The Economics of E-commerce and Technology
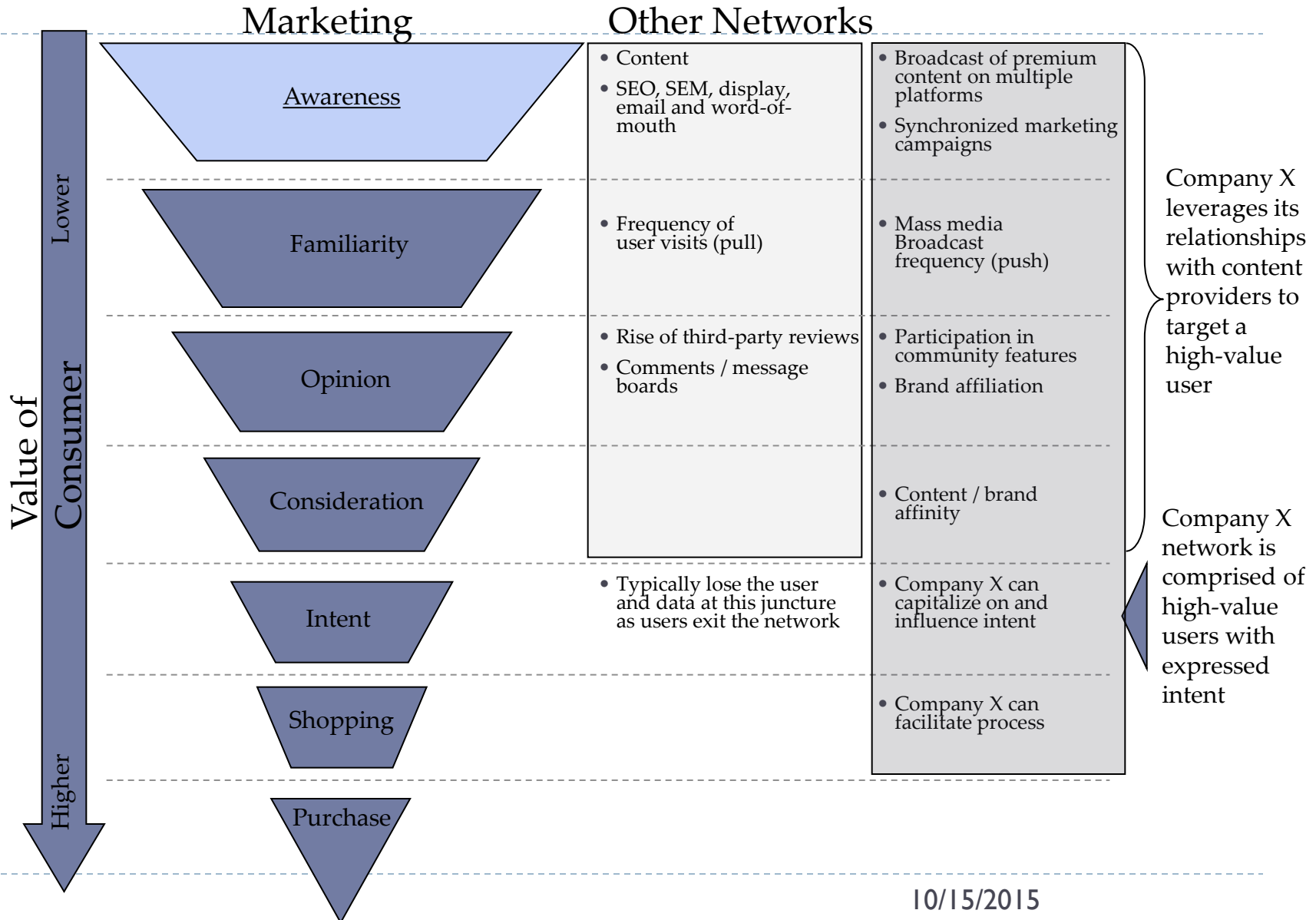
Monetization: Prices and Advertising

The Stages of Buying (The Marketing Funnel)

	Marketing	Other Networks	
Awareness	• Content • SEO, SEM, display, email and word-of-mouth	• Broadcast of premium content on multiple platforms • Synchronized marketing campaigns	Company X leverages its relationships with content providers to target a high-value user
Familiarity	• Frequency of user visits (pull)	• Mass media Broadcast frequency (push)	
Opinion	• Rise of third-party reviews • Comments / message boards	• Participation in community features • Brand affiliation	
Consideration		• Content / brand affinity	
Intent	• Typically lose the user and data at this juncture as users exit the network	• Company X can capitalize on and influence intent	Company X network is comprised of high-value users with expressed intent
Shopping		• Company X can facilitate process	
Purchase			

Value of Consumer — Lower / Higher

Basic Monopoly Pricing

Monopoly Pricing: Recap

▸ Constant marginal cost, c.

▸ Firm chooses quantity to maximize profits

$$\Pi(q) = q(p(q) - c)$$

▸ First-order condition

$$MR(q) = c$$

▸ Inverse elasticity rule

$$\frac{p - c}{p} = \frac{1}{e} \quad \text{where} \quad e = -\frac{p}{q}\frac{dq}{dp}$$

Multi-product monopolist

- ▸ **Microsoft sells XBox and Halo**
  - ▸ If sell separately optimal prices p_X=300, p_H=50.
  - ▸ But they sell both: how should they price them?

- ▸ **Walmart sells Xbox and PS3**
  - ▸ If sell separately optimal prices p_X=300, p_{PS}=400.
  - ▸ But they sell both: how should they price?

- ▸ **Economist sells print and online editions**
  - ▸ How should they price?

Multi-product monopolist

▸ Firm chooses (q_1,q_2) to maximize

$$\Pi(q_1,q_2) = q_1(p_1(q_1,q_2) - c_1) + q_2(p_2(q_1,q_2) - c_2)$$

▸ Inverse elasticity rule for p_1

$$\frac{p_1 - c_1}{p_1} = \frac{1}{e_{11}} - \frac{(p_2 - c_2)q_2}{p_1 q_1 e_{11}} e_{12} \quad \text{where} \quad e_{12} = -\frac{p_1}{q_2}\frac{dq_2}{dp_1}$$

▸ Substitutes: $e_{12} < 0$
  ▸ Negative externality so increase p_1.
▸ Complements: $e_{12} > 0$
  ▸ Positive externality so reduce p_1.

New Products and Cannibalization

▸ When launching new product, do cost-benefit analysis.

▸ But products are often complements/substitutes for old:

  ▸ Netflix launches Video on Demand

  ▸ Apple launches iPad

  ▸ Amazon launches Kindle

▸ Relation matters:

  ▸ If compliment then introduce product earlier

  ▸ If substitute then delay because of cannibalization

▸ This relates to last slide:

  ▸ Having a product unavailable is like price being infinity.

  ▸ Need to take externalities into account when launching.

Price Discrimination

Three types of price discrimination

1. **First-degree**
   - Perfect price discrimination.
   - Shows power of nonlinear pricing.

2. **Third-degree (group pricing)**
   - Price as function of observables.
   - Examples: Student status, zip code, assets.

3. **Second-degree (indirect price discrimination)**
   - Offer menu of options and let people self-select.
   - Examples: Versioning, quantity discounts.

- **Pricing often has all three elements: nonlinear pricing, group pricing and versioning.**

First-Degree Price Discrimination

- Suppose know customer's demand curve, $p(q)$.
- Firm can extract all consumer surplus
  - Let welfare maximizing quantity be q^*, so that $p(q^*)=c$.
- Three ways to extract
  1. Block pricing: sell q^* units at $W(q^*)=\int_0^{q^*}p(q)dq$
  2. Two-part tariff: price $p=c$ and fee $CS(q^*)=W(q^*)=\int_0^{q^*}[p(q)-c]dq$
  3. Nonlinear prices: Sell q^{th} unit for price $p(q)$.
- Big assumptions
  - Know customers demand.
  - Can charge different prices to different customers.
- Example: Elsevier and Universities

Third-Degree Price Discrimination

▶ Firm can observe customer characteristics
  - ▶ Country (e.g. book prices)
  - ▶ Student status (e.g. airline tickets)

▶ Optimal pricing: Use inverse elasticity rule for each group.
  - ▶ Lower price to most sensitive groups.

▶ Assumptions
  - ▶ No resale (e.g. international editions of textbooks)
  - ▶ No cost to setting different prices
  - ▶ Cannot change characteristics (e.g. hide student card)
  - ▶ No ethical issues (e.g. racial discrimination in car sales)
  - ▶ Consumer demand and observable characteristics are correlated

▶ Has internet made easier or harder?

Second-Degree Price Discrimination

▸ Offer menu of products and see which consumers choose
  ▸ High and low quality products (vertical differentiation).
  ▸ Indian and American textbook (horizontal differentiation).
  ▸ Quantity discounts.
▸ Big idea
  ▸ Choose options so different types of customers self-select.
  ▸ Want to separate groups that have different WTP.
  ▸ Need customers with different WTP to value features differently
▸ Classic example: Coupons (or Groupons)
  ▸ Put coupons in the newspaper.
  ▸ Annoying to cut out and bring to store.
  ▸ How does this raise profits? Why not just lower price?

A Classic Example

It is not because of the few thousand francs which would have to be spent to put a roof over the third-class carriages or to upholster the third-class seats that some company or other has open carriages with wooden benches. […] What the company is trying to do is to prevent the passengers who can pay the second-class fare from traveling third class; it hits the poor, not because it wants to hurt them, but to frighten the rich.

Jules Dupuit, 1849

A Modern Example

How to Price Discriminate

▸ **Theory beautiful but intricate.**

  ▸ See notes on website.

▸ **How to approach problem in general**

  ▸ Suppose utility is u=vx-p, with v∈{v_L, v_H}

  ▸ Consider selling bundles to each type, (x_L,T_L) and (x_H,T_H)

  ▸ Agents must choose their own bundle (incentive compatibility)

▸ **In optimum**

  ▸ High type will be indifferent between high- and low-bundle.

  ▸ Low type will be indifferent between low-bundle and no bundle.

  ▸ High quality is efficient; low quality is degraded.

Naïve Price Discrimination

▶ What if we just ignored other goods?

  ▶ Example: Utility $u=vx-p$, $v\sim U[0,1]$ and $x\in\{x_L, x_H\}$.

  ▶ Naïve pricing: $p_L=\frac{1}{2}(x_L+c_L)$ and $p_H=\frac{1}{2}(x_H+c_H)$

▶ What are optimal prices?

  ▶ Demand for each good:

$$q_H = 1 - \frac{p_H - p_L}{x_H - x_L} \quad \text{and} \quad q_L = \frac{p_H - p_L}{x_H - x_L} - \frac{p_L}{x_L}$$

  ▶ Firm's profits: $\pi=q_L(p_L-c_L)+q_H(p_H-c_H)$.

  ▶ Differentiating w.r.t. (p_L,p_H), the naïve prices are optimal!

  ▶ Generally, need hazard rate of demand to be affine.

Practical Issues of Versioning

▶ **How many versions?**
  ▶ Want to cleanly separate consumers (e.g. business vs. leisure)
  ▶ Cost to maintaining different product lines (e.g. airlines)
  ▶ Customer confusion from too many options (e.g. cinemas)
  ▶ Different options may reduce network effects. (e.g. wordpad)

▶ **Degraded versions**
  ▶ Need to ensure customers cannot undo (e.g. unlock software).
  ▶ Use degraded version to promote regular one (e.g. mathematica)

▶ **Framing**
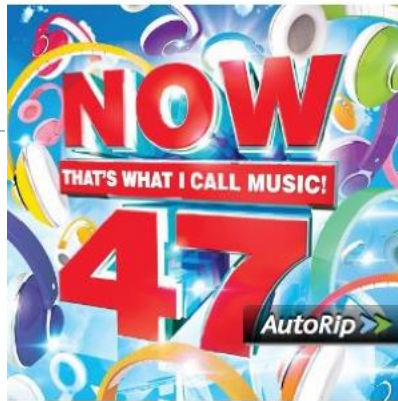 ▶ People like "middle" option.

Other Aspects of Pricing

Bundling

- **Bundling is very common**
  - Bundling of functions (e.g. Excel)
  - Bundling of programs (e.g. MS Office)
  - Bundling of people (e.g. MS Office site licenses)
- **Pure and Mixed Bundling**
  - Pure: only sell bundle.
  - Mixed: see bundle and components separately.

Bundling and Price Discrimination

▸ Bundling can reduce the dispersion of consumers' WTP.

▸ Ann and Bob have values for Excel and Word

	Excel	**Word**
Ann (accountant)	100	60
Bob (bureaucrat)	60	100

▸ If sell separately
  ▸ Prices: $60 for Word, $60 for Excel.
  ▸ Profits $240.

▸ If sell as bundle
  ▸ Prices: $160 for bundle.
  ▸ Profits: $320.

Now 47: That's What I Call Music

Now That's What I Call Music (Artist) | Format: Audio CD

★★★★☆ ☑ (31 customer reviews)

Price: $11.88 & FREE Shipping on orders over $25. Details

AutoRip >> : Includes FREE MP3 version of this album.
Provided by Amazon Digital Services, Inc. Terms and Conditions. Does not appl orders.

In Stock.
Ships from and sold by Amazon.com. Gift-wrap available.

Want it Monday, Sept. 23? Order within **20 hrs 27 mins** and choose **One-Day Shipping** Details

Complete your purchase to save the MP3 version to Cloud Player.

35 new from $8.58   **2 used** from $11.16

Share ☑ 🇫 🐦 📌

Roll over image to zoom in

Share your own customer images

🔊 **Listen to samples**

| Formats	Amazon Price	New from	Used from
MP3 Music, 20 Songs, 2013	$9.49	$9.49	--
Audio CD, 2013	$11.88	$8.58	$11.16

Listen to Samples and Buy MP3s

View the MP3 Album.

[Listen to all 🗗] Try our music sampler to hear song samples from this album.

Samples	◄ Preview all songs ► ►|
Song Title	**Artist**
▶	1. I Love It [feat. Charli XCX]	**Icona Pop**
▶	2. Mirrors	**Justin Timberlake**
▶	3. #Beautiful [feat. Miguel]	**Mariah Carey**
▶	4. Come & Get It	**Selena Gomez**
▶	5. Radioactive	**Imagine Dragons**
▶	6. When I Was Your Man	**Bruno Mars**
▶	7. Beneath Your Beautiful [feat. Emeli Sandé]	Labrinth
▶	8. Clarity [feat. Foxes]	Zedd
▶	9. I Need Your Love [feat. Ellie Goulding]	**Calvin Harris**

Bundling and Price Discrimination

▸ Bundling can reduce the dispersion of consumers' WTP.

▸ This is easy to see when there are many goods

  ▸ 1000 customers and 10 songs.

  ▸ Each customers' value per song is uniformly distributed on [0,1]
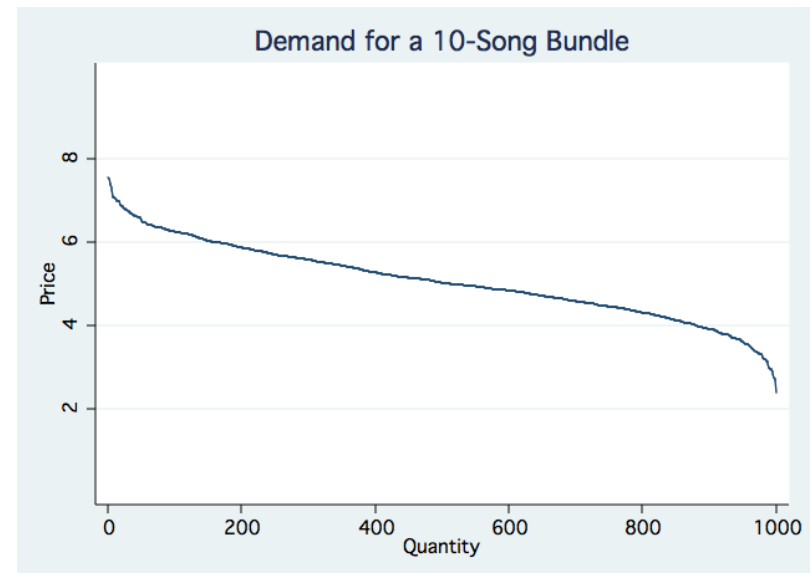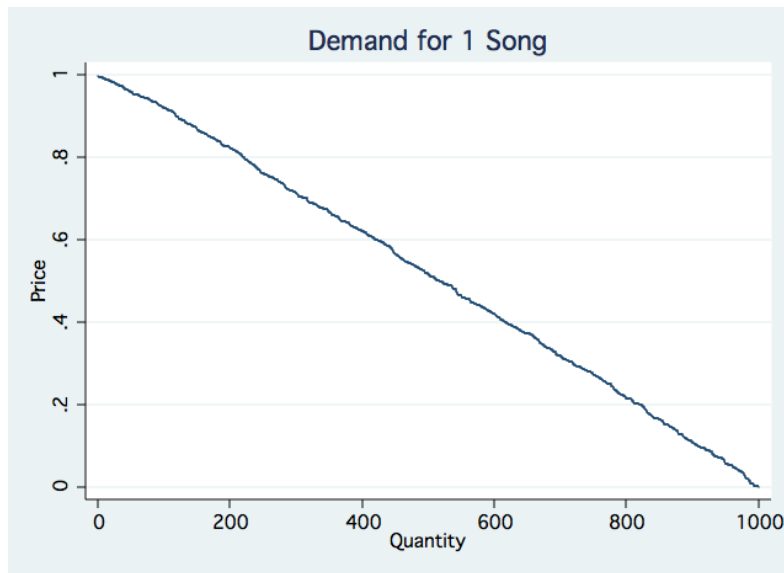
Other Reasons to Bundle

- Complimentary consumption (e.g. shoes)
- Complimentary production (e.g. CDs)
- Reduce the number of payments (e.g. newspaper articles)
- Blocking entry (e.g. Microsoft)

Price Complexity

▶ **Airline Pricing**

  ▶ Airline prices used to be very complex: price depends on whether single/return, on how match flights etc.

  ▶ Increasingly sell single tickets (e.g. Virgin America)

▶ **Complex prices**

  ▶ May be optimal form of price discrimination

  ▶ Makes price comparison hard, and softens competition

▶ **But…**

  ▶ Confuses customers

  ▶ People may think differential pricing is unfair

Framing

▸ Customers stick with default options (endowment effect)

  ▸ Put object "in hands" of customer.

▸ Don't overwhelm consumers (choice overload)

  ▸ People more likely to buy nothing.

▸ Product positioning (reference effects, anchoring)

  ▸ Choose middle option (compromise effect)

  ▸ Choose second cheapest wine

  ▸ Choices affected by dominated alternatives (attraction effect)

▸ Mental accounting

  ▸ People subdivide expenditures (e.g. insurance on computer).

Zero Prices

▸ Zero prices are commonplace.
  ▸ Email accounts, Internet hotspots, Online newspapers
▸ How earn money?
  ▸ Advertising (e.g. gmail)
  ▸ Selling complementary goods (e.g. support with Sun's MySQL)
▸ Advantages of zero price (over small prices)
  ▸ Avoid customers thinking about whether to use product.
  ▸ No transactions costs (billing, usernames, passwords)
  ▸ Create environment of experimentation
  ▸ Maintain privacy
▸ Problems
  ▸ Overconsumption if MC≠0 (e.g. data plans, email spam)
  ▸ Hoarding (e.g. IP addresses)

10/15/2015

Advertising

Facts

Online Advertising

U.S. Advertising Spending By Medium (2007-2012E)

(billions of dollars)   Data source: Barclays Capital

Television

Direct Mail

Directories

Magazines

Online

Outdoor

Radio

Newspapers
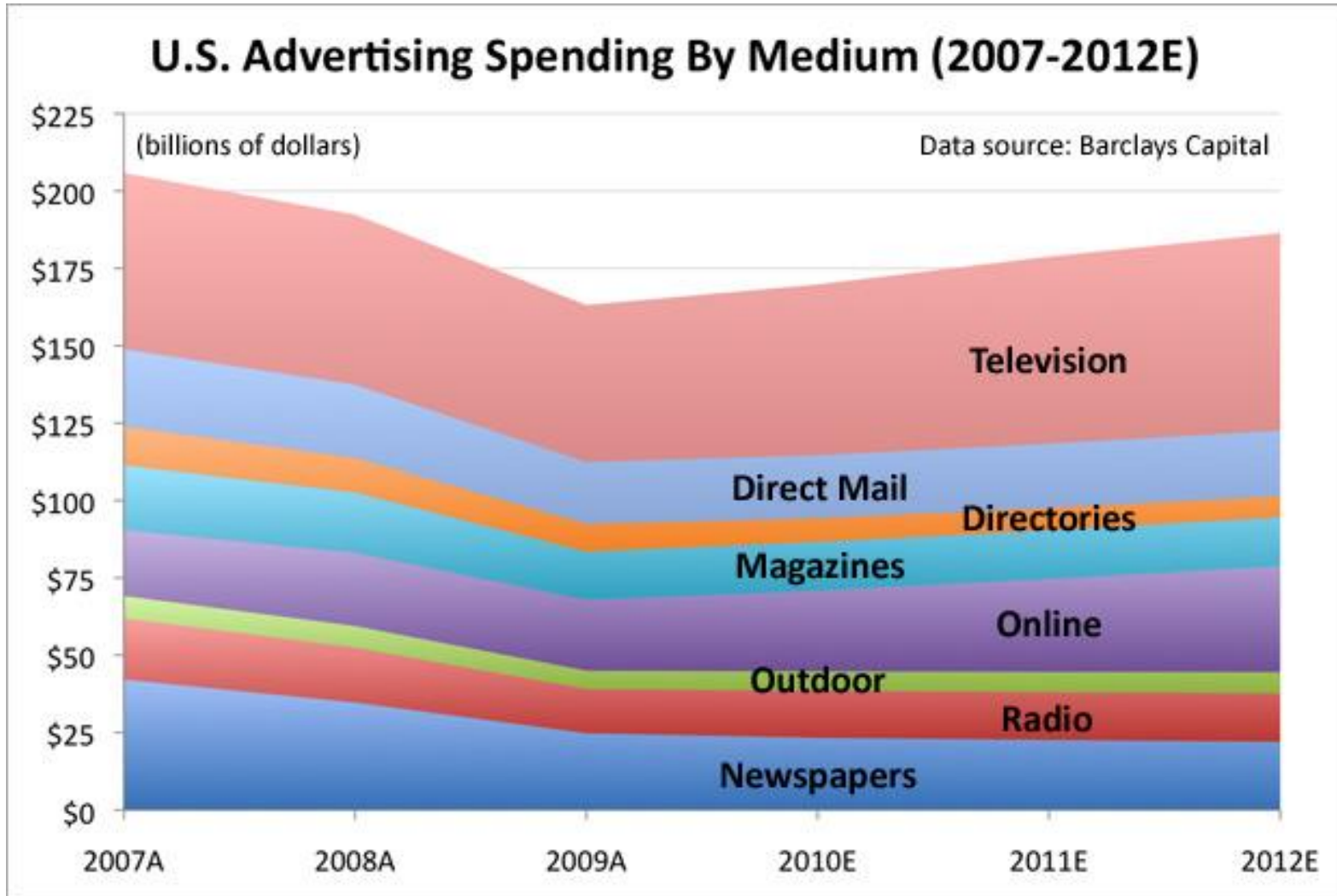
Online Advertising

- Advantages of online advertising
  - Highly targeted (IP, time, registration info, previous pages, GPS)
  - Low fixed cost
- Major types of ad
  - Display ads - visual appeal, branding
  - Search ads – very contextually specific
  - Text ads – specific, unobtrusive
  - Mobile ads – time and location sensitive
- Earned media/Publicity
  - Celebrity endorsements, press releases
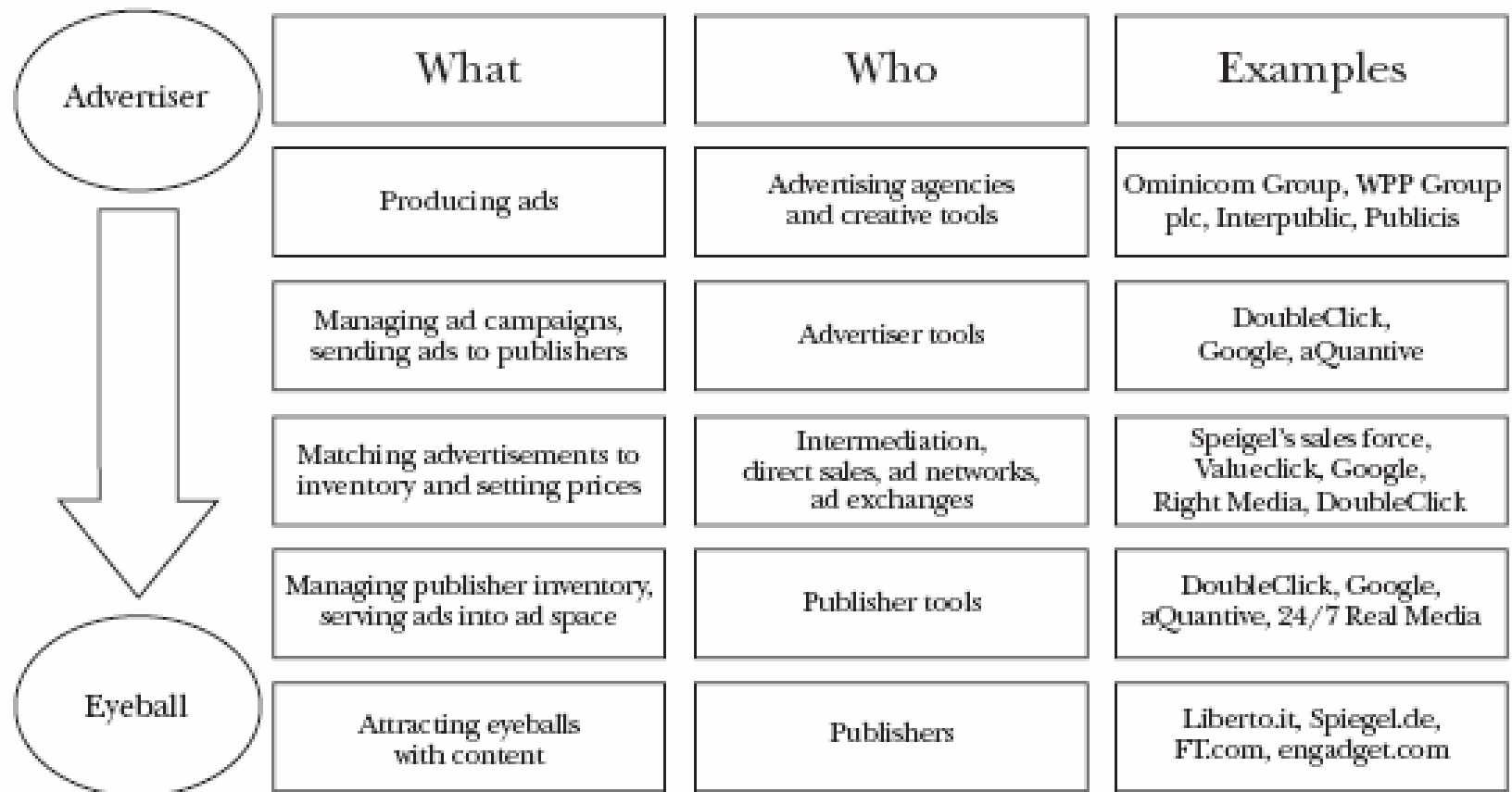- Social media
  - Online word of mouth

Advertising format	Share of advertising coming from this format								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Display related	**78%**	**72%**	**60%**	**42%**	**39%**	**34%**	**32%**	**34%**	**33%**
Banners	48%	36%	29%	21%	19%	20%	22%	21%	21%
Sponsorships	28%	26%	18%	10%	8%	5%	3%	3%	2%
Rich media	2%	2%	5%	8%	10%	8%	7%	8%	7%
Slotting fees	0%	8%	8%	3%	2%	1%	0%	0%	0%
Digital video	0%	0%	0%	0%	0%	0%	0%	2%	3%
Search	**1%**	**4%**	**15%**	**35%**	**40%**	**41%**	**40%**	**41%**	**45%**
Classifieds	**7%**	**16%**	**15%**	**17%**	**18%**	**17%**	**18%**	**16%**	**14%**
Lead generation	**4%**	**2%**	**1%**	**1%**	**2%**	**6%**	**8%**	**7%**	**7%**
E-mail	**3%**	**3%**	**4%**	**3%**	**1%**	**2%**	**2%**	**2%**	**2%**
Interstitials	**4%**	**3%**	**5%**	**2%**	**0%**	**0%**	**0%**	**0%**	**0%**
Other	**3%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Total (million $)	8,087	7,134	6,010	7,267	9,626	12,542	16,879	21,206	23,400

Ad Formats Definitions: Display ads on websites look like those in newspapers and magazines. A **banner** is a space (usually rectangular) on a web page that shows the advertiser's message; this category includes all display ads except for the other specialized categories listed below it. **Sponsorships** represent custom content and/or experiences created for an advertiser that may or may not include ad elements (for example, reskinning a section of a website with the advertiser's branding). **Rich media** refers to advertisements that incorporate animation, sound, and/or interactivity in any format. **Slotting fees** are the fee charged for premium ad placement and/or exclusivity. **Digital video format** includes commercials that appear in live, archived, and downloadable streaming content. **Search** refers to paying Internet companies to present an advertisement linked to a specific search word or phrase. It includes paid listings (text links appear at the top or side of search results for specific keywords); contextual search (text links appear in an article based on the context of the content rather than on the basis of a user-submitted keyword); and paid inclusion (guarantees that a marketer's URL is indexed by a search engine). Although this data source includes "contextual advertisements" in the search category, these ads are targeted display ads that are not based on the use of a search engine and are treated as part of display ads in the remainder of this paper. Contextual advertisements accounted for about 8 percent advertising revenue in 2008. "**Classifieds**" refer to the posting of a product or service in an online listing for a fee. "**Lead generation**" indicates referrals to qualified purchase inquiries. **E-mail ads** include banner ads, links, or advertiser sponsorships that appear in commercial e-mail communication. **Interstitials** are ads displayed during a transition from one Web page to the next.

Examples of online ads

‣ **Advertising on search site**

- ‣ Second price auction for adwords
- ‣ Bids ranked, and slots allocated with highest first
- ‣ Pay per click
- ‣ Price depends on word ($99 for mesothelioma; typically $0.4)

‣ **Advertising on other websites**

- ‣ Pay per view for display
- ‣ Media site: $12 per 1000 impressions
- ‣ Social networks historically lower: $0.5 per 1000 impressions
- ‣ Large firms find own advertisers for display.
- ‣ Otherwise use advertising network (e.g. Doubleclick)

Market Structure

	What	Who	Examples
Advertiser	Producing ads	Advertising agencies and creative tools	Ominicom Group, WPP Group plc, Interpublic, Publicis
	Managing ad campaigns, sending ads to publishers	Advertiser tools	DoubleClick, Google, aQuantive
	Matching advertisements to inventory and setting prices	Intermediation, direct sales, ad networks, ad exchanges	Speigel's sales force, Valueclick, Google, Right Media, DoubleClick
	Managing publisher inventory, serving ads into ad space	Publisher tools	DoubleClick, Google, aQuantive, 24/7 Real Media
Eyeball	Attracting eyeballs with content	Publishers	Liberto.it, Spiegel.de, FT.com, engadget.com

Advertising

Theory

Motives for Advertising

- ## Informative (e.g. restaurants)
  - Inform customers of products existence
  - Advertise specific features or price
  - Signal quality through commitment to product
- ## Persuasive (e.g. branded drugs)
  - Change customer's view of product
  - Jam their memory, so first think of your product.
- ## Importance of advertising depends on type of good
  - Search good – inform of existence, jam memory of customer
  - Experience good – persuade customer quality will be high

Intensity of Advertising

- The intensity of advertising varies a lot across industries
  - Breakfast cereals - advertising is 10% of revenue
  - Salt - advertising is essentially 0% of revenue
- Amount of advertising depends on
  - The sensitivity of demand to advertising
  - The markup
  - The efficiency of advertising
  - Whether advertising helps your firm, or helps all firm.
- The sensitivity depends on
  - The amount of product differentiation
  - Search vs. experience good
  - Market concentration

How Measure Sensitivity/Effectiveness?

- Existing Data ("Secondary Research")
  - Investor reports: annual report data, financial info, etc.
  - Scan data, databases, set top boxes, subscriber lists, public company data
- Analytics (Behavioral data)
  - Internal databases
  - Digital behaviors
  - Trend data
  - Behavioral patterns
- New Data ("Primary Research")
  - Quantitative – surveys, social monitoring
  - Qualitative – Focus groups, online chats, in-home interviews
  - Measurement – real behaviors, not self reported

10/15/2015

Advertising Strategy

- Single firm
    - Suppose advertising shifts the demand curve.
    - Care about the WTP of the marginal customer.
    - Analogous to vertical differentiation.
    - Like quality, advertising is also investment in brand equity.
- What if there are many firms?
- Advertising about features can soften price competition
    - Consumers realize products differentiated.
    - Spurious product differentiation (e.g. Nutrasweet vs. generics)
- Advertising about prices can increase price competition
    - If prices known, firms can cut price to get more customers.

Advertising – The Platform's Perspective

- Suppose you are Facebook, Twitter, or the NYTimes
  - Key formula: Value = #users × engagement × $/unit
- Raise number of users
  - Appeal to new demographic; add value to new customers
- Raise engagement
  - Add new features
- $/unit
  - Raise quality of ad via better targeting
  - Make ads more integral
- How should Facebook, Twitter, NYTimes, best raise value?