Privacy economics, attitudes, and behavior

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& Rebecca Balebako
September 9, 2014

8-533 / 8-733 / 19-608 / 95-818: Privacy Policy, Law, and Technology
Today’s Agenda

• Quiz
• IRB and Human Subjects Research
• Economics of Privacy
• Privacy Attitudes
• Privacy Survey and Behavioral Studies
By the end of class, you should be able to:

• Understand the review process of doing privacy research on human subjects

• Understand the difficulties in measuring privacy preferences and behavior

• Critically evaluate studies on privacy preferences or behavior
Human subjects research
Institutional Review Board

• Reviews human subjects research to make sure it is ethical and human subjects are protected

• Takes time and lots of paperwork

• Before submitting paperwork to IRB, you must complete human subjects training

• [http://www.cmu.edu/research-compliance/human-subject-research/](http://www.cmu.edu/research-compliance/human-subject-research/)
IRB approval

• Research involving human subjects requires IRB approval
• Surveys are exempt, but you must ask IRB for exemption
• Exempt and low-risk IRB approval usually happens within 2 weeks
• High risk usually takes about a month, but may be longer
• Whenever possible, design study so participants sign informed consent form up front
  – You will have to convince IRB that there is a good reason not to
• Submit your IRB form as early as possible
  – You can submit an amendment later
Ethical considerations

• Sometimes tests can be distressing
  – users have left in tears

• You have a responsibility to alleviate
  – make voluntary with informed consent
  – avoid pressure to participate
  – let them know they can stop at any time
  – stress that you are testing the system, not them
  – make collected data as anonymous as possible
Economics of privacy
Financial Transactions

• Buyer and seller example [Varian 1996]
  – Buyers want sellers to know what they want so they can reduce their search costs
  – Buyers do not want sellers to know their maximum willingness to pay
  – Buyers don’t want to be annoyed by sellers and don’t want to spend time hearing about products they don’t want (excess search costs)
  – Sellers don’t want to waste time pitching products to people who don’t want them
Externality

- The actions of a mailing list buyer impose costs on individuals on that list
- The seller of the list ignores those costs
- Varian says: Costs could be mitigated through choice
Incentives to reveal information

• Sometimes it is not to buyer’s advantage to reveal personal characteristics

• Seller should structure incentives to
Contracts and markets for info

• What if we had property rights in information about ourselves?
  – We could contract to allow information to be used for only specified purposes
  – We could buy and sell these property rights
    • National Information Market [Laudon 1996]
  – What about transaction costs?
Public interest in personal information

• Public records
  – Court records
  – Tax assessments
  – Salaries of public officials

• What happens when information goes online and transaction costs approach zero?
Privacy attitudes
Consumer surveys to measure privacy attitudes

- Westin/Harris surveys
  - Privacy fundamentalist, pragmatist, unconcerned (marginally concerned)

- TRUSTe surveys

- Academic research

- Does it matter what consumers think?
Privacy concerns seem inconsistent with behavior

• People say they want privacy, but don’t always take steps to protect it

• Many possible explanations
  – They don’t really care that much about privacy
  – They prefer immediate gratification to privacy protections that they won’t benefit from until later
  – They don’t understand the privacy implications of their behavior
  – The cost of privacy protection (including figuring out how to protect their privacy) is too high
How do we measure privacy behaviors?

• Self reported behaviors
  • Web surveys
  • Lab studies
• Field experiments
• Natural experiments
Ways to measure disclosure in a web survey

- Social Desirability Scale (SDS)
- Unethical Behaviors
- Sensitive Questions
- Gift Cards
Social Desirability Scale

• 33 items “No matter who I’m talking to I’m always a good listener”

• “There have been occasions when I feel like smashing things”

• High Social Desirability Score = Low disclosure

Unethical behavior

• Types of behavior: Financial, Illegal, Sexual

• Answer choices
  – Yes
  – No
  – Prefer Not to Answer

Sensitive Questions

- Essay questions
- Rated by independent judges 0-4

Gift Cards

- Willingness to pay for anonymous versus identified gift card

Measuring Behavior in lab studies
Effect of privacy info on purchasing

Will the salient display of privacy information cause consumers to take privacy into account when making online purchasing decisions?


- J. Tsai, S. Egelman, L. Cranor, and A. Acquisti. The Effect of Online Privacy Information on Purchasing Behavior: an Experimental Study. Information Systems Research. Published online 2010.
Research questions

• Do privacy icons influence purchase decisions?
• Will people pay for privacy?
Laboratory study

- 24 students recruited for “online shopping study”
- Paid $10 plus reimbursement for purchases made with their own credit cards
- Participants used “Shopping Finder” search engine
  - Control condition (no privacy icons)
  - Experimental condition (privacy icons)
- Asked to search for 6 outlet surge protector
But maybe we should have them search for something more privacy sensitive?
Power Strips, Prophylactics, and Privacy, Oh My!

1. **Trojan Shared Sensation Spermicidal Condoms - 12 Pack**
   Trojan Shared Sensation Spermicidal Condoms - 12 Pack - Unique Shared Sensation Design for the Pleasure and Excitement of Both Partners: Alternating rows of raised bumps and ridges for her - Flared ...
   store.yahoo.com/eprice/trojsharsens.html - Cached - Privacy Policy - Similar Pages

2. **Trojan Shared Sensation Condoms**
   Purchase Trojan Shared Sensation condoms at QuikCondoms.com for discount prices and free shipping! Product Description: The Trojan Shared Sensation is part of the latest trend in condom design; with condoms companies ... QC Price. Qty. Trojan Shared Sensation Lubricated 12 Pack. 11.99 ... https://www.quikcondoms.com/product.jsp?id=151 - Cached - Similar Pages

3. **Trojan Shared Sensation Lubricated Latex Condoms - 12 Condoms | Vitcost**
   Trojan Shared Sensation Lubricated Latex Condoms - 12 Condoms - Pleasure for Both Partners. Unique Shared Sensation Design for the Pleasure and Excitement of Both Partners: alternating ...
   www.vitcost.com/TrojanSharedSensationLubricatedLatexCondoms - No Cache - Privacy Policy - Similar Pages

4. **Trojan Shared Sensation Spermicide Condoms - 12 Pack**
   Trojan Shared Sensation Condoms feature a stimulating lubricant that enhances sensual pleasure for both partners. The Shared Sensation lubricant is activated by natural body oils.
   www.gamelink.com/sitemap/inkt_ref/title/230424.html - No Cache - Similar Pages

5. **Trojan Shared Sensation Spermicidal Condoms**
   Spermicidal Condoms > Trojan Shared Sensation Spermicidal Condoms. Trojan Shared Sensation Spermicidal Condoms ... Size: 12 Retail Pack. Trojan Shared Sensation Spermicidal Condoms ... www.condomave.com/trojan-shared-sensation-spermicidal-lubricated-condoms-condom.html - Cached - Privacy Policy - Similar Pages

6. **Trojan Shared Sensation Condoms 12 PK**
   ... Trojan Shared Sensation Condoms 12 PK. Lubricated Unique Shared Sensation is design for the pleasure and excitement of ... Trojan Ultra Pleasure 12 pack ...
   www.abcondoms.com/trshsecos12pk.html - Cached - Privacy Policy - Similar Pages

7. **Trojan Shared Sensation Lubricated - 12 pack**
   Shared Sensation Lubricated Trojan Condom supplies pleasure and excitement of both partners. It has alternating rows of raised bumps and ridges for her, and a flared design that’s roomy at the tip for him.
   store.yahoo.com/loveessentials/trojsharseni.html - Cached - Privacy Policy - Similar Pages
Sites selected for purchases

- **Power strips**
  - **Control**: 1 purchase, 2 purchases
  - **Experimental**: 1 purchase, 6 purchases

- **Number of purchases**: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

- **Legend**:
  - No bird
  - Red
  - Green

Experimental vs. Control:
- Experimental site: 6 purchases by Red
- Control site: 2 purchases by Green

- Experimental site: 5 purchases by Red without bird
- Control site: 1 purchase by Green without bird

- Experimental site: 1 purchase by Red with bird
- Control site: 2 purchases by Green with bird
Good, but we can do better

• Provide fixed payment rather than reimbursement to create price incentive

• Make price/privacy tradeoff more clear
  – Display price in search results
  – Order results based on price and privacy
  – Eliminate confusion about blank indicator

• Test whether people are attracted to pretty indicators

• Find more privacy-sensitive items to purchase
User Study Items

Would Not Purchase | Purchase, Very Concerned | Purchase, Somewhat Concerned | Purchase, No Concerns

Textbooks
Office Supplies
Flowers
Shoes
Laptop
Lingerie
Condoms
Lubricant
Book - Depression
Pregnancy Test
Book - Bankruptcy
Fertilizer
Adult Diapers
Hunting Knife
Cigarettes
Bottle of Peroxide
Sex toys
HIV test
Porn DVD
STD Medication
Bulletproof jacket
Bullets
Bomb-Making
Condition 1
No information

Duracell Alkaline Battery, AA, 8/PK
Duracell Coppertop Alkaline AA Batteries Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players
www.ccvsoftware.com/c/product.html?record@56119

$14.45 (w/shipping)

Duracell AA8 DURACELL - Alkaline Batteries Value Packs
Duracell AA8 DURACELL Alkaline Battery Value Packs...
discountofficeitems.zoovy.com/product/DURMN15RT12Z

$14.60 (w/shipping)

Duracell Alkaline Battery Value Packs
Duracell AA8 DURACELL Alkaline Battery Value Packs DURACELL AA ALKALINE BATTERY - 8 PACK Cardboard card for peg hook 8 pack Specifications Weight: 0.45 lbs Length 4.5 inches Width 3.75 inches Height 1 inches Manufactures Web site www.duracell...
www.instawares.com/Coppertop-Alkaline-Lithium-Bat...

$14.80 (w/shipping)

Duracell Coppertop Alkaline AA Batteries
Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players, medical equipment, toys and electronic games. Dependable after seven years of storage.
www.officequarters.com/product.php/item/DUR-MN1500B8...

$15.14 (w/shipping)
### Condition 2

Irrelevant information

<table>
<thead>
<tr>
<th>Product</th>
<th>Price (w/shipping)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duracell Alkaline Battery, AA, 8/PK</td>
<td>$14.45</td>
</tr>
<tr>
<td>Duracell AA8 DURACELL - Alkaline Batteries Value Packs</td>
<td>$14.60</td>
</tr>
<tr>
<td>Duracell Alkaline Battery Value Packs</td>
<td>$14.80</td>
</tr>
<tr>
<td>Duracell Coppertop Alkaline AA Batteries</td>
<td>$15.14</td>
</tr>
</tbody>
</table>
Condition 3
Privacy information

**Duracell Alkaline Battery, AA, 8/PK**
Duracell Coppertop Alkaline AA Batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players.

Privacy premium: $0.69 4.8%

**Duracell AA8 DURACELL - Alkaline Batteries Value Packs**
Duracell AA8 DURACELL Alkaline Battery Value Packs...

$14.45 (w/shipping)

**Duracell Alkaline Battery Value Packs**
Duracell AA8 DURACELL Alkaline Battery Value Packs DURACELL AA ALKALINE BATTERY - 8 PACK
Cardboard card for peg hook 8 pack Specifications Weight: 0.45 lbs Length 4.5 inches Width 3.75 inches Height 1 inches Manufactures Web site www.duracell...
[www.instawares.com/Coppertop-Alkaline-Lithium-Bat... Privacy Policy](http://www.instawares.com/Coppertop-Alkaline-Lithium-Bat...)

$14.60 (w/shipping)

**Duracell Coppertop Alkaline AA Batteries**
Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players, medical equipment, toys and electronic games. Dependable after seven years of storage.
[www.officequarters.com/product.php/item/DUR-MN1500B8... Privacy Policy](http://www.officequarters.com/product.php/item/DUR-MN1500B8...)

$14.80 (w/shipping)

**Duracell Coppertop Alkaline AA Batteries**
Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players, medical equipment, toys and electronic games. Dependable after seven years of storage.
[www.officequarters.com/product.php/item/DUR-MN1500B8... Privacy Policy](http://www.officequarters.com/product.php/item/DUR-MN1500B8...)

$15.14 (w/shipping)
Results

% Purchases by Level of Privacy

- Batteries
- Sex Toy

Level of Privacy: None, Low, Med, High

No Information, Handicap, Privacy
Results

• Demonstrated the following:
  – Privacy can be leveraged for profit
  – Prominent privacy information reduces information asymmetry gap
  – Indicators can provide people with an ability to choose a site based on privacy
Good privacy pays for web stores

People will pay more for goods if a website does a good job of protecting their privacy, a study shows.

The Carnegie Mellon study looked at what shoppers do when they are told what sites do with personal data.

It suggests that shoppers will pay a premium equal to about $0.60 (30p) on goods worth $15 (£7) if they are reassured about privacy.

The study was used to evaluate a tool that aims to give web users clearer information about privacy policies.
Problems remain

• No significant difference between battery and sex toy purchases

• But the privacy premium for sex toys was twice the premium for batteries

• We need better control over the prices

• Time to enlist the assistance of the online vendors
Contacting vendors

• Contacted 46 battery and sex toy vendors through postal mail, fax, and phone
• Convinced 8 vendors to adjust their prices for our study
• Most raised their prices but one had to lower prices
• Promised to pay difference to vendor who lowered prices
  – Sent $140 check to The Dirty Bunny for “research project assistance”
Timing Study

• Research Question
  – Does the timing of privacy information have an impact on the value of prominent privacy information?

• Controlled for price
  – Same privacy premiums for both products

S. Egelman, J. Tsai, L. Cranor, A. Acquisti. Timing is Everything? The Effects of Timing and Placement of Online Privacy Indicators. CHI ‘09.
Duracell Alkaline Battery, AA, 8/PK
Duracell Coppertop Alkaline AA Batteries Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players.
www.littleofficesupply.com/durm1500b82.html - Privacy Policy

$15.50 (w/shipping)

Duracell AA8 - Alkaline Batteries
Trusted Everywhere, Delivers long-lasting, dependable quality in wide range of everyday devices. For general use; Battery Size: AA; For Use With: General Use. Coppertop Alkaline Batteries, 1.5v, 8 Batteries per Pack, AA
www.instawares.com/coppertop-alkaline-lithium-batt... - Privacy Policy

$15.75 (w/shipping)

Duracell Alkaline Battery 8-Packs
Duracell A8 DURCELL Alkaline Battery Value Packs DURCELL AA ALKALINE BATTERY - 8 PACK Cardboard card for peg hook 8 pack Specifications Weight 0.45 lbs Length 4.5 inches Width 3.75 inches Height 1 inches Manufactures Web site www.durcell...
www.officequarters.com/product.php/item/DUR-MN150082/D... - Privacy Policy

$16.00 (w/shipping)

Duracell Coppertop Alkaline AA Batteries
Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players, medical equipment, toys and electronic games. Dependable after seven years of storage.
www.ontimesupplies.com/Duracell_Coppertop_Alkaline_Batteri... - Privacy Policy

$16.25 (w/shipping)

AA8 DURCELL DURCELL AA ALKALINE
Manufacturer: DURCELL Model: A8DURCELL Part Number: A8 DURCELL UPC: 41333825014 Cardboard card for peg hook Dimensions: 4.5x3.75x1 Comments...
www.shopfoodex.com/duracell-batteries-count-p-31250.html - Privacy Policy

$17.04 (w/shipping)
Coppertop Alkaline Batteries, AA, 8/pack
Go to: ontimesupplies.com
Go back to search results
Results

• Privacy information had the greatest impact when presented alongside search results

• Privacy-sensitive nature of product has an impact on the amount of desired privacy
Privacy and the control paradox

• What is the control paradox?
• Which actually gives you more control?
  – Control over release of personal info
  – Control over access and use of personal info
• What did the study find?
• When does control enhance privacy? When does it reduce privacy?
Disfluent fonts (typesets)

• Do you eat apples?

• Do you eat apples?

Is it the typeset or the type of statistics? Disfluent font does not reduce self-disclosure
Learning from Authoritative Security Experiment Results (LASER) Workshop
Disfluent font did not change disclosure behavior

\[ p = .91 \]

\[ p = .21 \]

\[ p = .04 \]  \quad p = .03 \]

\[ p = .81 \]  \quad p = .83 \]

\[ W\]]
Smart, Useful, Scary, Creepy: Perceptions of Behavioral Advertising

Blase Ur, Pedro G. Leon, Lorrie Faith Cranor, Richard Shay, and Yang Wang

SOUPS 2012
Research goals

• Gain insight into what users think about online behavioral advertising (OBA)
• Identify how participants’ mental models correspond with notice and choice mechanisms
Methodology

• 48 participants

• Recruited from the Pittsburgh, PA region
  – Non-technologists
  – Interested in testing privacy tools

• Combination semi-structured interview and usability study

• Part way through interview showed WSJ video to inform participants about OBA
Participants unaware of OBA

• Participants believed ads were tailored, but only based on context or on a single site
Participants unaware of OBA

- Participants believed ads were tailored, but only based on context or on a single site

- Thought it was only hypothetical
  - “I guess if they were monitoring what I did on the Internet... But I’d hope they weren’t...”
Didn’t recognize OBA icon

• Not sure what would happen if they clicked on icon
  – Express interest in product
  – Purchase your own ads
  – Go to product’s website
  – See related ads
Mixed opinion about OBA

• Recognized benefits
  – Advertisers can reach consumers interested in their products
  – Consumers find things they’re interested in and don’t get ads for things they’re not interested in

• Concerned about privacy
Beliefs about OBA

• Advertisers collect information including name, financial information, and address

• This information, along with browsing history, is stored in cookies
Participants’ impressions: available choice mechanisms

- Deleting cookies
- No options
- Antivirus software suites
- Web browser
Familiarity and trust are important

Familiar brands judged based on non-advertising activities

Unfamiliar brands not trusted
Takeaways

• Opinions about OBA mixed – both useful and creepy
• Participants did not understand OBA technologies
• Some of the worst fears based on misconceptions
• Participants did not know how to effectively exercise choice