# Lecture 19: Cookie Consent

CS 181W

Fall 2022

# Recall: Privacy as Control

Privacy is the claim of individuals, groups or institutions to determine for themselves when, how and to what extent information about them is communicated to others.

– Alan Westin
*Privacy and Freedom,* 1967

Informed Consent

policies.google.com/privacy?hl=en&fg=1

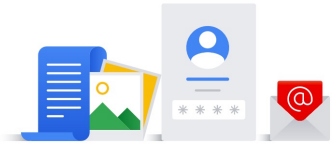
Privacy Policy

might like. The information Google collects, and how that information is used, depends on how you use our services and how you manage your privacy controls.

When you're not signed in to a Google Account, we store the information we collect with unique identifiers tied to the browser, application, or device you're using. This allows us to do things like maintain your preferences across browsing sessions, such as your preferred language or whether to show you more relevant search results or ads based on your activity.

When you're signed in, we also collect information that we store with your Google Account, which we treat as personal information.

## Things you create or provide to us



When you create a Google Account, you provide us with personal information that includes your name and a password. You can also choose to add a phone number or payment information to your account. Even if you aren't signed in to a Google Account, you might choose to provide us with information — like an email address to communicate with Google or receive updates about our services.

# Problems with Privacy Policies

1. People don't read privacy policies

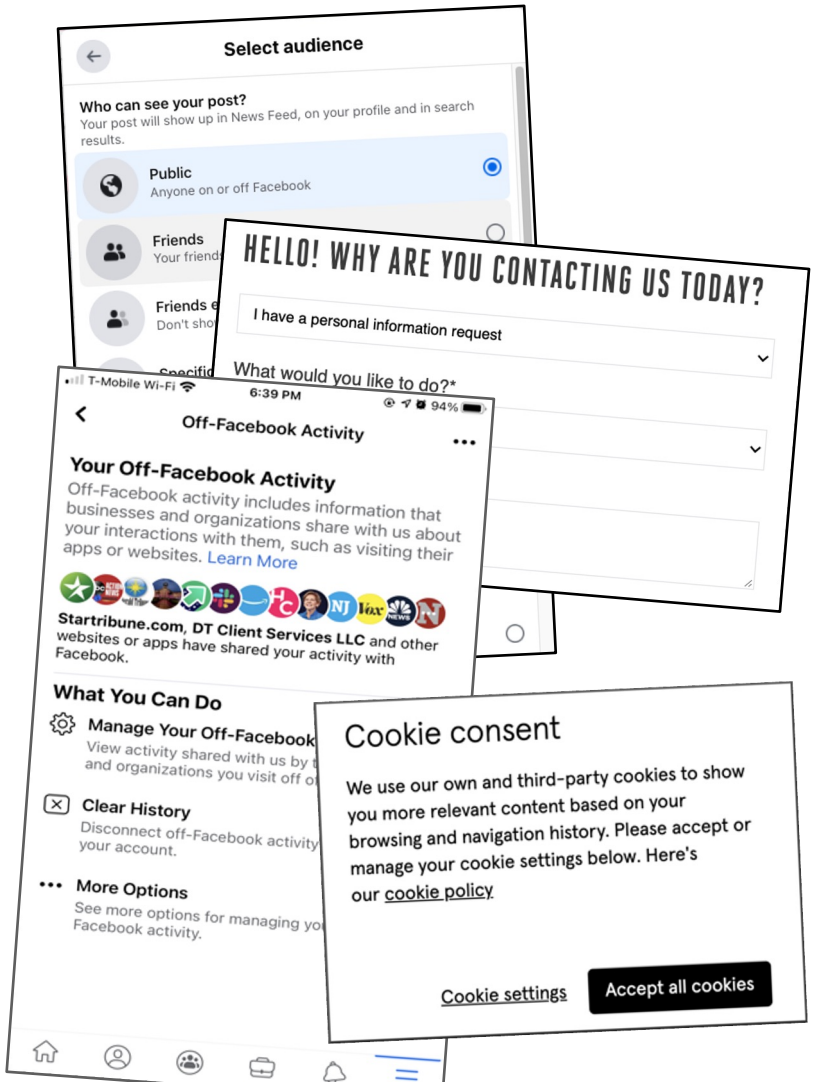
2. People don't understand privacy policies

# Improving on Privacy Policies

- ~~Idea #1: Improve how information is communicated~~
- Idea #2: Give people choices
- Idea #3: Legally-mandate absolute protections

# Privacy consent and choice interfaces

- App permissions interfaces
- Audience controls on social media
- Cookie banners
- Third-party advertising controls
- Marketing opt-outs
- CCPA do not sell my personal information interfaces
- GDPR privacy rights interfaces



# URLs

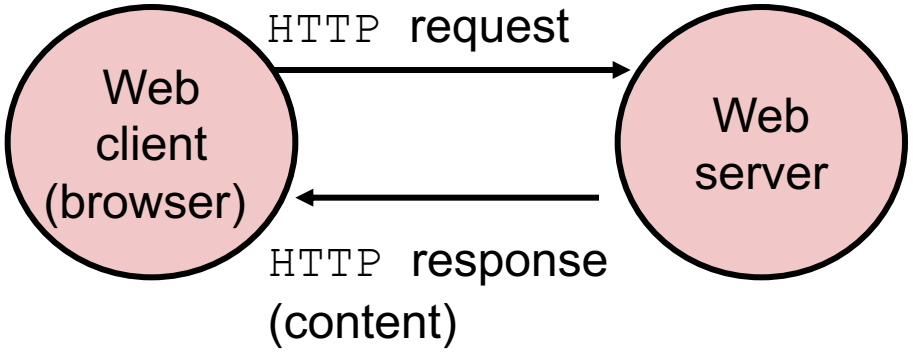
- Unique name for a file: URL (Universal Resource Locator)
- Example URL: `http://www.cs.pomona.edu:80/classes/cs105/index.html`

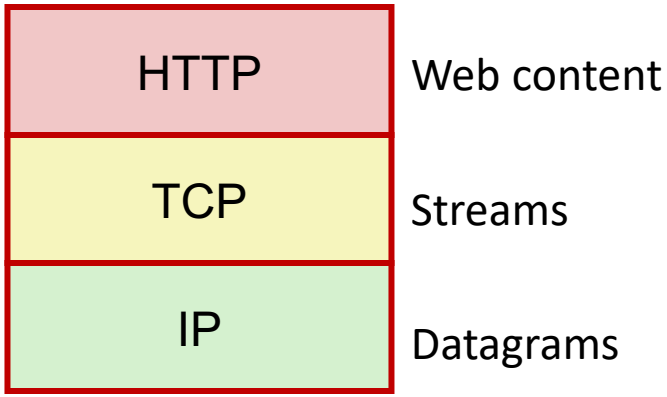
- Clients use *prefix* (`http://www.cs.pomona.edu:80`) to infer:
  - Where the server is (`www.cs.pomona.edu`)
  - What port it is listening on (80)
  - What kind (protocol) of server to contact (HTTP)

- Servers use *suffix* (`/classes/cs105/index.html`) to:
  - Specify what content they want

# HTTP

- Clients and servers communicate using the HyperText Transfer Protocol (HTTP)
  - Client and server establish TCP connection
  - Client requests content
  - Server responds with requested content
  - Client and server close connection (eventually)
- Current version is (mostly) HTTP/2.0
  - RFC 7540, 2015
  - Includes protocol negotiation
  - HTTP/3 published 2022 (25% if Internet)



# HTTP Requests

- HTTP request is a **request line**, followed by zero or more **request headers**

- Request line: `<method> <uri> <version>`
  - `<method>` is one of `GET`, `POST`, `OPTIONS`, `HEAD`, `PUT`, `DELETE`, or `TRACE`
  - `<uri>` is typically URL for proxies, URL suffix for servers
    - A URL is a type of URI (Uniform Resource Identifier)
    - See http://www.ietf.org/rfc/rfc2396.txt
  - `<version>` is HTTP version of request (`HTTP/1.0` or `HTTP/1.1`)

- Request headers: `<header name>: <header data>`
  - Provide additional information to the server

# HTTP Responses

- HTTP response is a **response line** followed by zero or more **response headers**, possibly followed by **content**
  - a blank line ("`\r\n`") separates headers from content.

- Response line: `<version> <status code> <status msg>`
  - <version> is HTTP version of the response
  - <status code> is numeric status
  - <status msg> is corresponding English text
    - 200 OK Request was handled without error
    - 301 Moved Provide alternate URL
    - 404 Not found Server couldn't find the file

- Response headers: `<header name>: <header data>`
  - Provide additional information about response
  - `Content-Type:` MIME type of content in response body
  - `Content-Length:` Length of content in response body

# Web Content

- Web servers return content to clients
  - *content:* a sequence of bytes with an associated MIME (Multipurpose Internet Mail Extensions) type

- Example MIME types

| | |
|---|---|
| `text/html` | HTML document |
| `text/plain` | Unformatted text |
| `image/gif` format | Binary image encoded in GIF |
| `image/png` format | Binar image encoded in PNG |
| `image/jpeg` format | Binary image encoded in JPEG |

You can find the complete list of MIME types at:
`http://www.iana.org/assignments/media-types/media-types.xhtml`

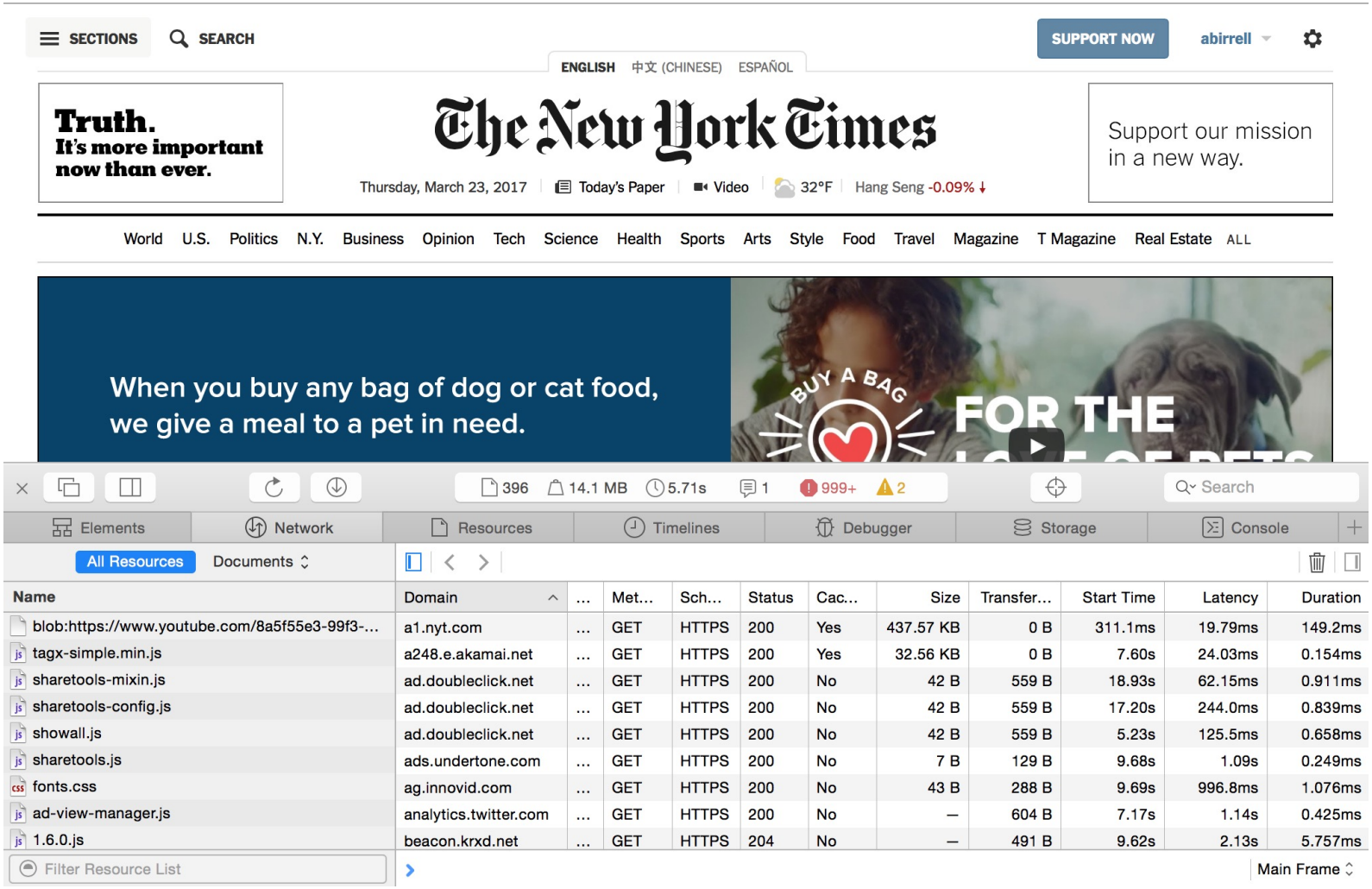
# Static and Dynamic Content

- The content returned in HTTP responses can be either **static** or **dynamic**
  - *Static content*: content stored in files and retrieved in response to an HTTP request
    - Examples: HTML files, images, audio clips
    - Request identifies which content file
  - *Dynamic content*: content produced on-the-fly in response to an HTTP request
    - Example: content produced by a program executed by the server on behalf of the client
    - Request identifies file containing executable code
- Bottom line: *Web content is associated with a file that is managed by the server*

# Cookies

- Cookies are small blocks of data stored locally by the web browser
- Cookie is sent with every request to that domain
- Can be used to keep track of whether a user has authenticated (as which user)
- And also other things…
- Can be set by third parties

# Browser Tracking



# The result…

**Your categories**

Below you can review the interests and inferred demographics that Google has associated with your cookie. You can remove or edit these at any time.

Business & Industrial

Business & Industrial - Manufacturing

Computers & Electronics - Computer Hardware - Laptops & Notebooks - Tablet PCs

Computers & Electronics - Software - Multimedia Software - Photo & Video Software

Computers & Electronics - Software - Operating Systems - Mac OS

Internet & Telecom - Mobile & Wireless - Mobile Phones

Internet & Telecom - Mobile & Wireless - Mobile Phones - Smart Phones

Online Communities - Social Networks

Reference - General Reference - Time & Calendars

Science - Mathematics

# EU "Cookie law"

- cookies are allowed for legitimate purposes if users are informed of purpose
  - buried in privacy policy
- users should have the opportunity to refuse cookies
  - access could be conditional on acceptance
- methods of giving information, offering a right to refuse, or requesting consent should be as user-friendly as possible
  - no meaningful enforcement

# General Data Protection Regulation (GDPR)

- Changed the definition of consent
- "Consent should be given by a clear affirmative act establishing a freely given, specific, informed and unambiguous indication of the data subject’s agreement"
- silence, inactivity, or pre-ticked boxes are not consent

# Cookie consent

We use our own and third-party cookies to show you more relevant content based on your browsing and navigation history. Please accept or manage your cookie settings below. Here's our cookie policy

Cookie settings

Accept all cookies

## Taste the Ultimate Buy Whole Foods Online Experience

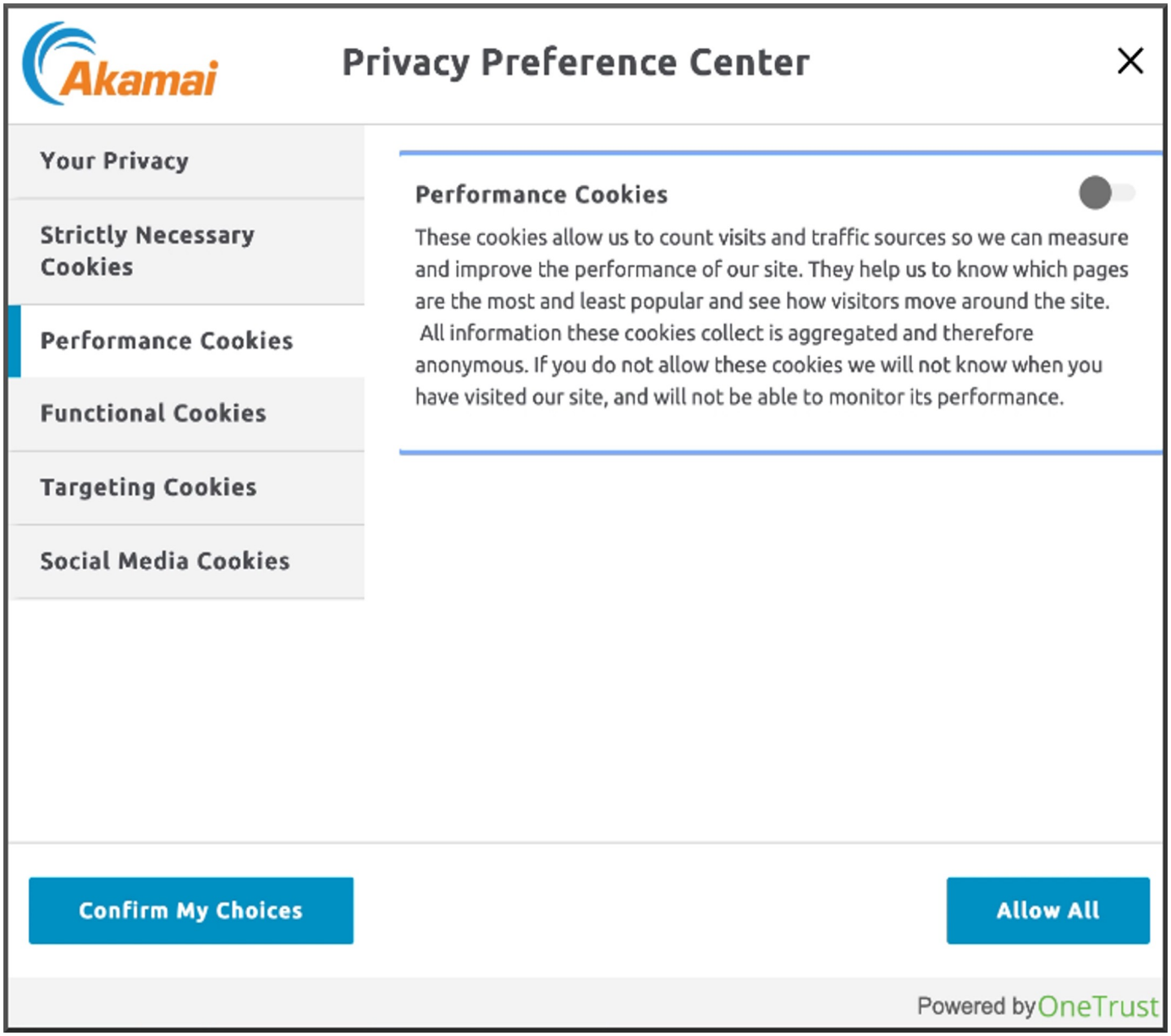
We want to give you the very best service during your search for the highest quality foods.

By clicking “Accept All Cookies”, you agree to the storing of cookies on your device to enhance site navigation, analyse site usage, and assist in our marketing efforts.

Don't worry, all of our cookies are made from the best quality organic ingredients!

Cookies Settings

Accept All Cookies


Akamai
Privacy Preference Center
Your Privacy
Strictly Necessary Cookies
Performance Cookies
Functional Cookies
Targeting Cookies
Social Media Cookies
Performance Cookies
These cookies allow us to count visits and traffic sources so we can measure and improve the performance of our site. They help us to know which pages are the most and least popular and see how visitors move around the site. All information these cookies collect is aggregated and therefore anonymous. If you do not allow these cookies we will not know when you have visited our site, and will not be able to monitor its performance.
Confirm My Choices
Allow All
Powered by OneTrust

# Your Choices Regarding Cookies on this Site

Ex Libris
a ProQuest Company

Please choose whether this site may use Functional and/or Advertising cookies, as described below:

## REQUIRED COOKIES

These cookies are required to enable core site functionality.

## FUNCTIONAL COOKIES

These cookies allow us to analyze site usage so we can measure and improve performance.

## ADVERTISING COOKIES

These cookies are used by advertising companies to serve ads that are relevant to your interests.

## Functionality Allowed

- Provide secure log-in
- Remember how far you are through an order
- Remember your log-in details
- Remember what is in your shopping cart
- Make sure the website looks consistent
- Allow you to share pages with social networks
- Allow you to post comments
- Serve ads relevant to your interests

This page transmits information using HTTPS protocol. Some vendors cannot support HTTPS opt-out requests. TrustArc will submit your preferences through HTTP in a pop-up window.

CANCEL | SUBMIT PREFERENCES | ADVANCED SETTINGS

Privacy Policy | Powered by: TrustArc | TRUSTe

# Manipulation of privacy behavior

A few common examples of dark patterns on privacy-related interfaces

- Defaults are not privacy protective
- Buttons have confusing labels
- Framing - including wording
  that shames users to influence their decisions
  or makes them feel like they will be missing out
- Highlighting – visually emphasizing opt-in
- Cumbersome privacy choices - more
  difficult to choose privacy options

# User Study 1: Manipulating Consent

- AB comparison of real-world behavior on partner website
- Recorded interactions with cookie banners
- Debriefing after 30 seconds
- Option to participate in survey

- 9 conditions
- between-subjects study
- 36,530 participants

# Highlighting

[This website] uses cookies to analyze your usage of this site, to embed videos and social media, and to personalize the ads you see. Do you consent to this use? You can find more information in our Privacy Policy.

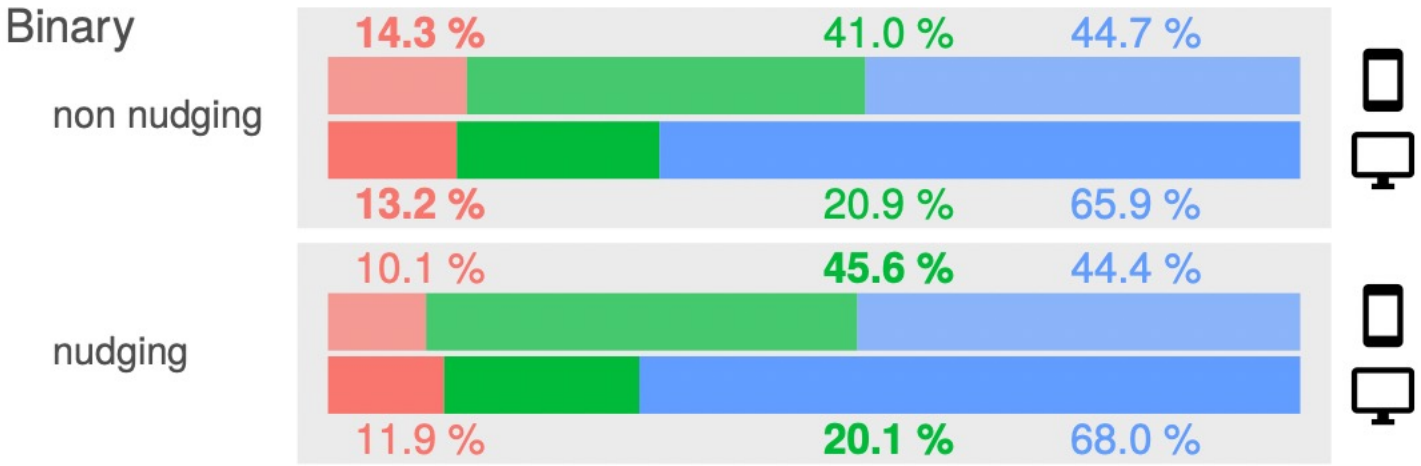
Accept

Decline

[This website] uses cookies to analyze your usage of this site, to embed videos and social media, and to personalize the ads you see. Do you consent to this use? You can find more information in our Privacy Policy.

Accept

Decline



# Defaults

[This website] uses cookies to analyze your usage of this site, to embed videos and social media, and to personalize the ads you see. Please select the types of cookies we are allowed to use. You can find more information in our Privacy Policy.

- [x] Necessary
- [x] Personalization & Design
- [x] Analytics
- [x] Social Media
- [x] Marketing

Submit

[This website] uses cookies to analyze your usage of this site, to embed videos and social media, and to personalize the ads you see. Please select the types of cookies we are allowed to use. You can find more information in our Privacy Policy.

- [x] Necessary
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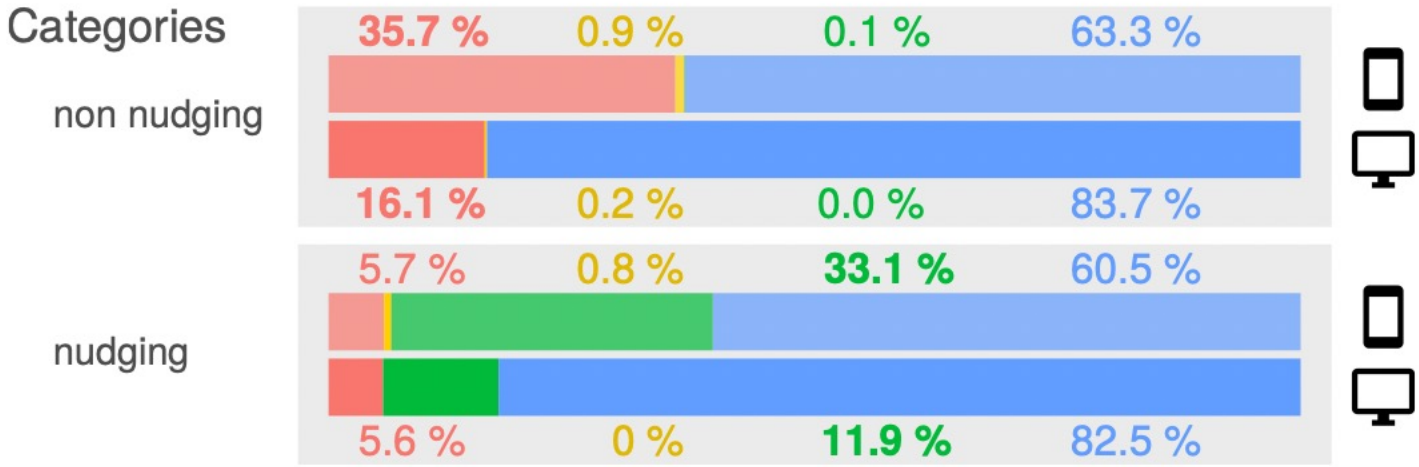
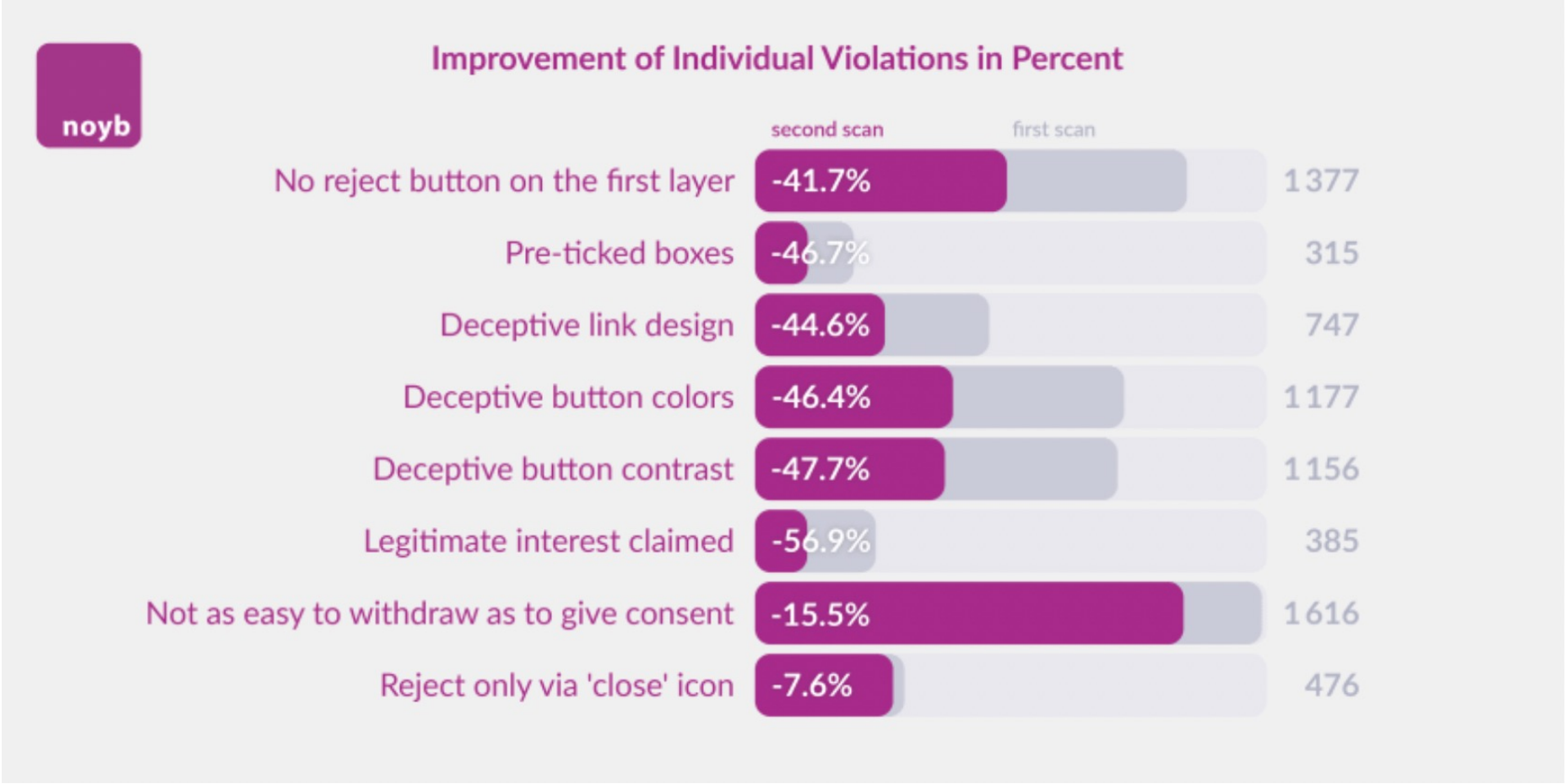
Submit



# Dark Patterns are common



# What makes an interface usable?

- Easy to learn
- Once learned, easy to remember how to use it
- Can be used efficiently
  - not time consuming
- Can be used with minimal errors
  - Users don’t make errors very often
  - Errors are not likely to put users at greater risk
  - Users can easily detect and correct errors
- Users are satisfied, find using it a pleasant experience

# How could this interface be improved?

We use cookies to make the website work properly, enhance performance, create personalized functionality, and deliver targeted ads. Note that if you do not accept optional cookies your experience may be affected. By continuing to use this site you agree to the use of cookies as shown in your cookie preferences. You may update your cookie preferences at any time. For more information, please see our Privacy Policy.

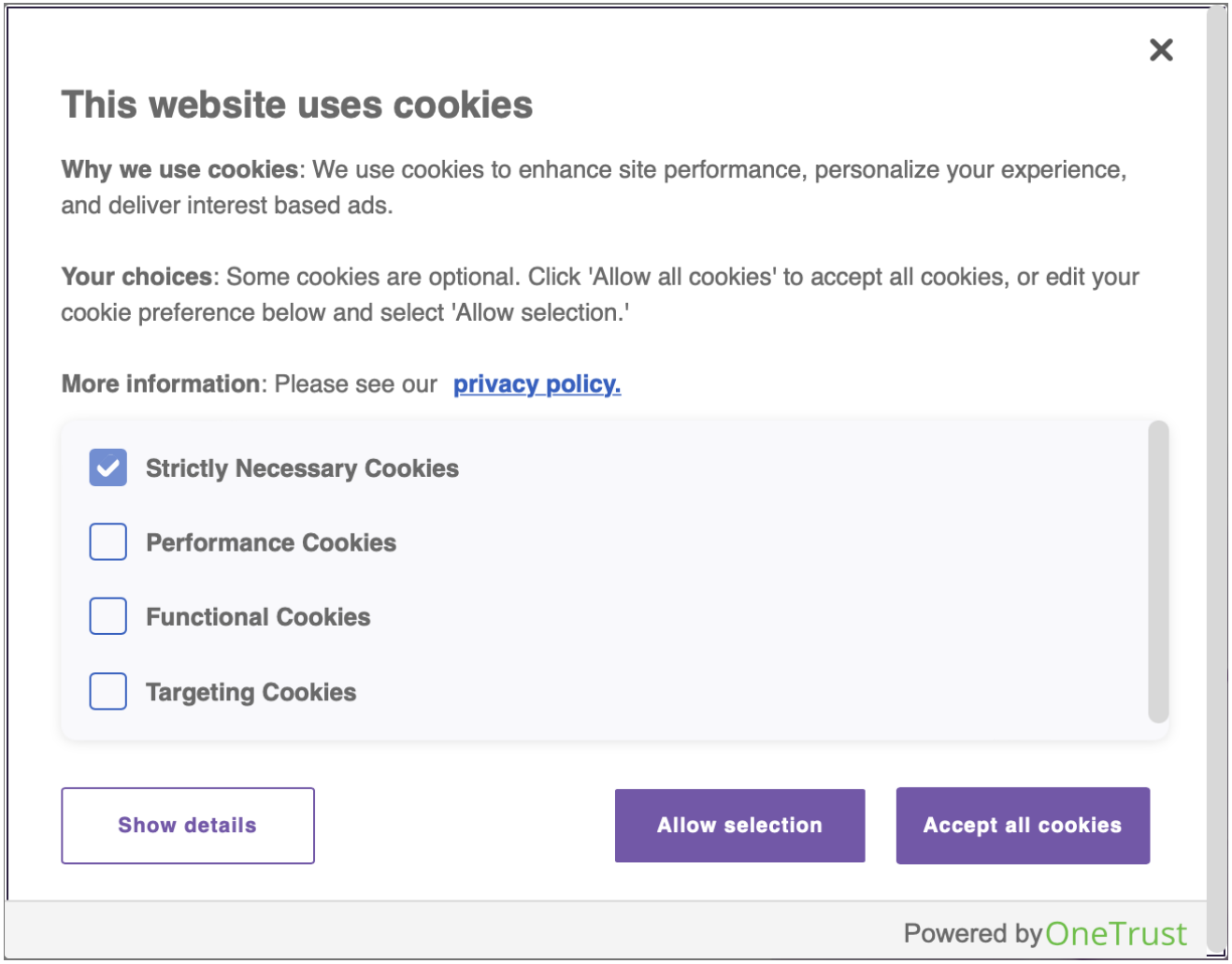
**This website uses cookies**

We use cookies to make the website work properly, enhance performance, create personalized functionality, and deliver targeted ads. Some cookies are optional—click 'Allow all cookies' to accept all cookies, or click 'Edit cookie preferences' to customize your cookies. For more information please see our privacy policy.

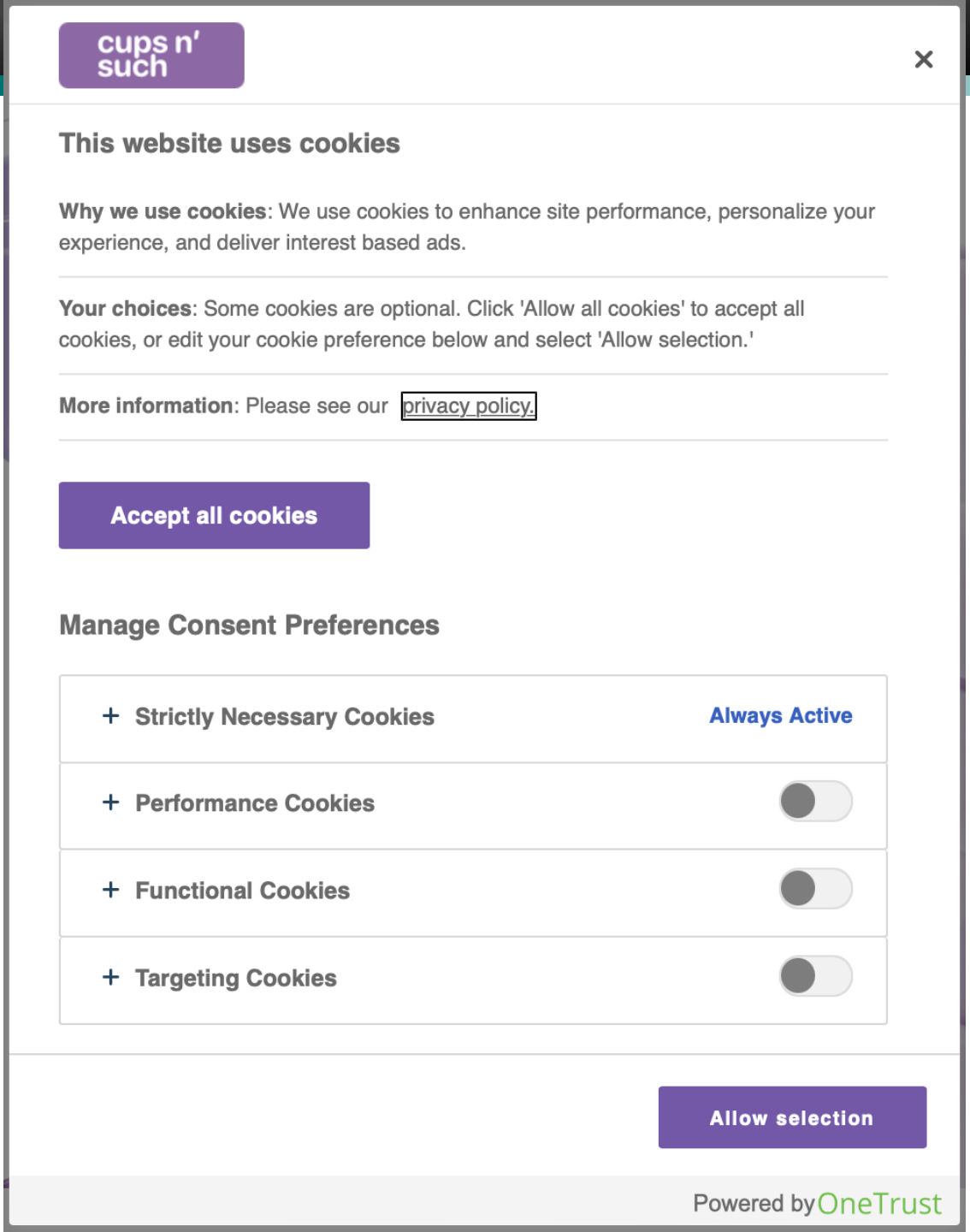
Edit cookie preferences

Accept all cookies

# Better?


This website uses cookies
Why we use cookies: We use cookies to enhance site performance, personalize your experience, and deliver interest based ads.
Your choices: Some cookies are optional. Click 'Allow all cookies' to accept all cookies, or edit your cookie preference below and select 'Allow selection.'
More information: Please see our privacy policy.
Strictly Necessary Cookies
Performance Cookies
Functional Cookies
Targeting Cookies
Show details
Allow selection
Accept all cookies
Powered by OneTrust

# Better?

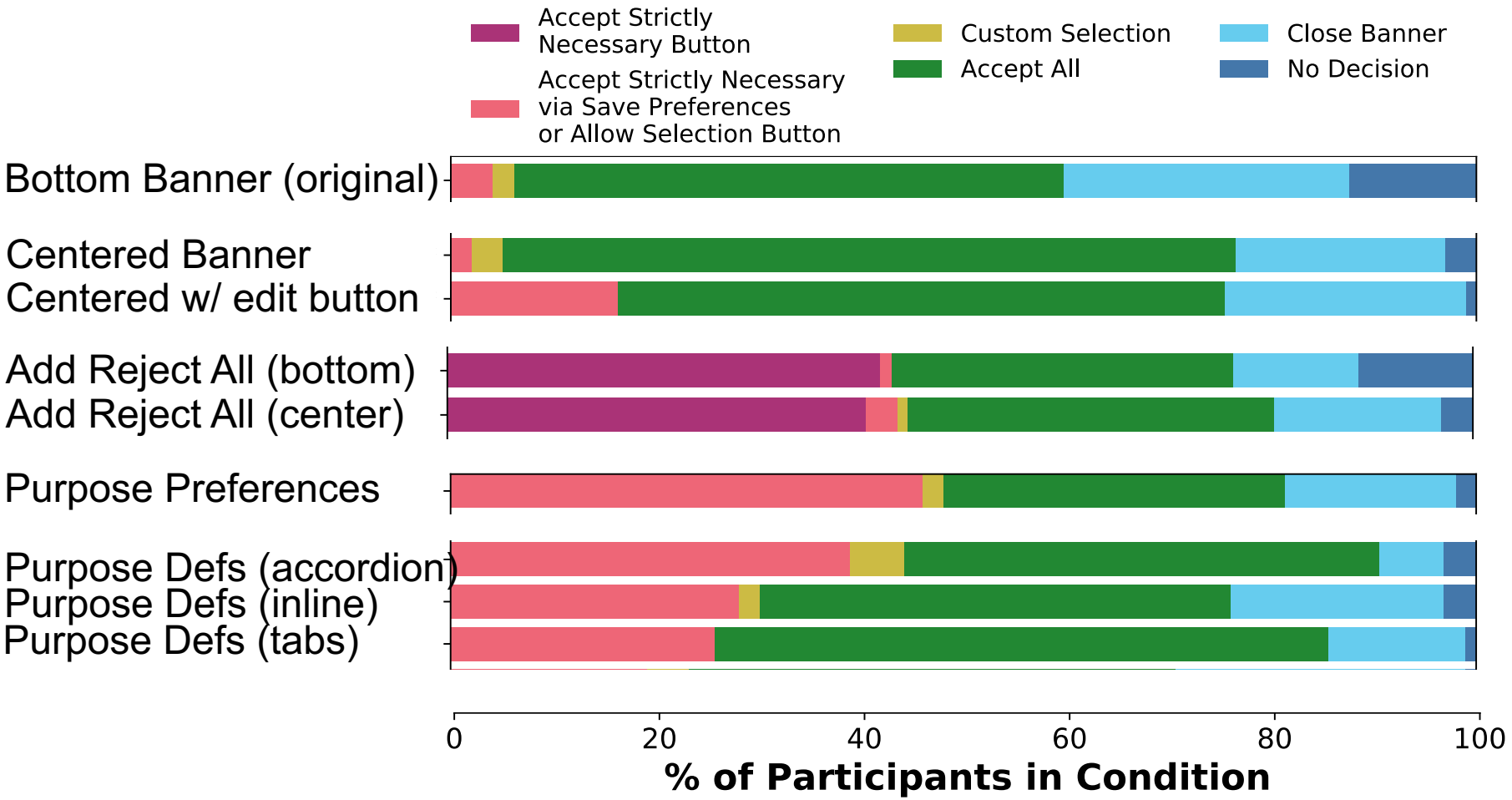

cups n' such
This website uses cookies
Why we use cookies: We use cookies to enhance site performance, personalize your experience, and deliver interest based ads.
Your choices: Some cookies are optional. Click 'Allow all cookies' to accept all cookies, or edit your cookie preference below and select 'Allow selection.'
More information: Please see our privacy policy.
Accept all cookies
Manage Consent Preferences
+ Strictly Necessary Cookies
Always Active
+ Performance Cookies
+ Functional Cookies
+ Targeting Cookies
Allow selection
Powered by OneTrust

# User Study 2: Improving Interfaces

- Simulated non-security task (online shopping)
- Recorded interactions with banner
- Post-task survey

- Online experimental study
- 14 conditions
- 1359 participants

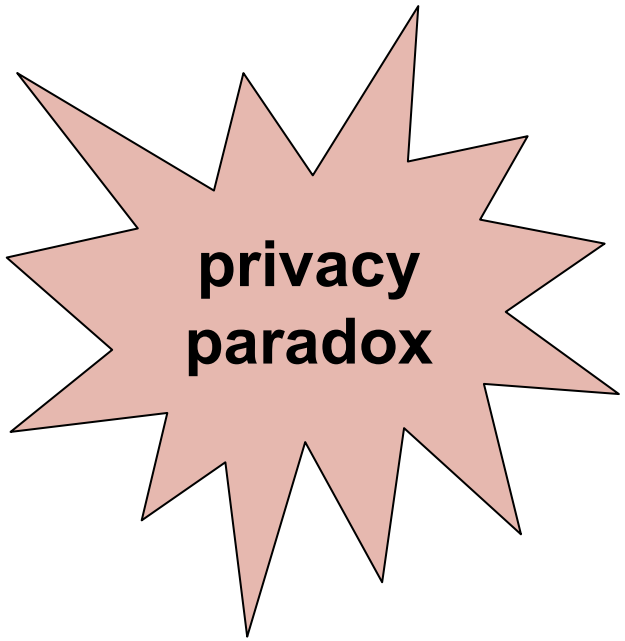
# User Study: Cookie Consent Interfaces



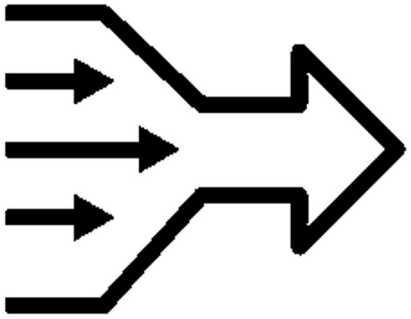

41.2% made decision that agreed with reported preferences

# Why do people say they want privacy, and then fail to protect it?

- Information asymmetry
- Resignation
- Bounded rationality



# Prospect Theory



- Reference-dependence
- Isolation
- Pseudocertainty

- Loss Aversion
- Certainty
- Source-dependence

# Prospect Theory as Descriptive Model

- **Finance:** which stocks investors sell [Shefrin & Statman, 1985]
- **Insurance:** predicting over-insurance[Sydnor, 2010]
- **Savings:** patterns in spending [Koszegi & Rabin, 2009]
- **Security:** adoption of 2FA [Qu et al., 2019]
- **Privacy:** disclosure of personal information [Adjerid et al., 2013]

# Prescriptive Applications of Prospect Theory

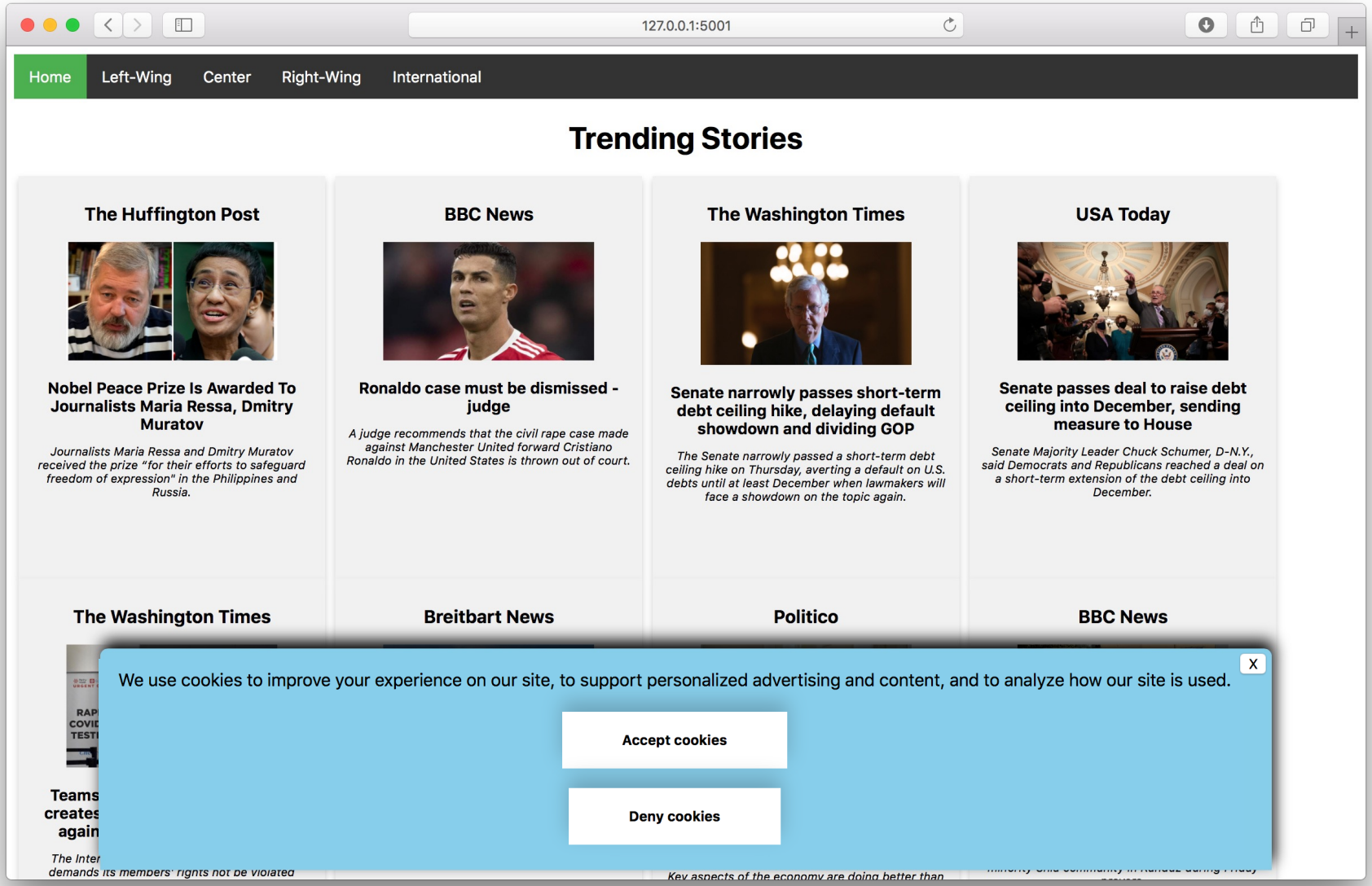
- Nudge employees to increase their retirement contributions [Thaler & Benartzi, 2004]
- Nudge teams in high-tech factories to increase productivity [Hossain & List, 2012]
- Nudge teachers to improve student outcomes [Levitt et al., 2016]

# User Study 3: Framing Consent

- 2160 participants recruited through Google Ad campaign

- **Data Minimization:** no personal information collect
- **Transparency:** Full disclosure in privacy policy

# Cookie Consent Interface



# Framing Cookie Consent (Cookies=Good)

- Positive Framing:

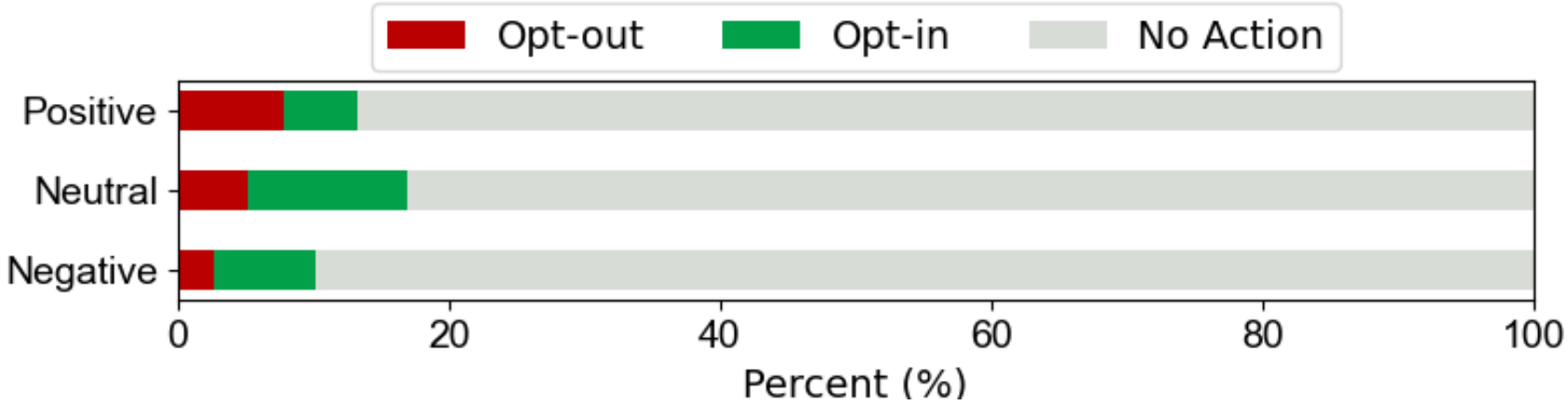
  **Opt-out:** Deny cookies

  **Opt-in:** Accept cookies to improve your experience on this site

- Negative Framing:

  **Opt-out:** Deny cookies and degrade your experience on this site

  **Opt-in:** Accept cookies



# Framing Cookie Consent (Cookies=Bad)

- Positive Framing:

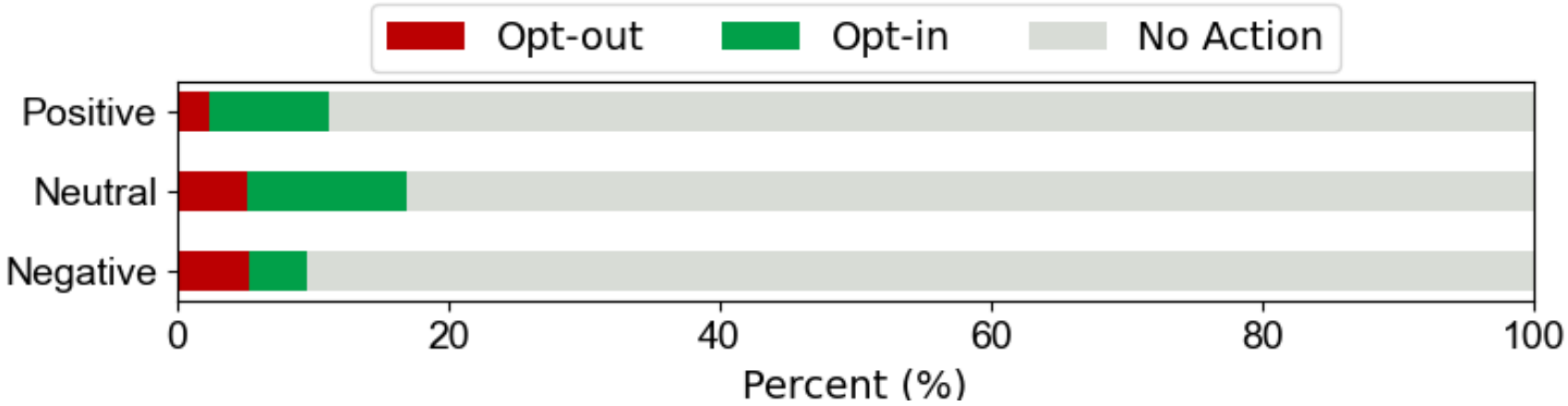
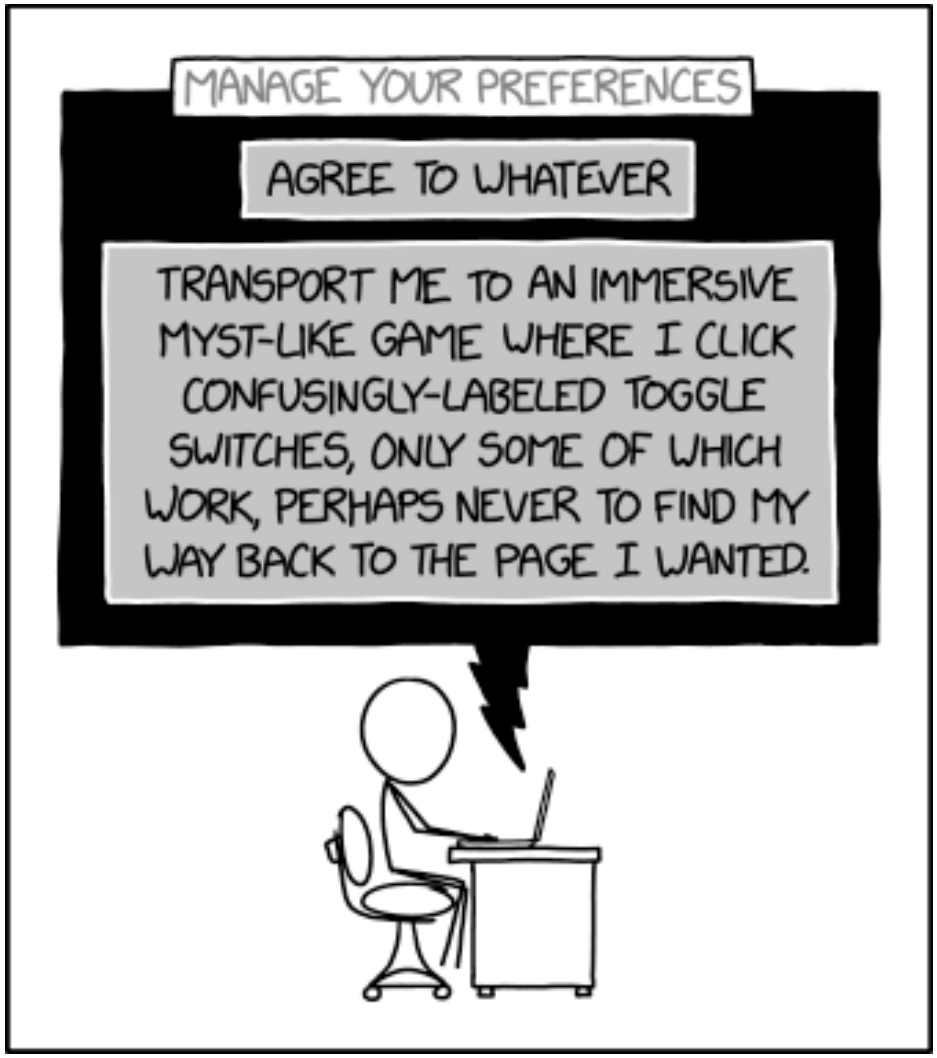
  **Opt-out:** Deny cookies to prevent this website and its partners from accessing or selling your personal information

  **Opt-in:** Accept cookies

- Negative Framing:

  **Opt-out:** Deny cookies

  **Opt-in:** Accept cookies to allow this website and its partners to access and sell your personal information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