Session 3: Consumer Privacy Expectations

Your Data, My Decision: The Privacy Impact of Anonymous Sharing Across Varying Contexts

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PennState

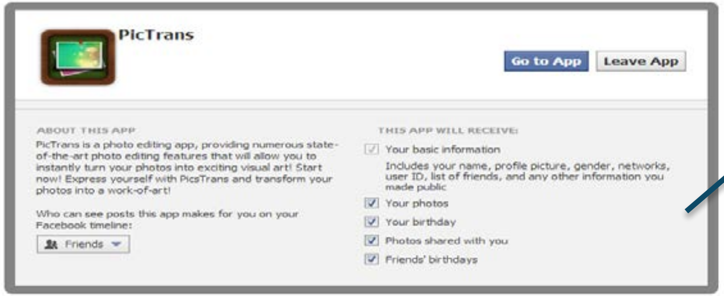
PRIVACYCON

Interdependent Privacy

- To which degree do SNS users care about friends' privacy? Are we good stewards of others' data?
  - Many decisions on SNS involve data of "friends"
- Our scenario: Third-party Apps

1 User

Decision to adopt app



ABOUT THIS APP

PicTrans is a photo editing app, providing numerous state-of-the-art photo editing features that will allow you to instantly turn your photos into exciting visual art! Start now! Express yourself with PicsTrans and transform your photos into a work-of-art!

Who can see posts this app makes for you on your Facebook timeline:

Friends ▾

THIS APP WILL RECEIVE:

☑ Your basic information

Includes your name, profile picture, gender, networks, user ID, list of friends, and any other information you made public

☑ Your photos

☑ Your birthday

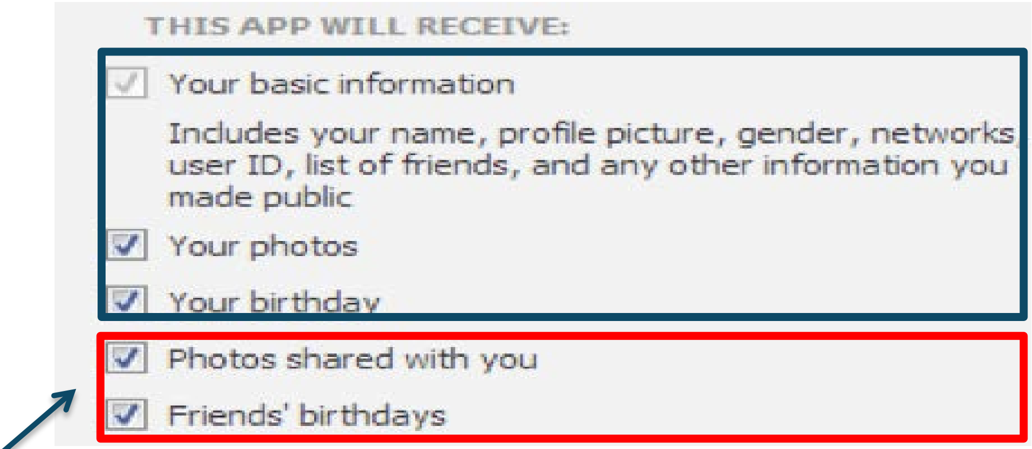
☑ Photos shared with you

☑ Friends' birthdays

Data of user made accessible

Third-Party Company

Direct decision-making path


THIS APP WILL RECEIVE:

☑ Your basic information

Includes your name, profile picture, gender, networks, user ID, list of friends, and any other information you made public

☑ Your photos

☑ Your birthday

☑ Photos shared with you

☑ Friends' birthdays

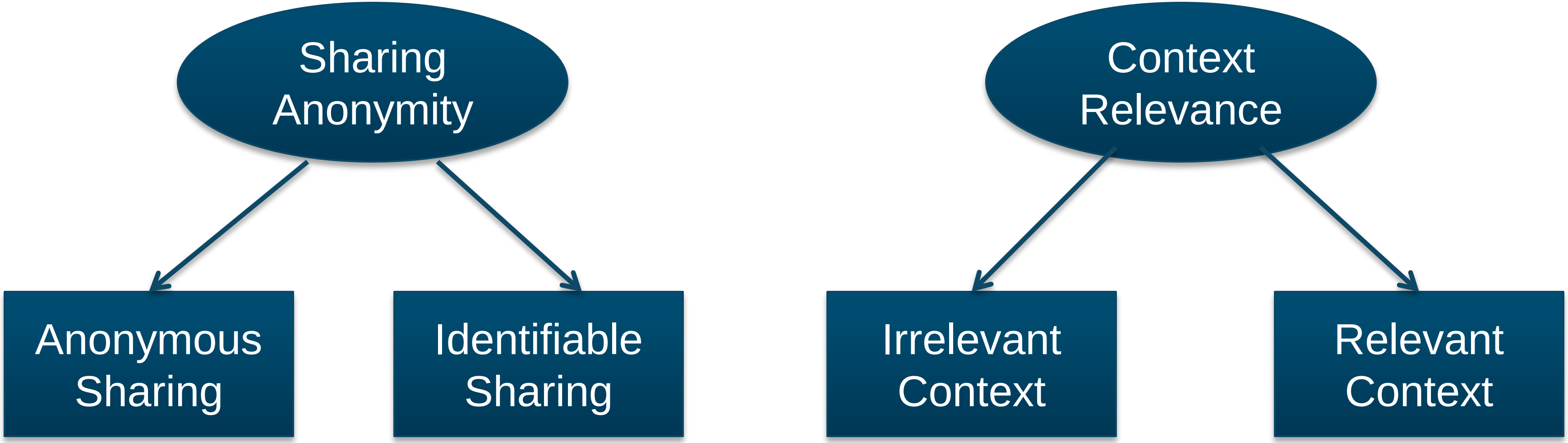
Data of 250 - 300 friends made accessible as well

Only very limited influence over decision

Approach

- Quantify the monetary value app users place on friends' personal profiles on SNS
  - Measured with *conjoint analysis* method
- Survey constructs to develop behavioral model to explain valuations
  - Model built with *Structural Equation Modeling*

Experimental Treatments



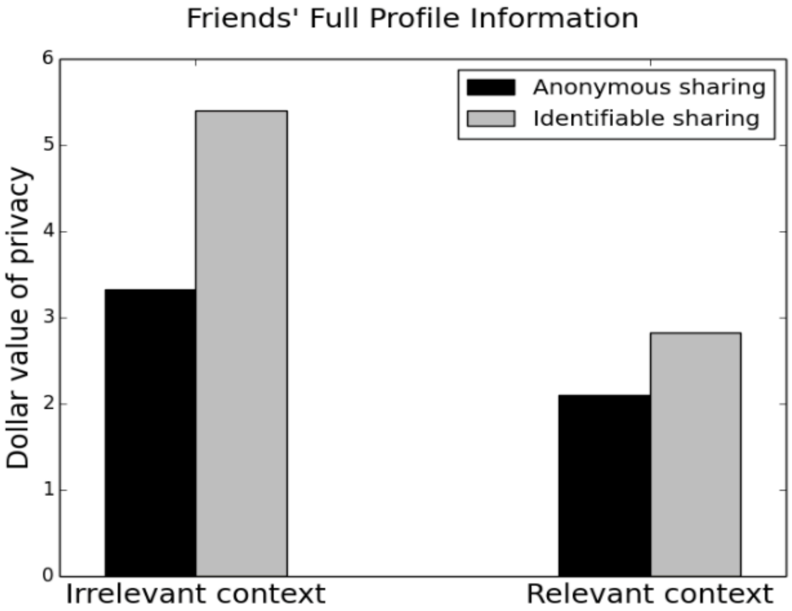
Effects of Sharing Anonymity and Context Relevance

Sharing Anonymity:
p = 0.025

Context Relevance:
p = 0.002

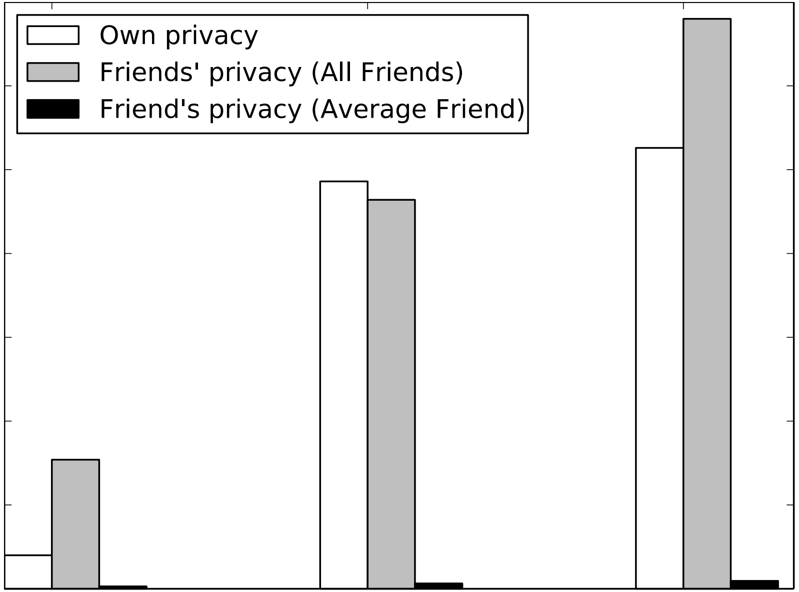
Detect the same effects for:

- Friends’ basic profile information
- Friends’ valuable information



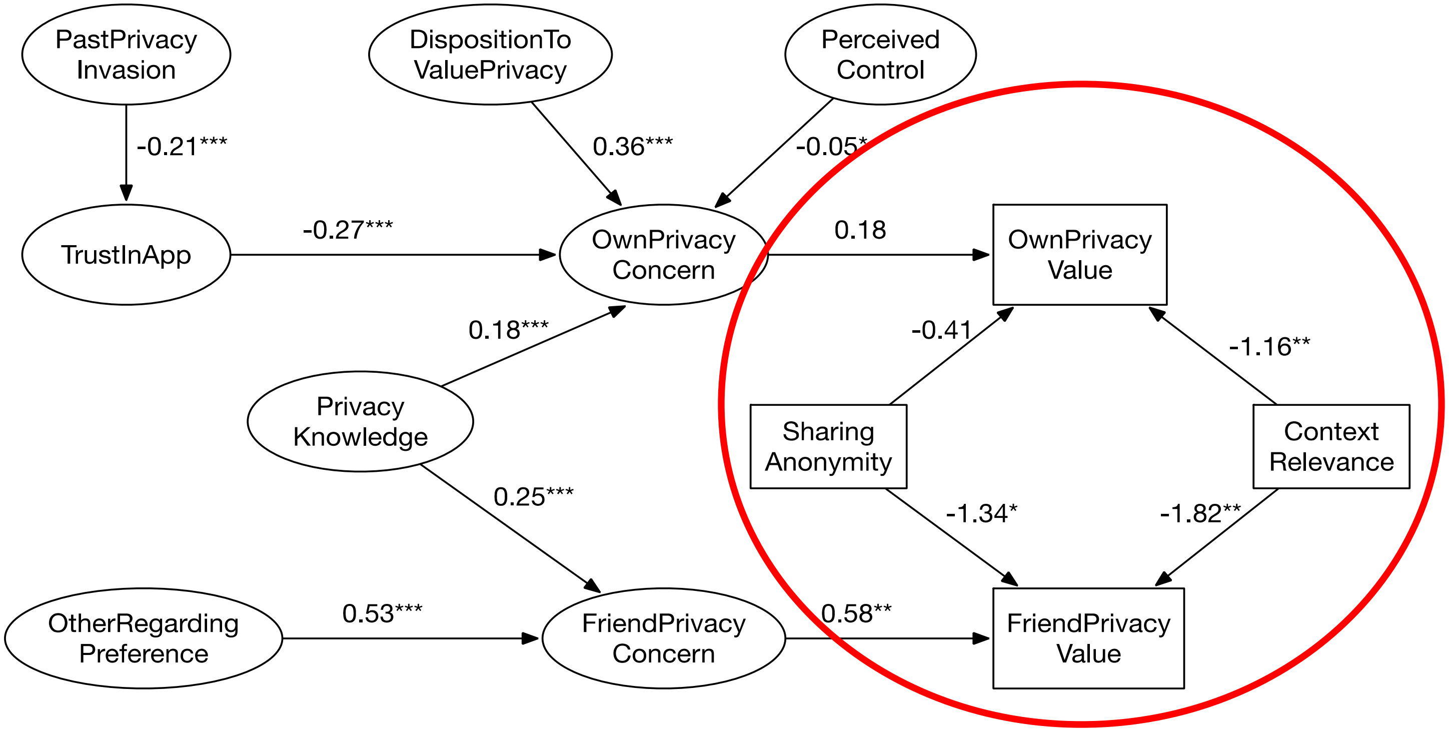
Value of Single Friend’s Data

Privacy Egoist



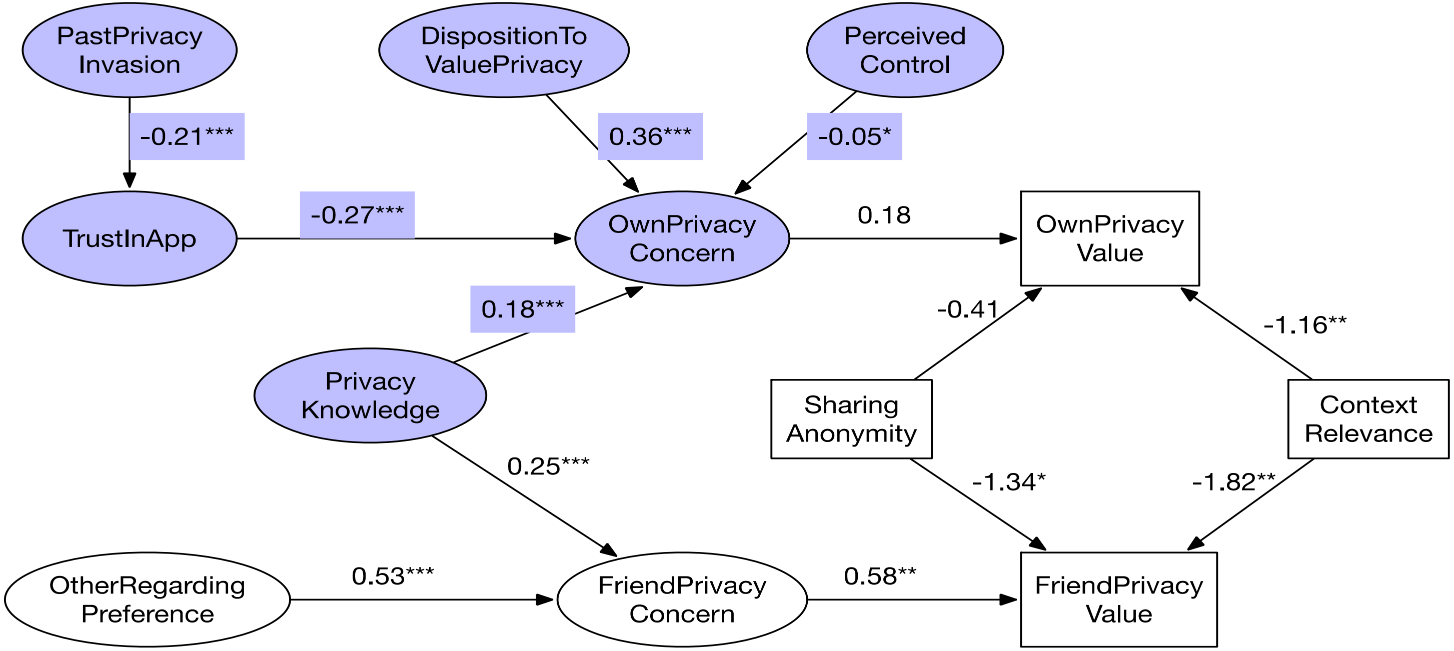
Data aggregated across treatments (same effects for different treatment groups)

Explain Interdependent Privacy Values



* p <0.05, ** p < 0.01, *** p < 0.001

Factors Driving Concern Towards Own Privacy



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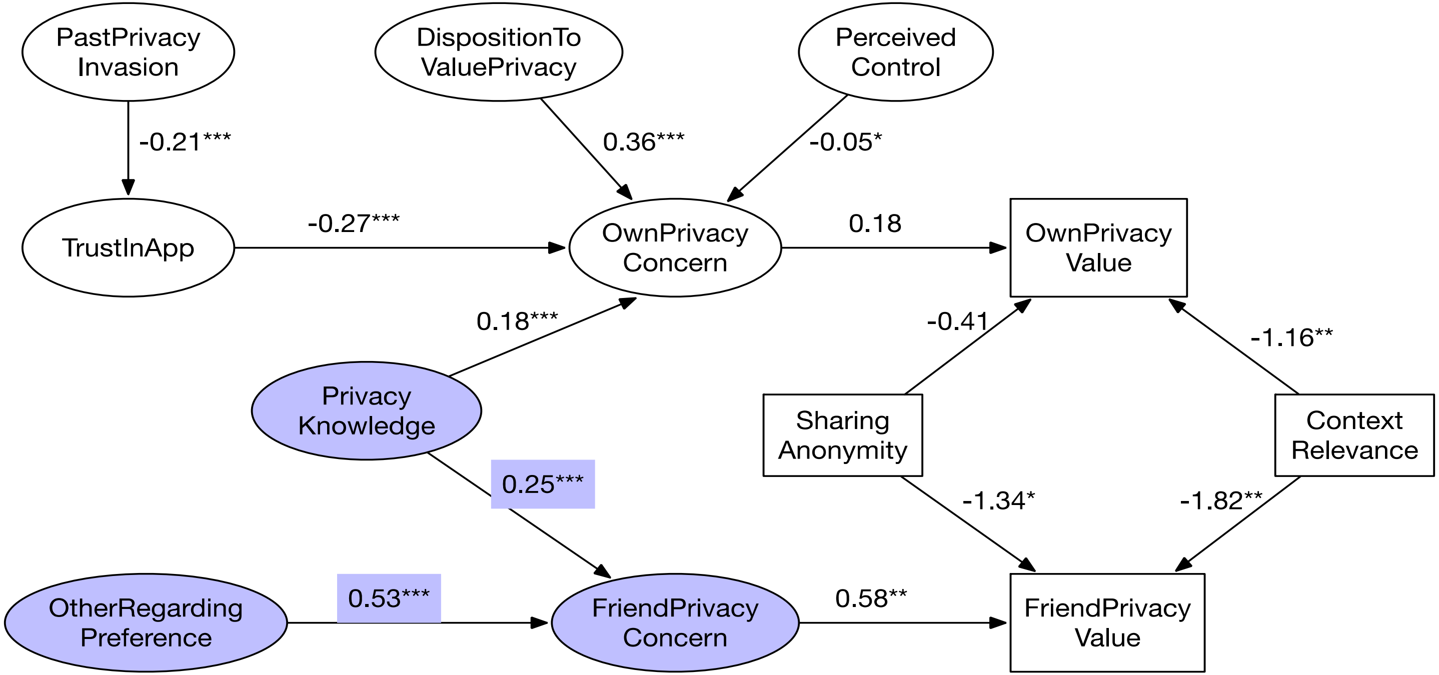
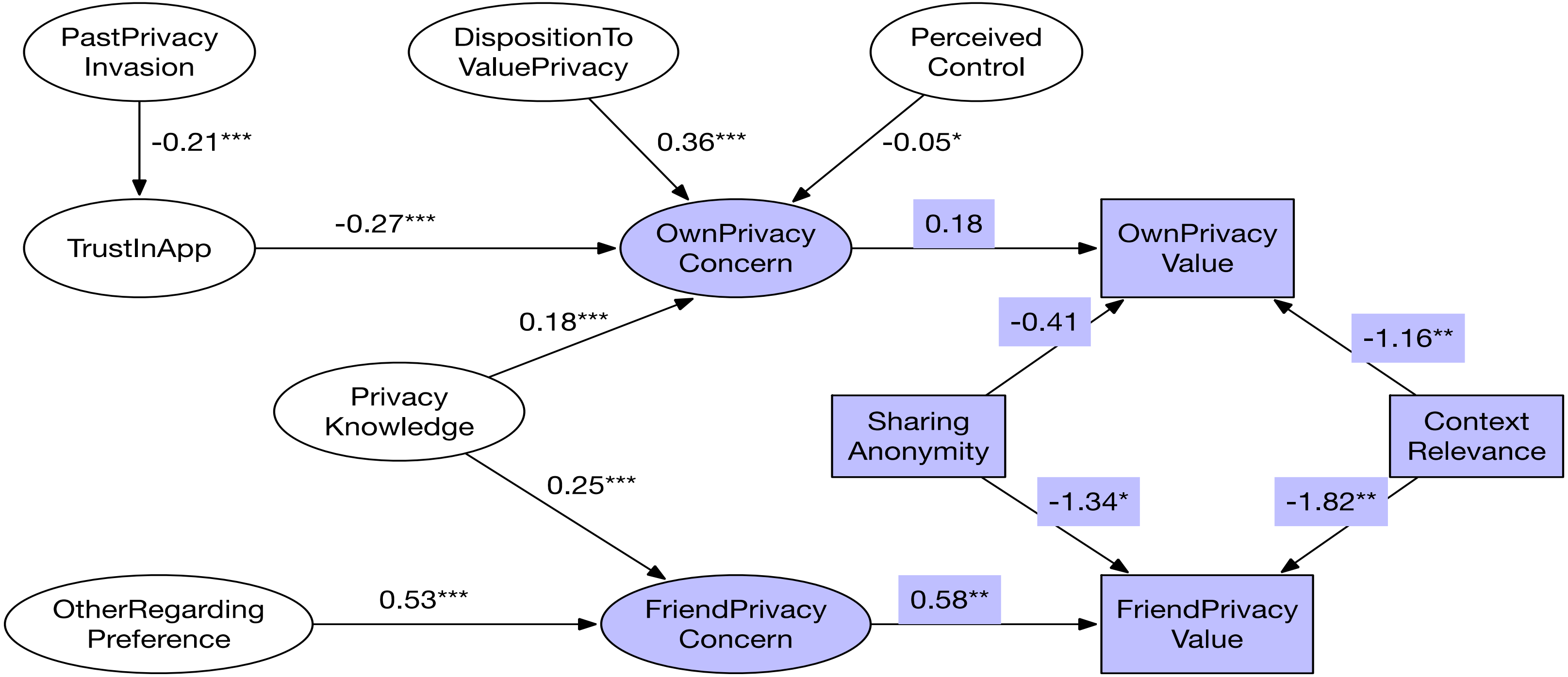
Factors Driving Concern Towards Friends' Privacy



* p <0.05, ** p < 0.01, *** p < 0.001

Factors Driving Privacy Valuation



* p <0.05, ** p < 0.01, *** p < 0.001

Lessons Learned - Policy

- App users are “privacy egoists”

  --> Limit the collection of friends’ data

  - What interventions are suitable?

  - Can app platforms (SNS) self-regulate interdependence?

- Privacy knowledge impacts interdependent privacy valuations

  --> Consider introducing policies which integrate interdependent privacy in educational programs

Lessons Learned – Privacy by ReDesign

- Data collection contexts affect how users value their friends’ information

  --> *Call for mechanisms that inform users of apps’ data practices*

- Sharing anonymity plays an important role in interdependent privacy valuations

  --> *Suggests designs that inform users of whether sharing friends’ information will be later discoverable*

Related Publications/Replications

1. **Yu Pu, and Jens Grossklags. Valuating Friends' Privacy: Does Anonymity of Sharing Personal Data Matter? 2016 (Working Paper).**

2. Yu Pu, and Jens Grossklags. Sharing is Caring, or Callous? In *15th International Conference on Cryptology and Network Security (CANS)*, 2016.

3. Yu Pu, and Jens Grossklags. Towards a Model on the Factors Influencing Social App Users' Valuation of Interdependent Privacy. In *16th Privacy Enhancing Technologies Symposium (PETS)*, 2016.

4. Yu Pu, and Jens Grossklags. Using Conjoint Analysis to Investigate the Value of Interdependent Privacy in Social App Adoption Scenarios. In *Proceedings of the 36th International Conference on Information Systems (ICIS)*, 2015.

It’s creepy, but it doesn’t bother me

Chanda Phelan, Cliff Lampe, Paul Resnick

University of Michigan

This research was funded by Google’s Social Interactions Focused Program

PRIVACYCON

The intuitive process

System 1

- generates impressions
- automatic
- fast
- often emotionally charged

The reasoning process

System 2

- generates judgments
- conscious
- slower
- may be governed by logic

Intuitive concern

- emotional
- fast (“gut feeling”)
- may not be able to articulate reasons

Considered concern

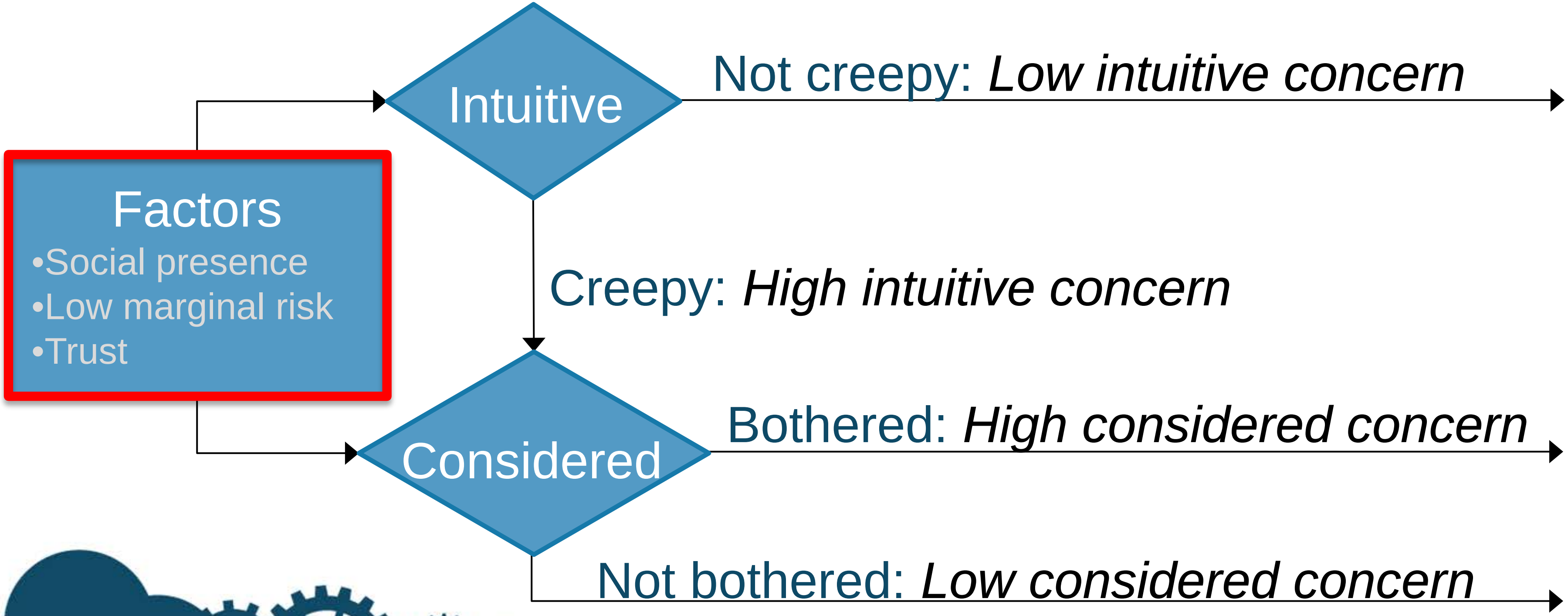
- assessment of how problematic
- may include explicit cost-benefit analysis
- doesn’t always happen

Interviewer: Would it change how you felt about [MT] if it read your messages?

S05: ***Oh, definitely. That’s pretty invasive****.*

Interviewer: What do you think is different?

S05: [pause] Good question. ***I don’t… [know] how to explain it****. It’s just...* ***I guess it's a matter of knowing who is going to see it.*** *[…] It would be kind of, just like...* ***I don't know, it just kinda makes me less comfortable.***



Factors

- Social presence
- Low marginal risk
- Trust

Intuitive

Not creepy: *Low intuitive concern*

Creepy: *High intuitive concern*

Considered

Bothered: *High considered concern*

Not bothered: *Low considered concern*

Factor: **Social presence**

“The fact that people know where I've been to […] the fact that there's somebody behind me, trailing me, it's just a little scary.” (S27)

“I don’t know. […] it’s just like a weird thing to think about that someone’s sort of watching you, whatever you’re doing.” (S04)

Factor: **Social presence**

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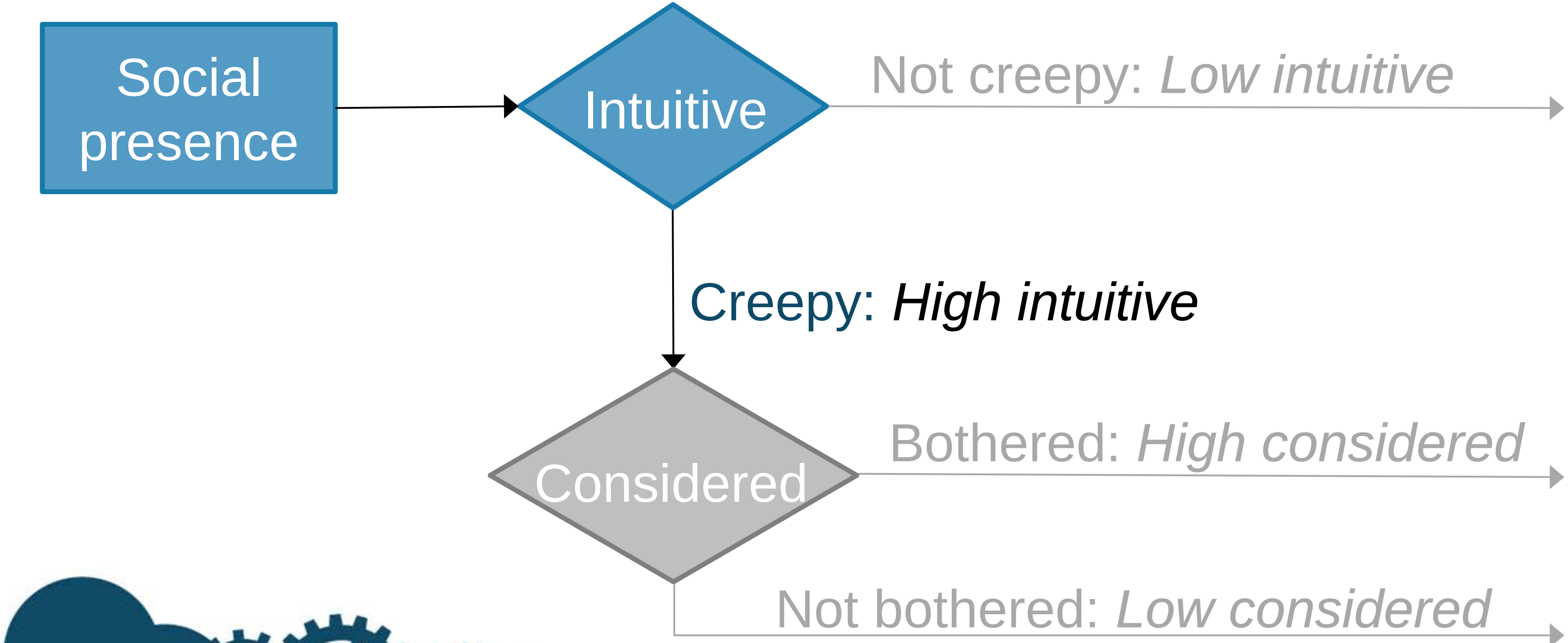
Factor: **Social presence**



Social presence

Intuitive

Not creepy: *Low intuitive*

Creepy: *High intuitive*

Considered

Bothered: *High considered*

Not bothered: *Low considered*

Factor: **Low marginal risk**

“All you guys were asking for was monitoring my sites and my hits, and basically a lot of other sites already do that without my permission.” (S30)

“I'm just numb to the fact that people can get information about me. I guess, it did occur to me like, ‘Oh, what if they can see my Facebook?’ […] [but in the end] I just signed up for it.” (S11)

Factor: **Low marginal risk**

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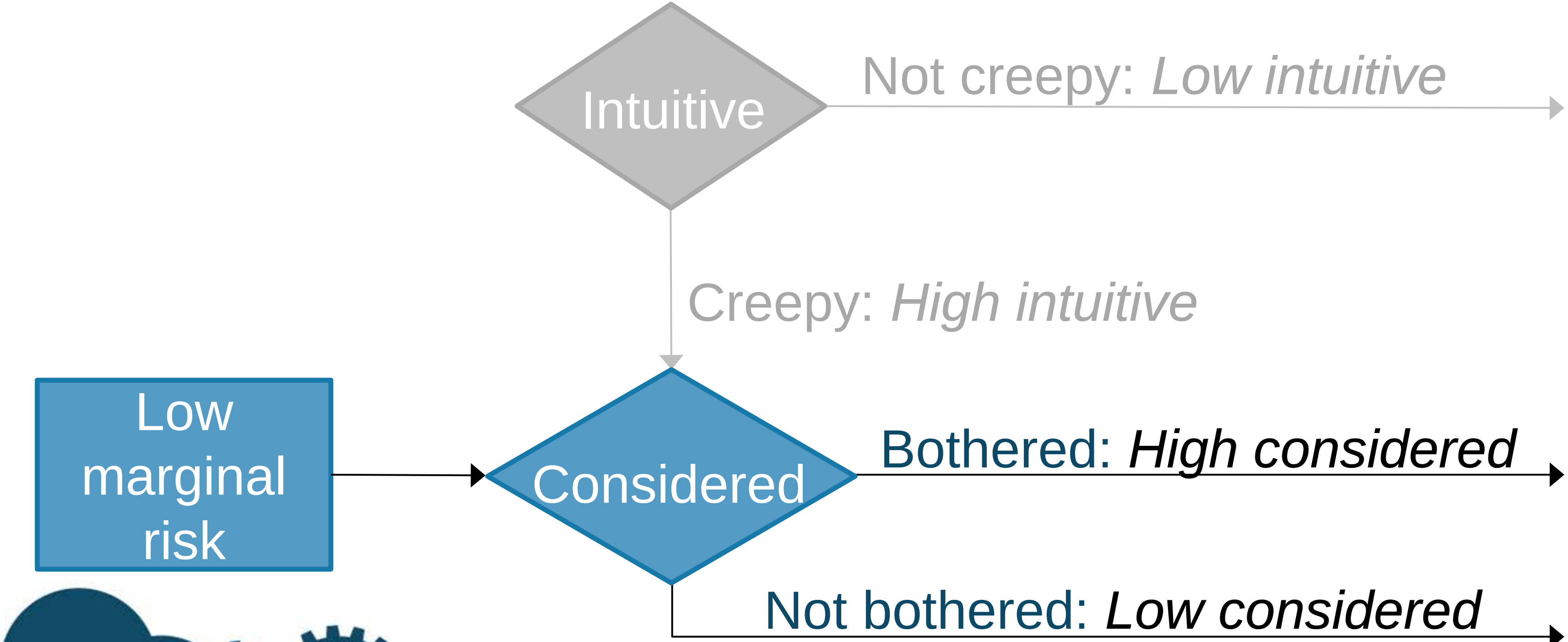
Factor: **Low marginal risk**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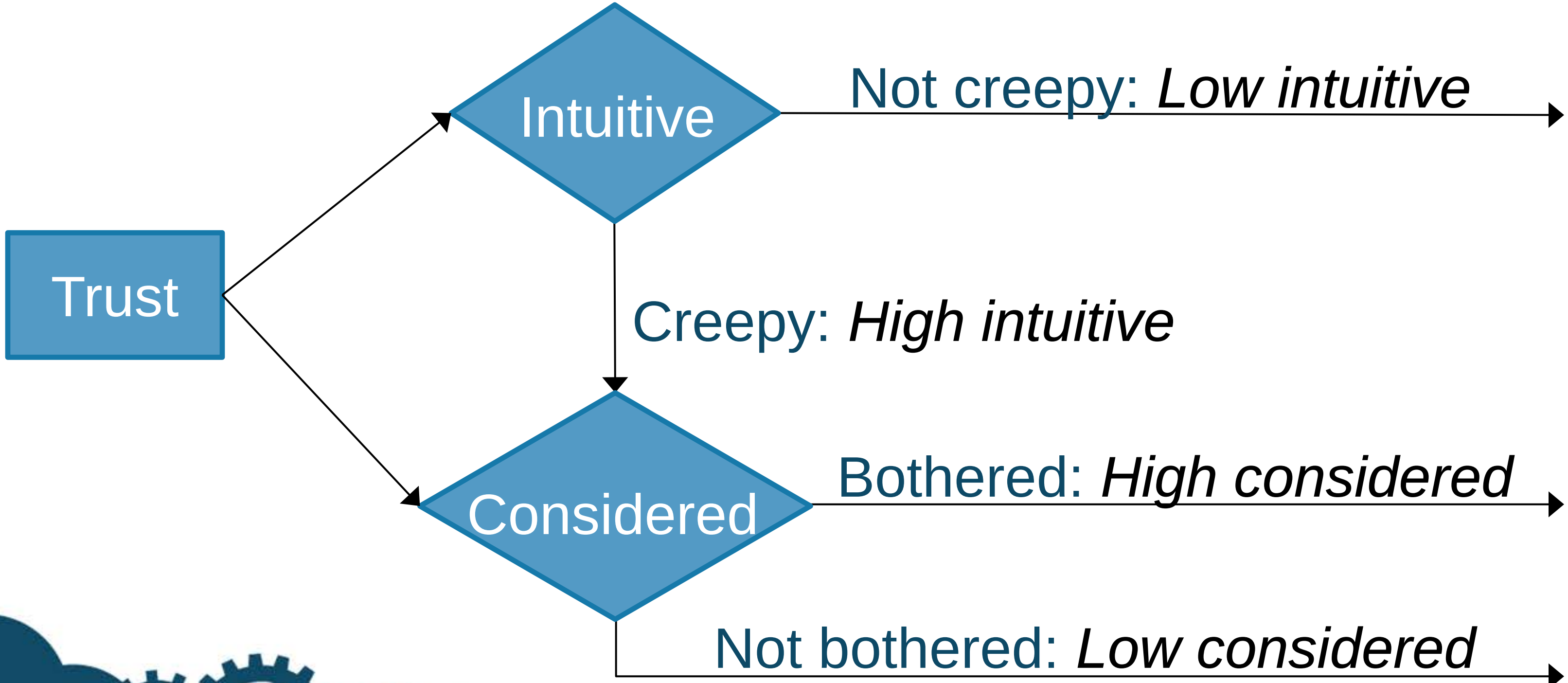
Factor: **Trust**

“*I was just flipping through, yay, whatever, install, and then when I went and looked back […] I was like, ‘Wow. They must be collecting something in my computer.’ […] So, I guess I was maybe hesitant […] I feel like that's not their motive, to collect personal information from me. […] Especially when it's coming from professors from the university, they’re trustworthy people.*” (S08)

Factor: **Trust**

“*I was just flipping through,* ***yay, whatever, install****, and then when I went and looked back […] I was like, ‘Wow. They must be collecting something in my computer.’ […]* ***So, I guess I was maybe hesitant*** *[…]* ***I feel like that's not their motive, to collect personal information from me.*** *[…]* ***Especially when it's coming from professors from the university, they’re trustworthy people.***” (S08)

Factor: **Trust**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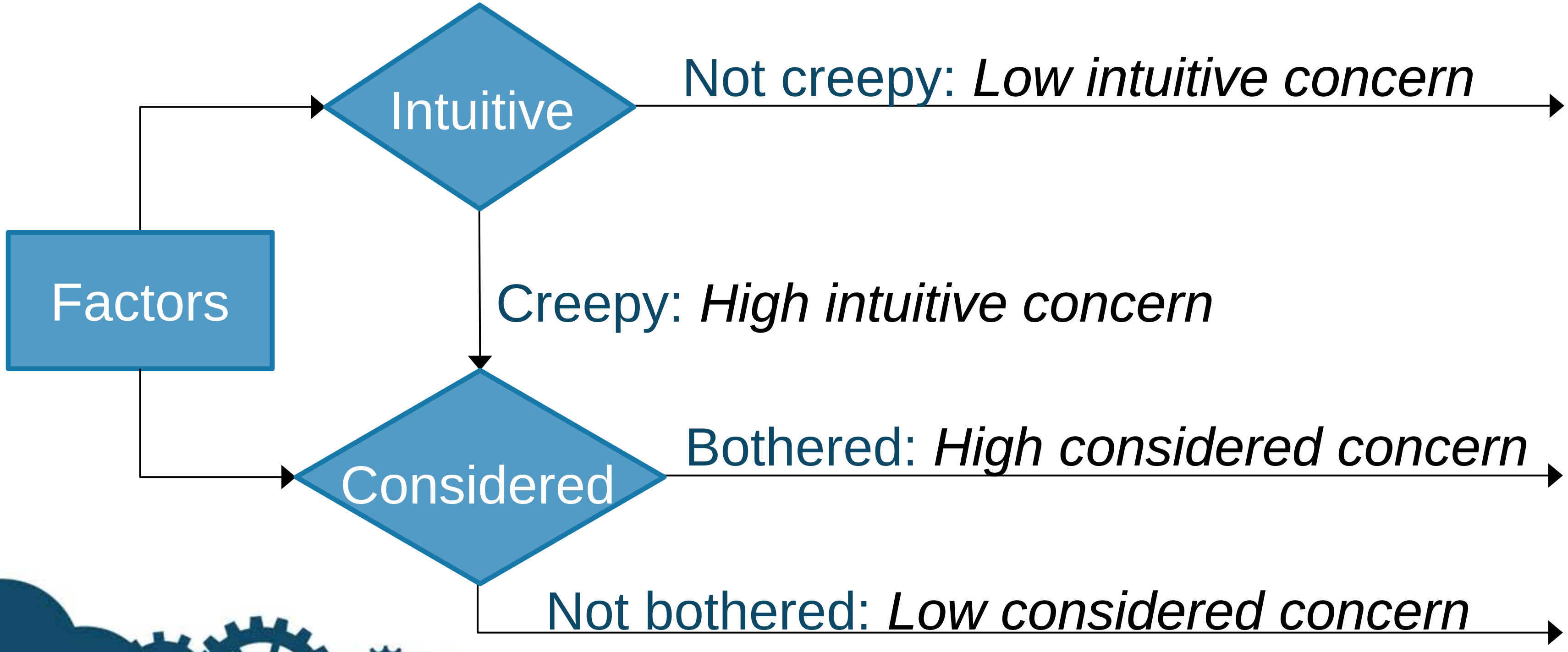

Factors

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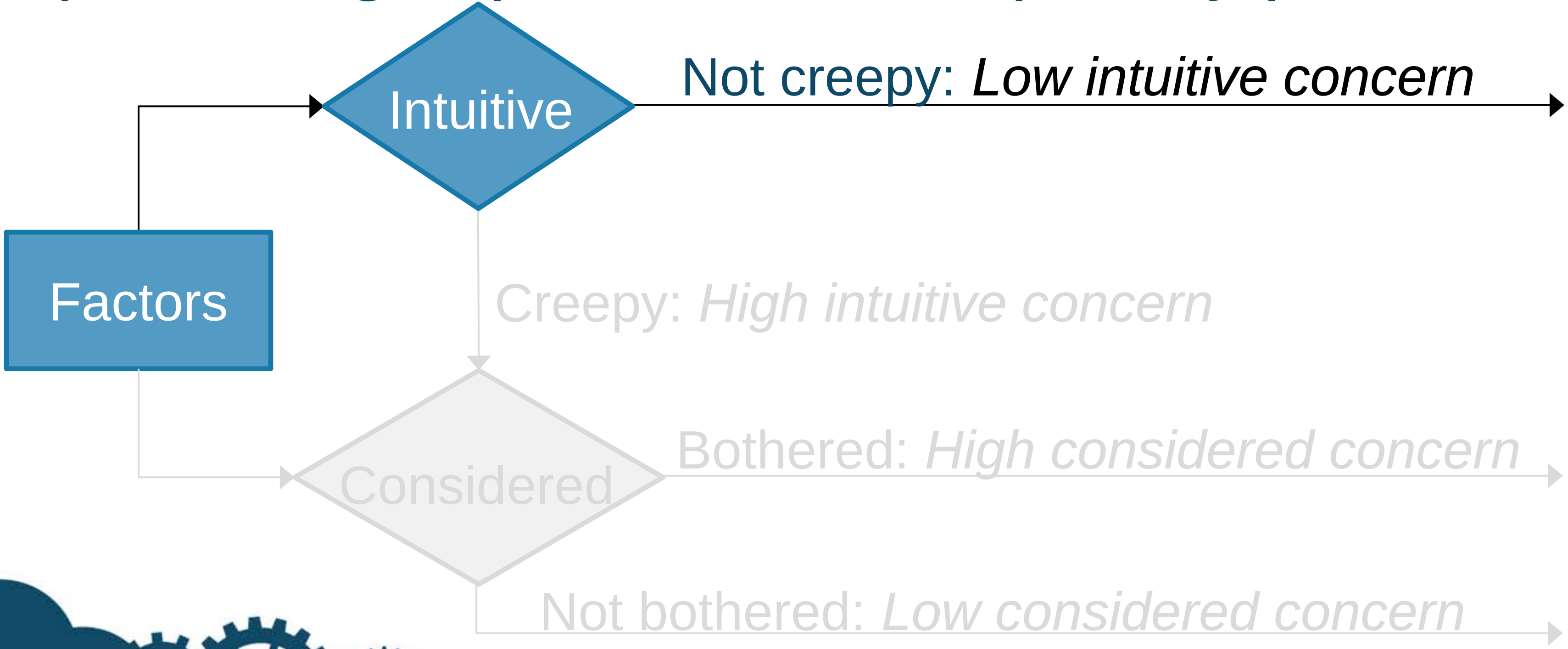
1) **Existing** explanation of the privacy paradox


Factors
Intuitive
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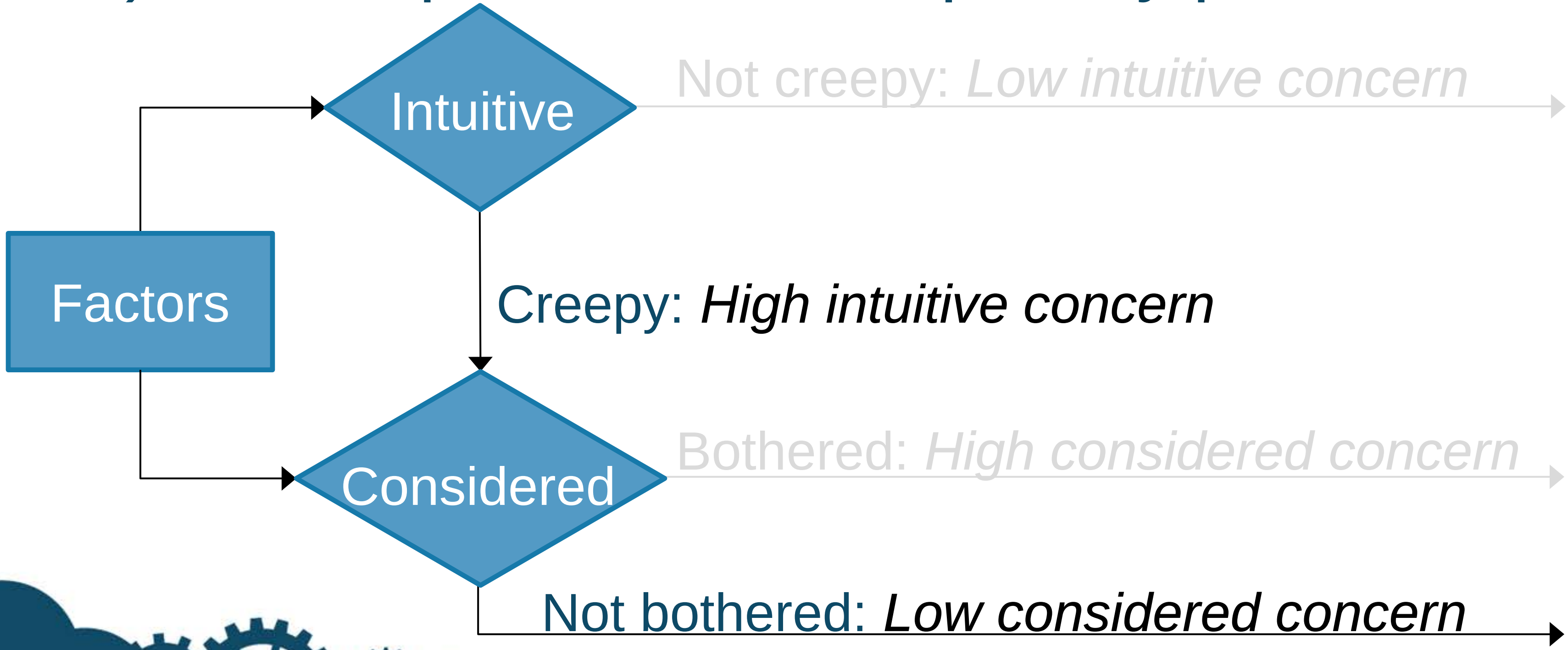
2) **New** explanation of the privacy paradox



Factors

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Practical Policy Implication: Focus on Considered Concern

- **Elicit only considered concern**
- **Encourage congruence**
  - – If **low considered concern**, encourage product owners to reduce intuitive concern
  - – If **high considered concern**, prevent product owners from reducing intuitive concern

Folk Models of Online Behavioral Advertising

Yang Wang

Syracuse University

This research was funded by National Science Foundation (#1464347)

Online behavioral advertising (OBA)

“Tracking a person’s online activities in order to deliver advertising tailored to the person’s interests”

People have mixed feelings about OBA

Don’t know what people think about how OBA works

Folk model

Models of reality used to reason and make decisions

Can be incorrect but are used by people in practice

Source: medium.com

Why folk models matter?

Understand *user attitudes*

Customize *user education*

Influence *user behavior*

Interviews

2 rounds of interviews

- How OBA works
- Information vs. trackers
- Privacy tools for OBA

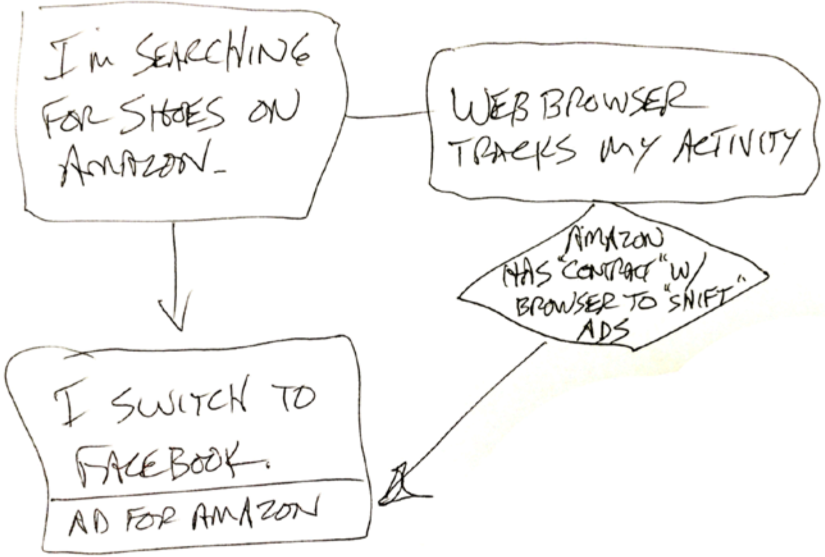
21 participants

- New York, California
- Age: 18-64 (avg. 34)
- Gender: 6 F, 15 M

Hypothetical scenario

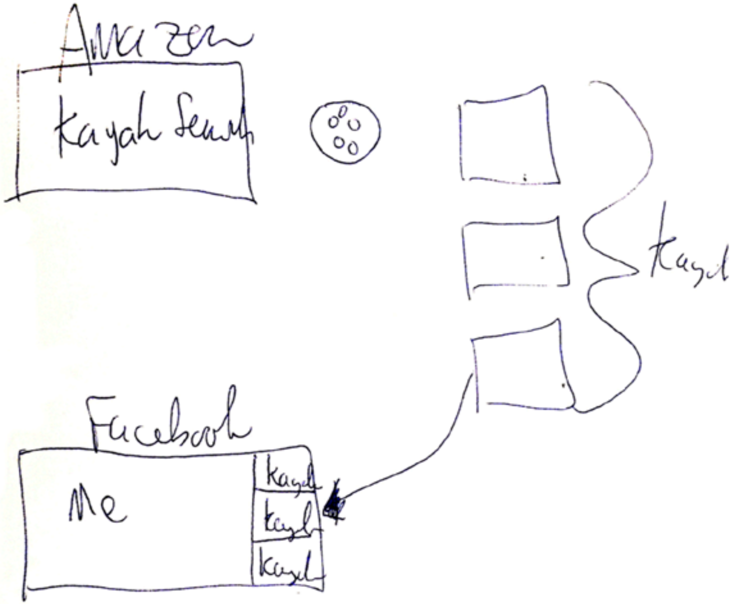
You first look for shoes on Amazon.com and a few hours later you visit Facebook and see other shoe ads there

Browser-Pull


I'M SEARCHING FOR SHOES ON AMAZON.
WEB BROWSER TRACKS MY ACTIVITY
AMAZON HAS "CONTRACT" W/ BROWSER TO "SNIFT" ADS
I SWITCH TO FACEBOOK.
AD FOR AMAZON

Browser does it all

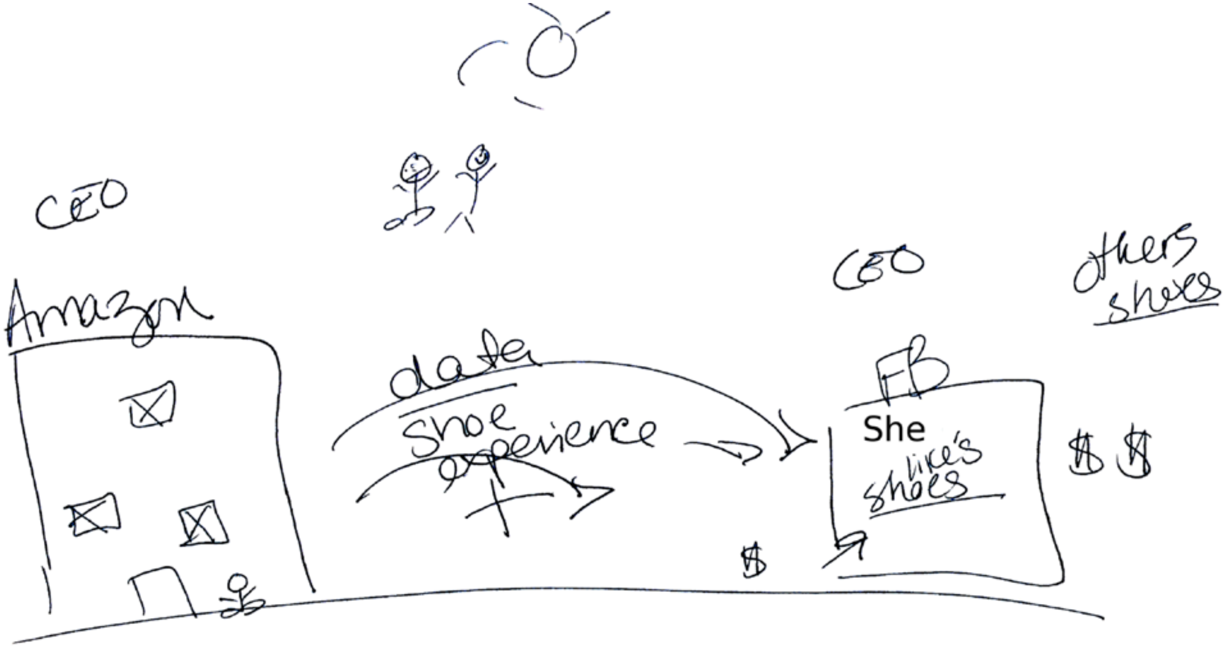
1st Party-Pull



Browser tracks and stores user info

1st-party sites pull ads

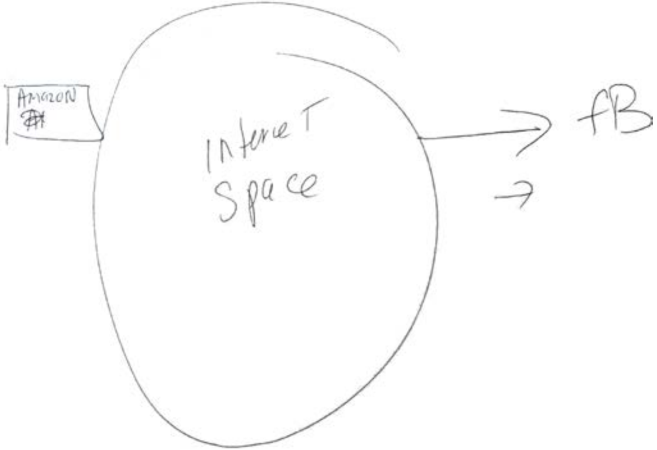
Connected 1st Party



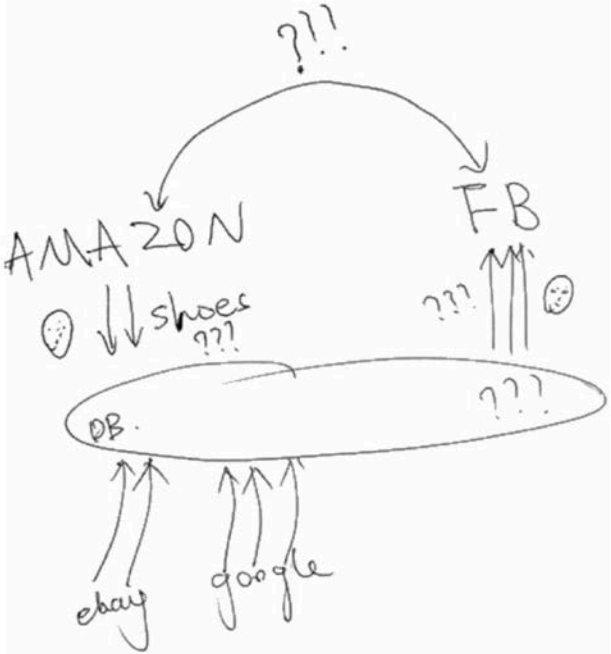
1st party does it all

1st party shares directly

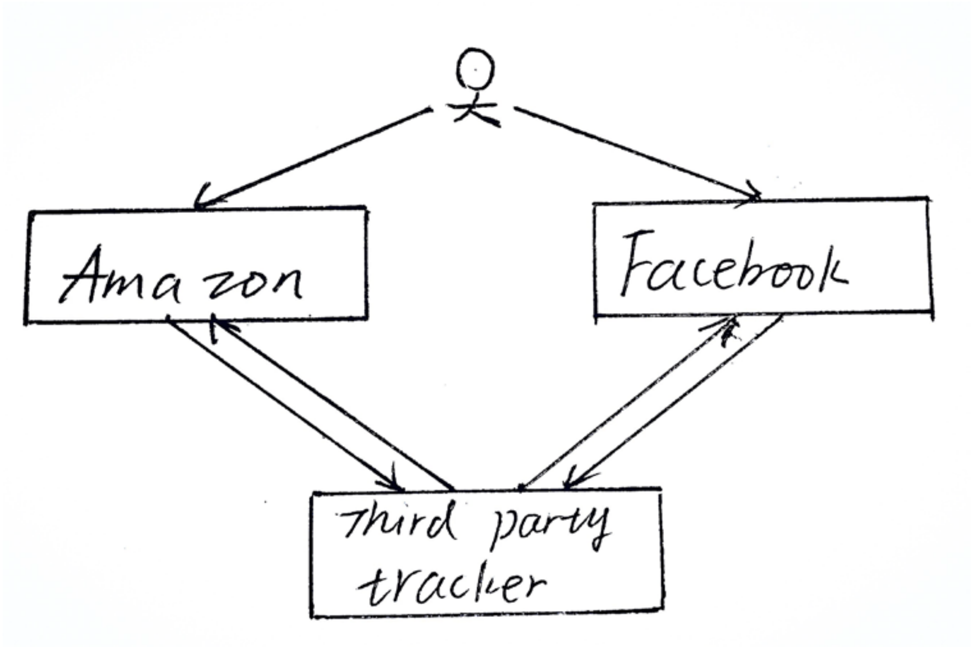
3rd Party



3rd party does it all



Common practice



Information vs. trackers

Information being tracked more important than who’s tracking it (i.e. **trackers**)

“I mean the biggest thing is the information. I mean trackers are replaceable, but information is not because that’s a specific set of info per person.”

Implications for design and policy

Tools cannot assume users know about 3rd parties

Trackers **should** clearly explain data they collect

Information-based vs tracker-based blocking

Acknowledgements

Joint work with Yaxing Yao and Davide Lo Re

Y. Yao, D. Lo Re, Y. Wang. Folk Models of Online Behavioral Advertising. CSCW 2017.

(Do Not) Track Me Sometimes: Users’ Contextual Preferences for Web Tracking

William Melicher, Mahmood Sharif, Joshua Tan, Lujo Bauer, Mihai Christodorescu*, and Pedro Giovanni Leon

Carnegie Mellon University

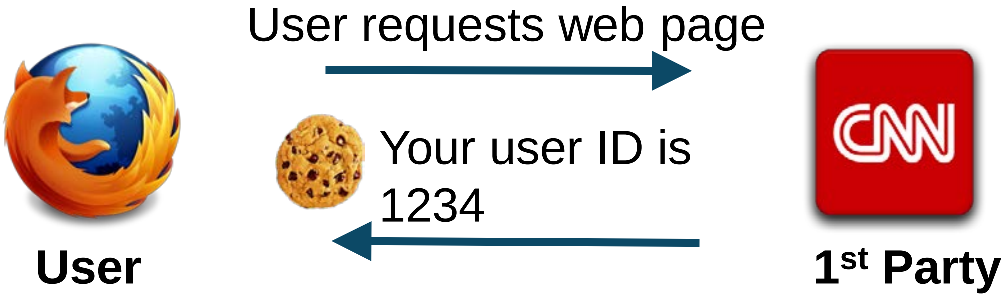
*QUALCOMM

This research was partially funded by the National Science Foundation

What Is Online Tracking?

Cookies are small tokens that store website state

- Used for: logging in, shopping carts, **tracking**



User requests web page

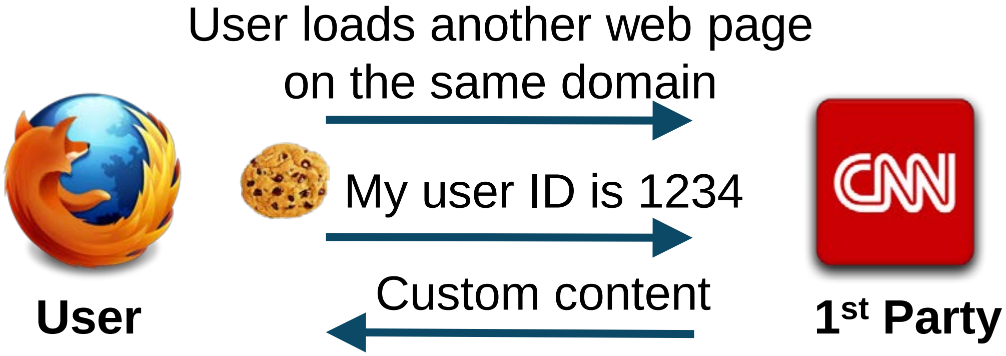
Your user ID is 1234

User

1st Party

What Is Online Tracking?

Later...



User loads another web page on the same domain

My user ID is 1234

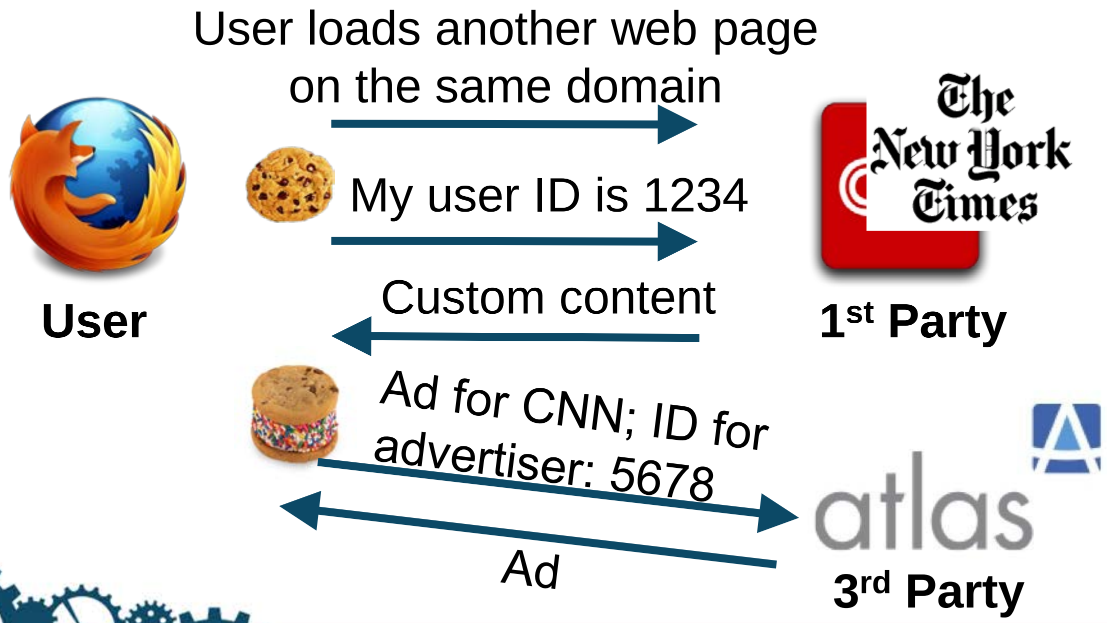
Custom content

User

1st Party

What Is Online Tracking?

Later...



User loads another web page on the same domain

My user ID is 1234

Custom content

Ad for CNN; ID for advertiser: 5678

Ad

User

1st Party

3rd Party

What do experts think about online tracking?

Proponents say:

Targeted (better) ads, customized content, social widgets, shopping recommendations

Revenue used to provide free services online

Opponents say:

Privacy concerns

Third parties can build detailed profiles about users

Can happen without users’ knowledge

But What Do *Users* Think?

Current Understanding of Users' Views

- 65% to 79% have serious privacy concerns
- Users' preferences are complex
- But, prior studies mostly in hypothetical scenarios

How do you feel about tracking …
… on a shopping website?

vs

… when you were shopping for heartburn medicine on Thursday on amazon.com?

Research Questions

In the context of users' own web history:

- What harms and benefits do users care about?
- What situational factors affect users' comfort with tracking?
- Do current tools address users' needs?
- How can we improve current tools?

Methodology

Send filtered web history

Prepare interview

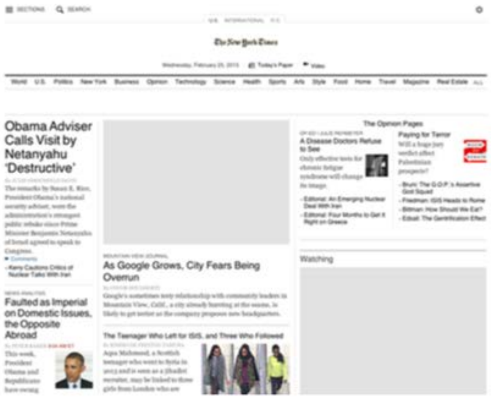
Conduct interview

- 35 semi-structured interviews
- Variety of situations:
  - News, weather, shopping, search, financial services, etc.
  - 1st and 3rd party tracking
- Two coders developed codebook and coded interviews

Methodology: Example Situation

For your *nytimes* visit:

- Benefits of tracking?
- Harms of tracking?
- Are you comfortable with tracking?



SECTIONS SEARCH

The New York Times

Today's Paper Video

World U.S. Politics New York Business Opinion Technology Science Health Sports Arts Style Food Home Travel Magazine Real Estate ALL

Obama Adviser Calls Visit by Netanyahu 'Destructive'

The remarks by Susan E. Rice, President Obama's national security adviser, were the administration's strongest public rebuke since Prime Minister Benjamin Netanyahu of Israel agreed to speak to Congress.

- Comments
- Kerry Cautions Critics of Nuclear Talks With Iran

NEWS ANALYSIS

Faulted as Imperial on Domestic Issues, the Opposite Abroad

This week, President Obama and Republicans have swung

As Google Grows, City Fears Being Overrun

Google's sometimes testy relationship with community leaders in Mountain View, Calif., a city already bursting at the seams, is likely to get testier as the company proposes new headquarters.

The Teenager Who Left for ISIS, and Three Who Followed

Aqsa Mahmood, a Scottish teenager who went to Syria in 2013 and is seen as a jihadist recruiter, may be linked to three girls from London who are

The Opinion Pages

A Disease Doctors Refuse to See

Only effective tests for chronic fatigue syndrome will change its image.

- Editorial: An Emerging Nuclear Deal With Iran
- Editorial: Four Months to Get It Right on Greece

Paying for Terror

Will a huge jury verdict affect Palestinian prospects?

- Bruni: The G.O.P.'s Assertive God Squad
- Friedman: ISIS Heads to Rome
- Bittman: How Should We Eat?
- Edsall: The Gentrification Effect

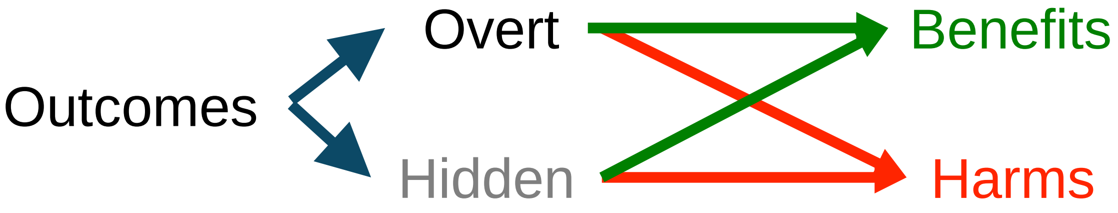
Watching

1. nytimes.com
The New York Times - Breaking News on Wed, Jan 14 07:05 PM

PRIVACYCON

Results

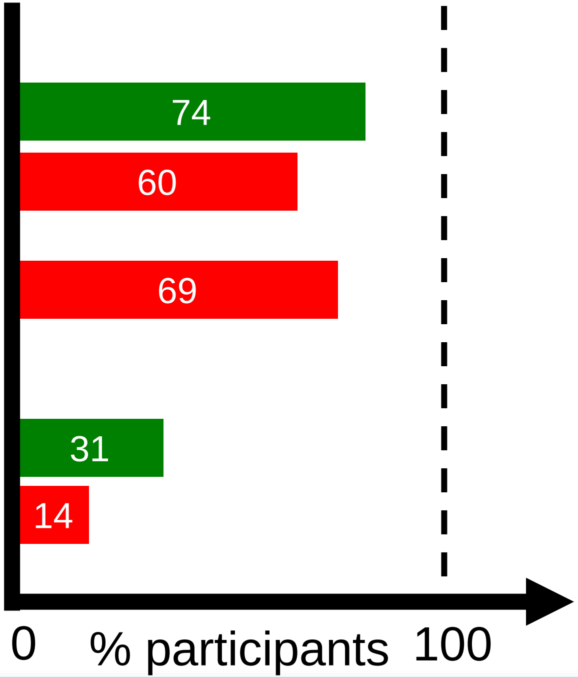
- Perceived outcomes of tracking



- Situational factors

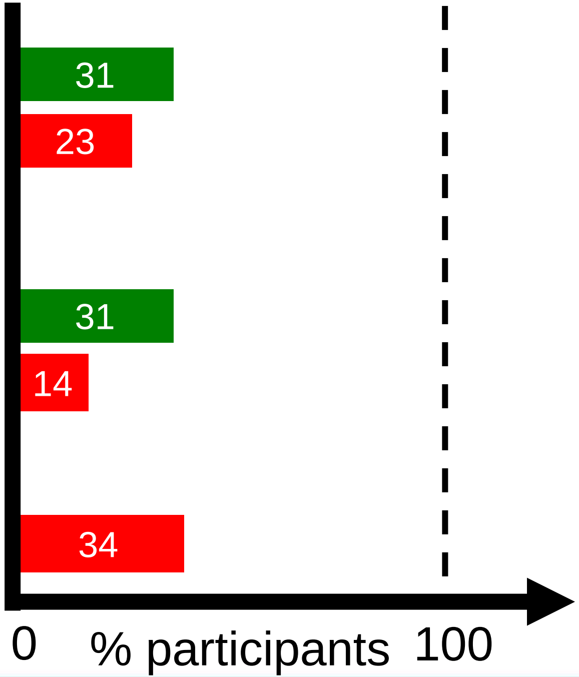
Example Perceived Outcomes: Overt

- Targeted ads
  - Beneficial: more useful, relevant
  - Harmful: annoying, others might see
- Feel “stalked”
- Customized websites
  - Beneficial: saves time, more relevant
  - Harmful: “filter bubble”



Example Perceived Outcomes: Hidden

- Company revenue
  - Beneficial: provides for free services
  - Harmful: feel used by companies
- Price discrimination
  - Beneficial: special sales, coupons
  - Harmful: maybe higher prices
- Data linked to identity
  - Harmful: privacy invasive



Outcomes vs. Comfort

- Perceived harms/benefits ↛ comfort
- Less comfortable with harms
- Hidden outcomes → least comfortable

Situational Preferences

What about specific page visits made users more or less comfortable?

- Sensitive contexts: less comfortable with 3rd party tracking than 1st
- What kind of information is tracked
- Sharing with other 1st parties

- Trust in the tracking party
- Lack of awareness of tracking
- Lack of consent to tracking
- Visit frequency to website

Tool Evaluation

- Use findings from interviews to evaluate tools

✓ Adequately address perceived harms

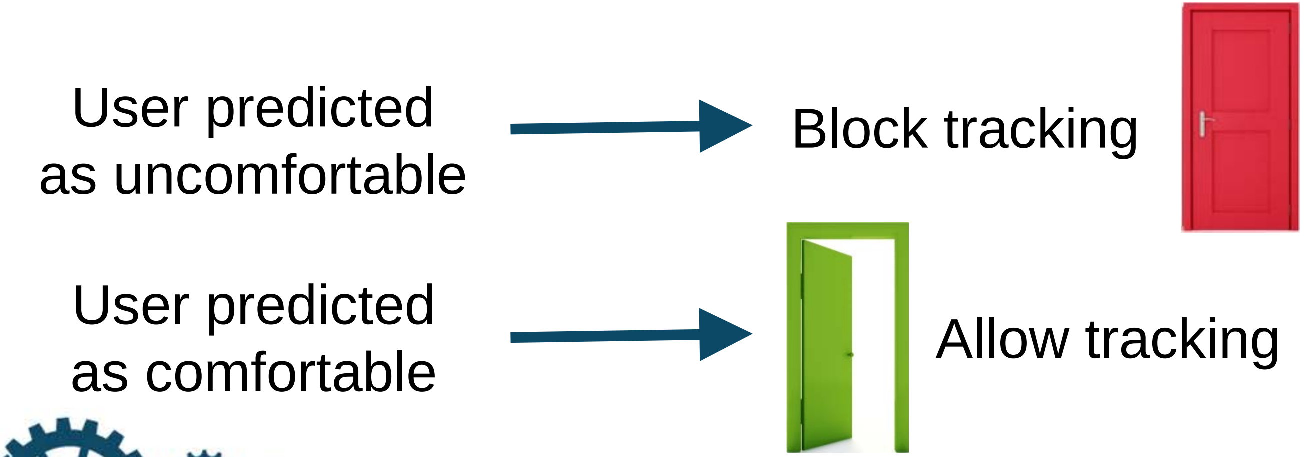
✗ Do not allow benefits

✗ Provide few controls based on situational factors

Does More Detailed Understanding of Preferences Lead to Better Tools to Control Tracking?

Situational Preference Prediction

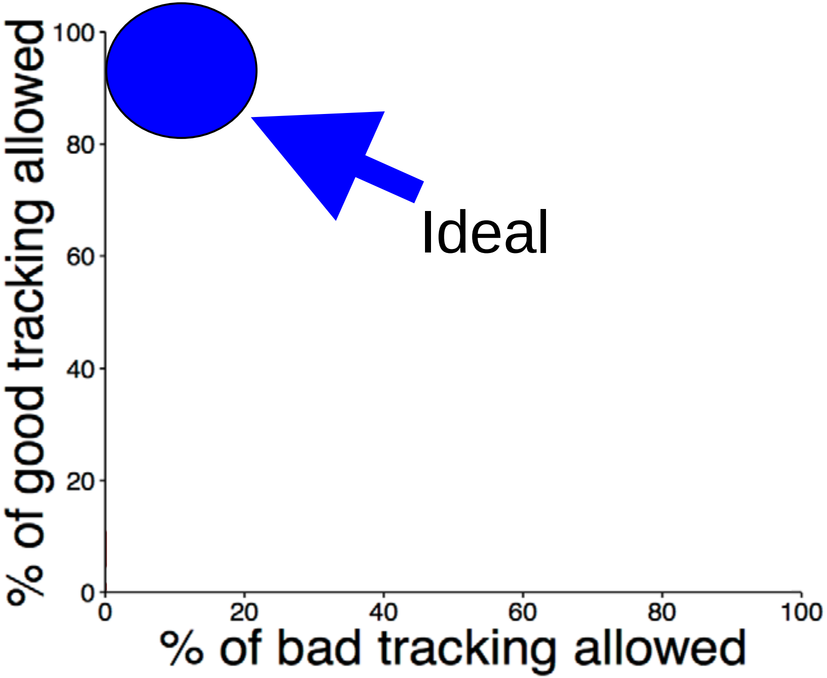
Use machine learning methods to predict comfort with tracking for a specific page visit from situational factors



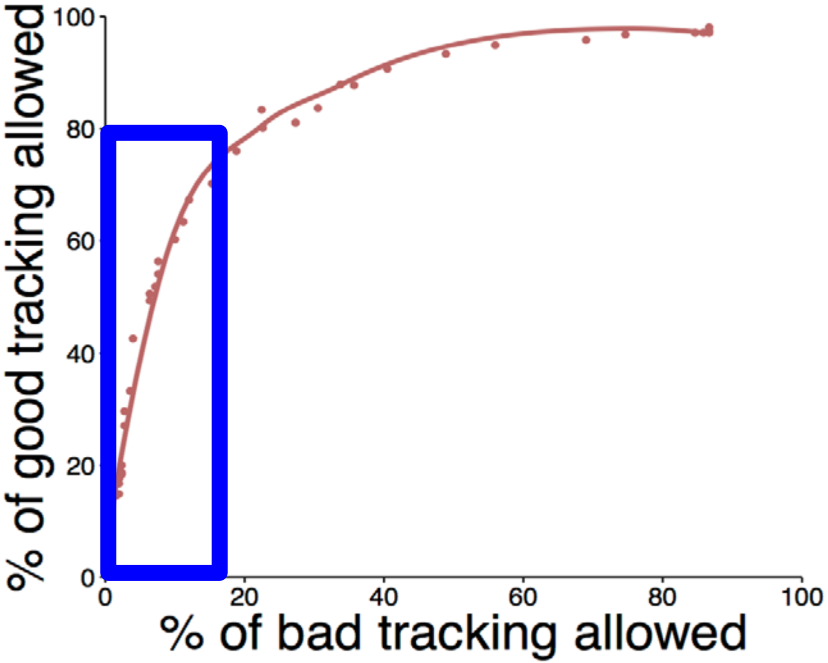
User predicted as uncomfortable → Block tracking

User predicted as comfortable → Allow tracking

Prediction Accuracy



Prediction Accuracy



(Do Not) Track Me Sometimes

- Explored users’ *in-context* preferences
  - Based on actual browsing history
  - Found outcomes, situational factors that matter
- Evaluated current tools
  - Tools don’t adequately address users’ needs
- Hope for automated preference enforcement

William Melicher, Mahmood Sharif, Joshua Tan, Lujo Bauer, Mihai Christodorescu*, and Pedro Giovanni Leon

Carnegie Mellon University *QUALCOMM

Discussion of Session 3

Presenters:

- **Jens Grossklags,** Technical University of Munich
- **Yu Pu,** The Pennsylvania State University
- **Chanda Phelan,** University of Michigan School of Information
- **Yang Wang,** Syracuse University
- **Mahmood Sharif**, Carnegie Mellon University

Moderator:

- **Lorrie Cranor,** Federal Trade Commission

LUNCH POSTER SESSION