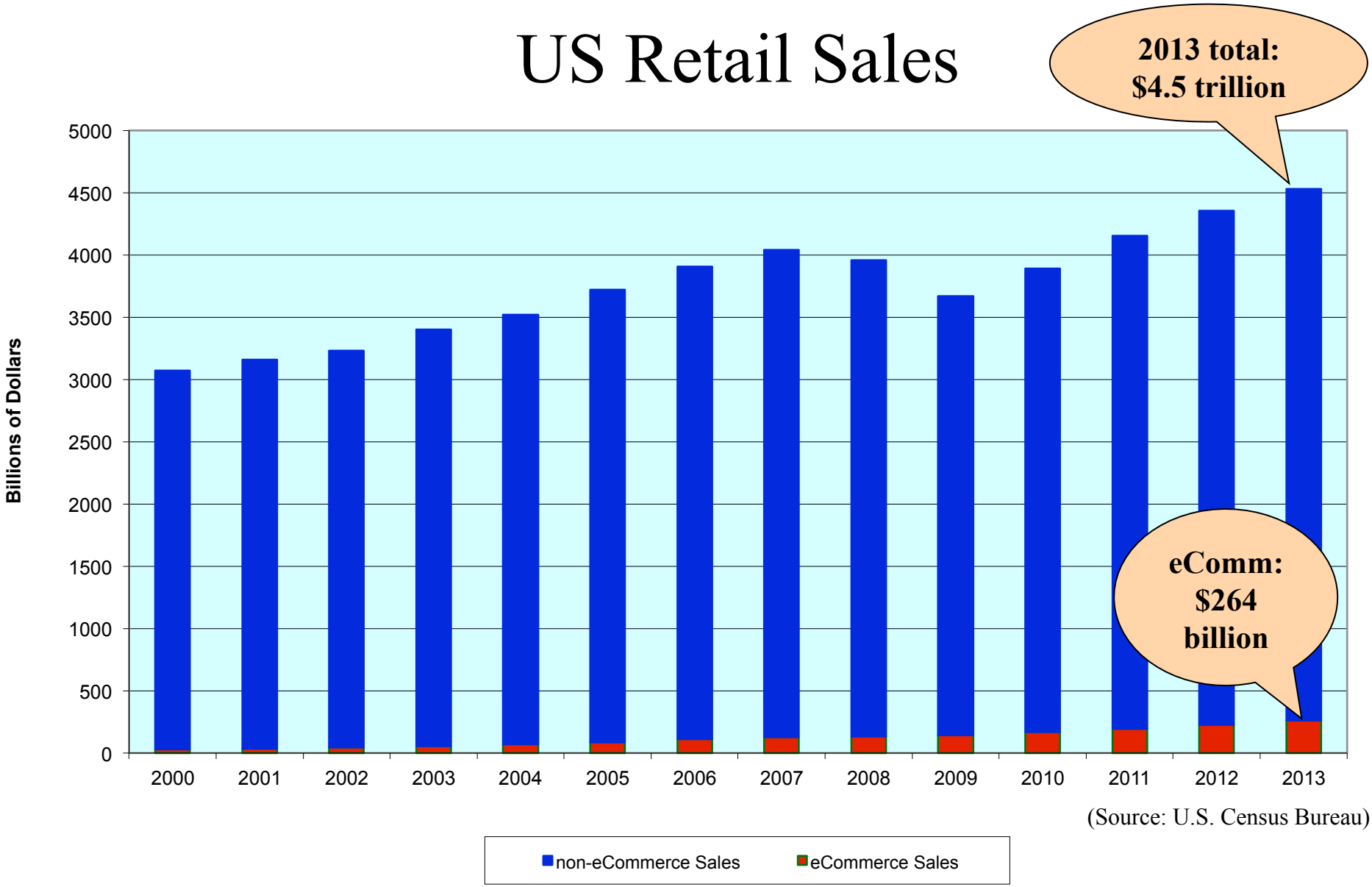
Why Are We Here?

a. Web Apps are the most important software platform?
b. For the money

The Money

- I’m going to show you the money
- Moral:
  - Do software, not hardware
  - Deliver it via the web

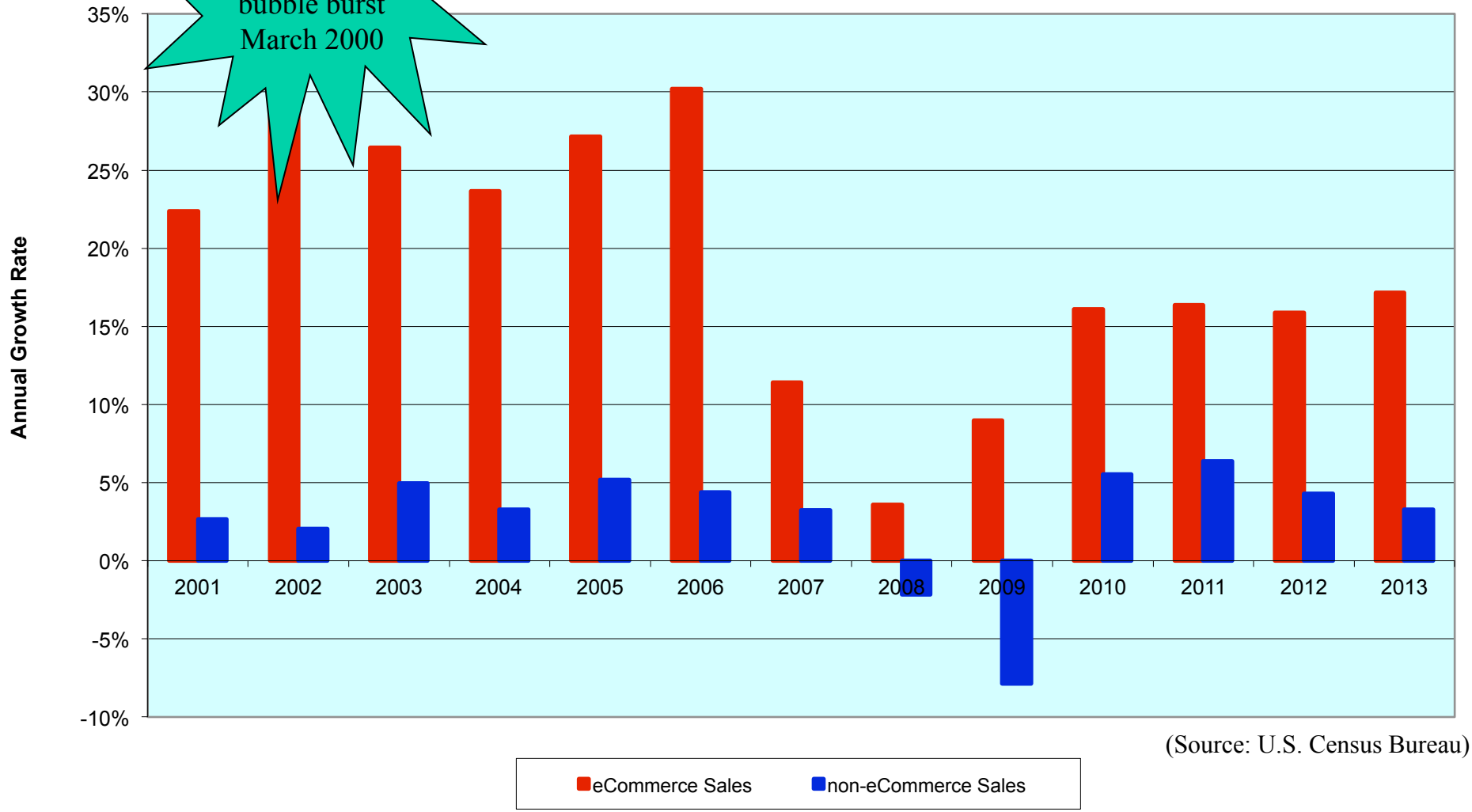
US Retail Sales



(Source: U.S. Census Bureau)

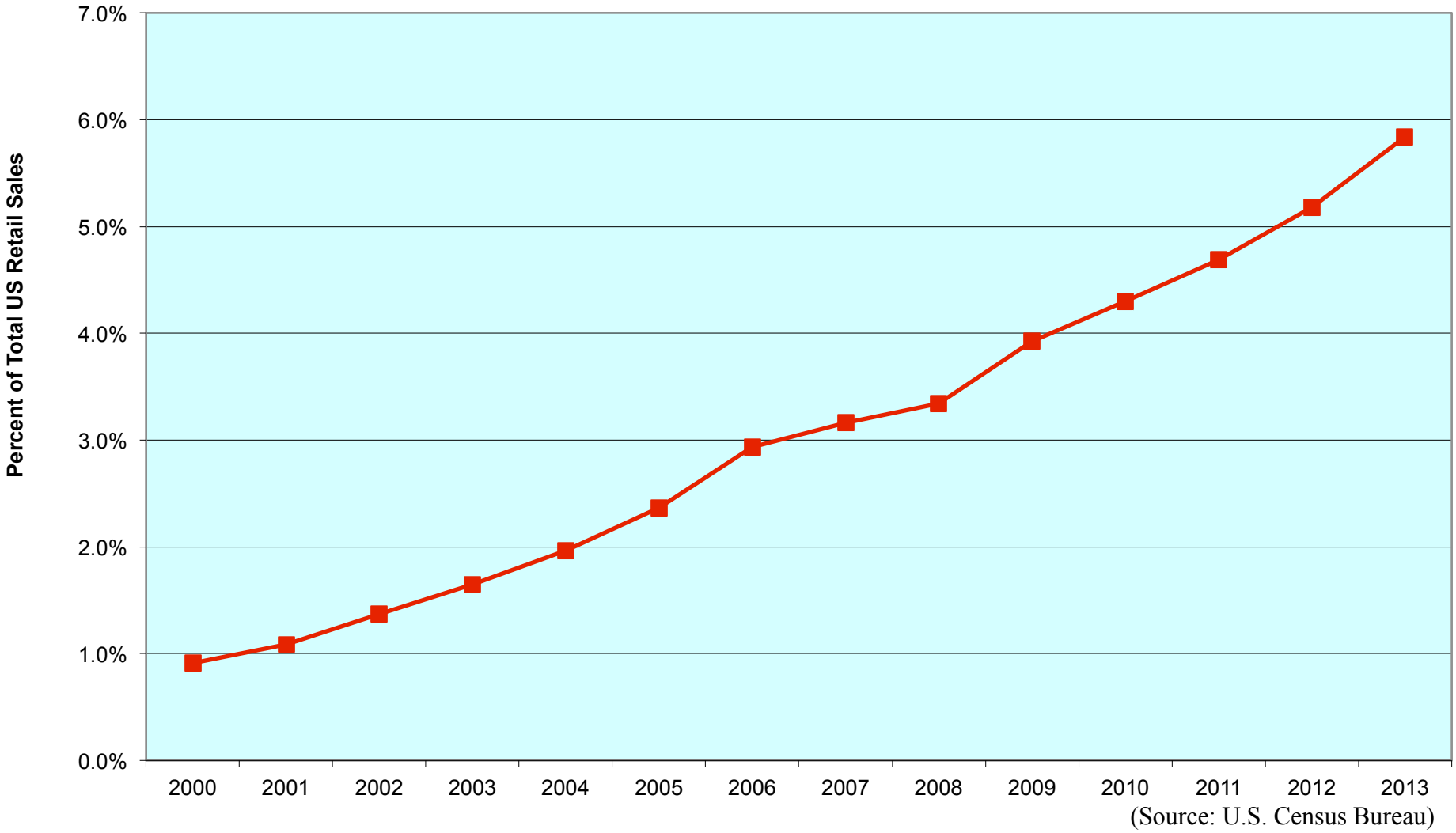
US Retail Sales Growth

Remember: The .com bubble burst March 2000



(Source: U.S. Census Bureau)

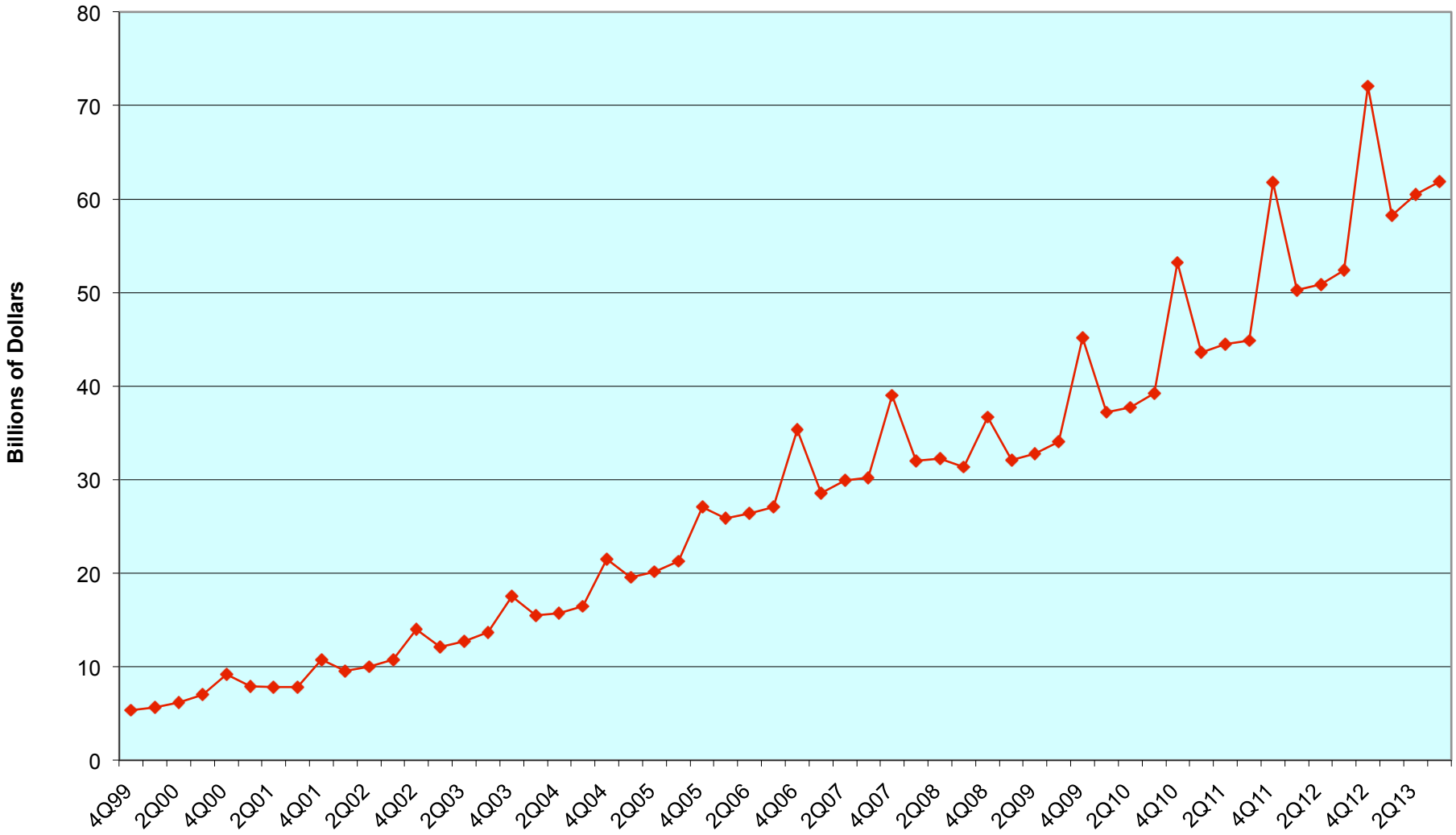
eCommerce Share of US Retail Sales



(Source: U.S. Census Bureau)

U.S. eCommerce Retails Sales

(Quarterly Data)



(Source: U.S. Census Bureau)

Who Are the Players?

- IBM
- Microsoft
- Google
- Apple
- Carnegie Mellon?

IBM

(Billions of Dollars)

FY	Sales	Profit	Margin	Sales Growth
1995	72	4	6%	
1996	76	5	7%	6%
1997	79	6	8%	3%
1998	82	6	8%	4%
1999	88	8	9%	7%
2000	85	8	9%	-3%
2001	83	8	10%	-2%
2002	81	5	7%	-2%
2003	89	8	9%	10%
2004	96	7	8%	8%
2005	91	8	9%	-5%
2006	91	9	10%	0%
2007	99	10	11%	8%
2008	104	12	12%	5%
2009	96	13	14%	-8%
2010	100	15	15%	4%
2011	107	16	15%	7%
2012	105	18	17%	-2%
2013	100	18	18%	-5%

(Source: Annual Reports)

Microsoft

(Billions of Dollars)

FY	Sales	Profit	Margin	Sales Growth
1995	6	1	24%	
1996	9	2	25%	46%
1997	11	3	30%	31%
1998	15	4	29%	34%
1999	20	8	39%	29%
2000	23	9	41%	16%
2001	25	7	29%	10%
2002	28	5	19%	12%
2003	32	8	23%	13%
2004	37	8	22%	14%
2005	40	12	31%	8%
2006	44	13	28%	11%
2007	51	14	28%	15%
2008	60	18	29%	18%
2009	58	15	25%	-3%
2010	62	19	30%	7%
2011	70	23	33%	12%
2012	74	17	23%	5%
2013	78	22	28%	6%
2014	87	22	25%	12%

(Source: Annual Reports)

Google

(Billions of Dollars)

FY	Sales	Profit	Margin	Sales Growth
2001	0.1	0.01	8%	
2002	0.4	0.10	23%	409%
2003	1.5	0.11	7%	234%
2004	3.2	0.40	13%	118%
2005	6.1	1.47	24%	92%
2006	10.6	3.08	29%	73%
2007	16.6	4.20	25%	56%
2008	21.8	4.23	19%	31%
2009	23.7	6.52	28%	9%
2010	29.3	8.51	29%	24%
2011	37.9	9.74	26%	29%
2012	50.2	10.74	21%	32%
2013	56.7	12.92	23%	13%

(Source: Annual Reports)

Apple

(Billions of Dollars)

FY	Sales	Profit	Margin	Sales Growth	
1993	8.0	0.09	1%		
1994	9.2	0.31	3%	15%	
1995	11.1	0.42	4%	20%	
1996	9.8	-0.82	-8%	-11%	
1997	7.1	-1.05	-15%	-28%	Jobs Returns
1998	5.9	0.31	5%	-16%	
1999	6.1	0.60	10%	3%	
2000	8.0	0.79	10%	30%	
2001	5.4	-0.03	0%	-33%	iTunes/iPod
2002	5.7	0.04	1%	7%	
2003	6.2	0.06	1%	8%	
2004	8.3	0.27	3%	33%	
2005	13.9	1.33	10%	68%	
2006	19.3	1.99	10%	39%	
2007	24.6	3.50	14%	27%	iPhone
2008	37.5	6.12	16%	53%	
2009	42.9	8.24	19%	14%	
2010	65.2	14.10	22%	52%	iPad
2011	108.2	25.92	24%	66%	
2012	156.5	41.73	27%	45%	
2013	170.9	37.04	22%	9%	
2014	182.8	39.51	22%	7%	

(Source: Annual Reports)

CMU

(Billions of Dollars)

FY	"Sales"	"Profit"	Margin	Sales Growth
1997	0.4	0.02	5%	
1998	0.4	0.02	5%	1%
1999	0.4	0.01	2%	5%
2000	0.4	0.00	0%	3%
2001	0.5	0.01	2%	10%
2002	0.5	0.00	0%	6%
2003	0.6	0.00	0%	10%
2004	0.6	0.02	3%	4%
2005	0.6	0.01	2%	9%
2006	0.7	0.00	0%	7%
2007	0.7	-0.01	-1%	8%
2008	0.8	0.00	0%	5%
2009	0.8	0.00	0%	6%
2010	0.9	0.01	2%	7%
2011	0.9	0.03	3%	4%
2012	0.9	0.03	3%	4%
2013	1.0	0.04	4%	7%
2014	1.1	0.02	2%	7%

(Source: Annual Reports)

The Employee Contribution

	2013 Employees	Sales / Emp	Profits / Emp
IBM	431,212	$231,327	$41,648

(Source: Annual Reports)

The Employee Contribution

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IBM	431,212	$231,327	$41,648
Microsoft	99,000	$786,354	$220,838

(Source: Annual Reports)

The Employee Contribution

	2013 Employees	Sales / Emp	Profits / Emp
IBM	431,212	$231,327	$41,648
Microsoft	99,000	$786,354	$220,838
Google	55,000	$1,030,364	$234,909

(Source: Annual Reports)

The Employee Contribution

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IBM	431,212	$231,327	$41,648
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Apple	98,000	$1,865,255	$403,163

(Source: Annual Reports)

The Employee Contribution

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Google	55,000	$1,030,364	$234,909
Apple	98,000	$1,865,255	$403,163
CMU	5,425	$197,807	$3,244

(Source: Annual Reports)

Why are so many companies doing web apps?

- Web-based "sales" are more efficient
  - Than **brick & mortar sales**
  - Than **telephone sales**
- Web-based apps are easy to grow
  - Don't have to build more stores
  - Don't have to hire more telephone operators

A Last Thought?

a) The Future of Computing

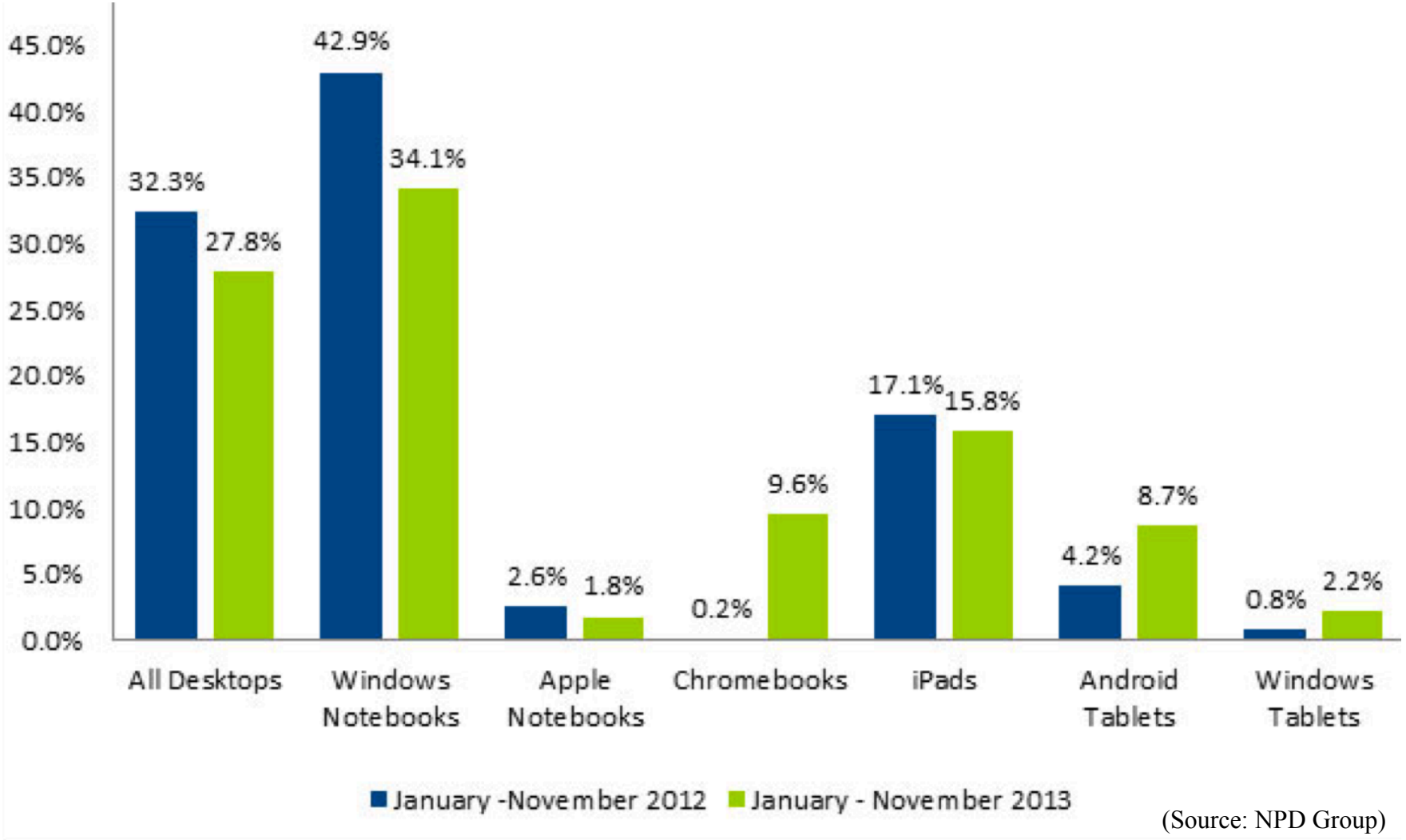
b) Google May Overtake Microsoft

c) This Course is the Most Important Course You'll Take at Carnegie Mellon

All of the Above

- Popular applications are being offered as web apps
  - Example: Microsoft Office => Google Apps
    - Outlook => Gmail & Google Calendar
    - Word => Google Docs
    - Excel => Google Spreadsheets
  - Other Examples
    - Web Banking, Web Stock Trading, Web Bill Paying
    - Web Shopping (Amazon), Web Garage Sale (eBay)
- Soon the only PC app a ***typical end-user*** may need is the web browser
  - ChromeBook is seeing tremendous growth

Share of Unit Sales
U.S. Commercial Channel



(Source: NPD Group)

ChromeBook, Mobile & Tablet Devices

- This is the growth area
- If current trends hold
  - Almost everyone in most countries has a mobile
  - Most people in US have a smartphone
  - In ten years, most in world will have smartphones

Native or Web App?

- I predict that, increasingly
  - We will develop web apps for mobile devices
  - They will run in browsers on the phones
  - They will look like native apps
  - We will cache them on the phones

Also Note: Google May Not Be the Provider

- For important apps, there will be local providers
  - Example:
    - Corporate Webmail or Calendars
    - Corporate Doc & Spreadsheet App Servers
- Of course, these may be sold by Google… or Microsoft ☺

So, …

If everything is web app:

- All user data is stored on servers
- All applications are web apps
- Client device just caches content

Could there be a more important course at CMU?

Short-term Plan

(Rest of This Week)

- Resolve wait list
- Thursday class will on HTML & CSS
- Homework 1 should be posted by Thursday
  - It will be due on Mon, Jan 19th
  - You can turn it in as late as Wed, Jan 21st without penalty

Other Things

- Git
  - We will use Git to distribute code to you
  - You will use Git to turn in your homework
- Python
  - We will be developing the server side of our app using the Django Framework.
  - Django runs on the Python Programming Language
  - If you don't know Python, start learning now
    - https://developers.google.com/edu/python/