UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

The Effect of Design Patterns on (Present and Future) Cookie Consent Decisions

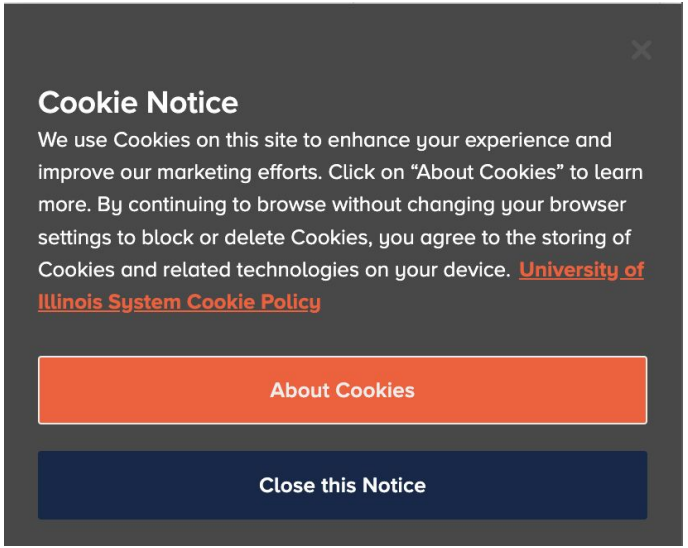
CS563 Advanced Computer Security | Spring 2025

Dark / Bright Patterns

“dark patterns” or “deceptive design” refers to interfaces that direct, deceive, coerce, or manipulate users into making choices that are often not in their best interest

GDPR Cookie Banners:

“freely given, specific, informed and unambiguous indication of the data subject’s wishes”



CNIL (Commission Nationale Informatique & Libertés)

The French Data Protection Authority issues guidelines for cookies and consent banner interfaces

“the expression of the user’s refusal must [..] be able to be translated by an action presenting the same degree of simplicity as the one allowing to express his consent”.

“Unequal path to decline”

Considered a violation of the regulation since "several clicks are required to refuse all cookies, against a single one to accept them."

https://www.cnil.fr/sites/cnil/files/atoms/files/recommandation-cookies-et-autres-traceurs.pdf

Problem:

*No study*** exists that consent banners (even in their recommended format) allow users to express their true preferences.*

***Paul Graßl et al. “Dark and bright patterns in cookie consent requests.”

- N=277 UK residents.
- “users and did not find any statistically significant difference in consent decisions between users interacting with this type of banner versus a neutral banner.

*“Therefore, no studies found **support** for difference in users behavior.”*

What elements contribute to

an effective cookie consent banner?

Behavioral Levers Approach

7 experts reviewed 18 behavioral levers to add to consent banner

- 4 CNIL agents
  - Lawyer with expertise on sanctions
  - Design expert
  - Law and technology expert
  - Computer scientist
- 3 experts outside the CNIL
  - Behavioral economist
  - Online experimentation expert
  - Cognitive neuroscience expert

18 potential design solutions such as simplifying the text, using heuristics, or changing the choice architecture and the display of buttons to make refusing easier or more desirable

Selected 3 Levers

1. Highlight consequences of their choice
2. Pre-select “Refuse all”
3. Use visual aids that can be used as heuristics.

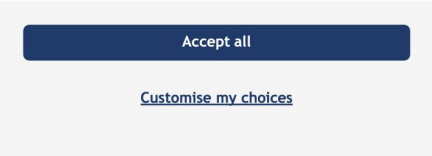
Reasoning for Levers:

- Users still lack knowledge on cookies.
- Users lack motivation to actively make informed consent choices.

Experiment

- 3,947 participants in France
- They thought that they were taking part in a market research study.
- Visited 3 fake e-commerce websites
- 6 variants of a consent banner following research questions

(a) *Control* banner.

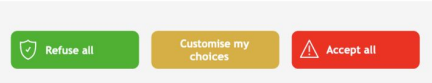


(b) *No decline* banner.

(c) *Highlighted accept* banner.

(d) *Highlighted decline* banner.

(e) *Consequences* banner.



(f) *Tricolor* banner.

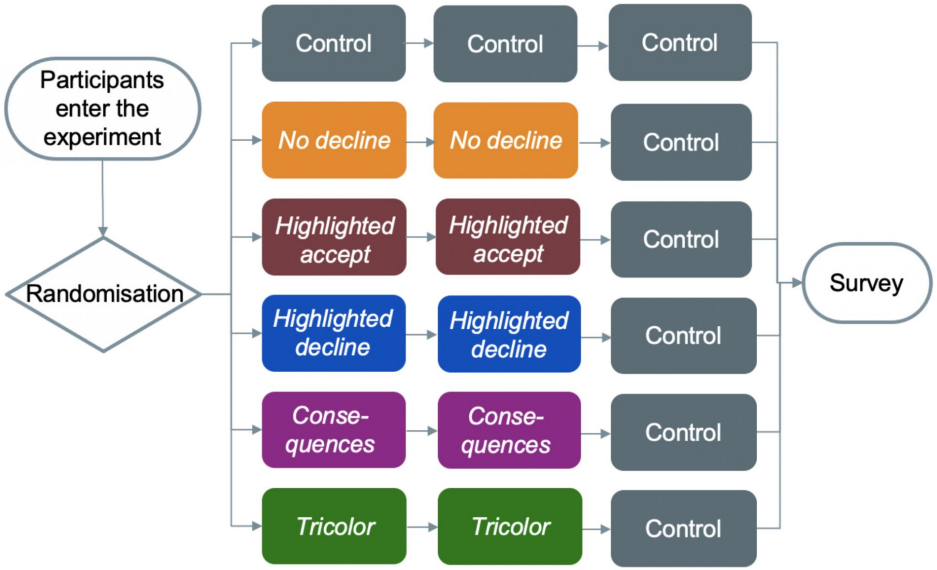


Figure 2: User journey through the online experiment.

Survey

- Introduction to the subject of cookies
- Recall and reasons for users' choices
- Questions on knowledge

Baseline

- 52% reported being comfortable sharing their data on the internet, even without knowing for what purpose.
- 31% say they are not comfortable sharing their data in any way.

“Therefore, at least **31% of internet users should refuse the use of cookies**, regardless of banner design”

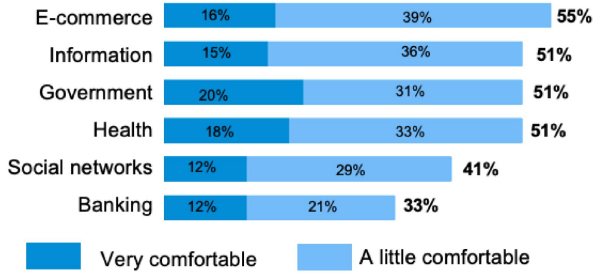


Figure 3: Comfort level of the participants with the idea of accepting all cookies, by type of website visited (N=4,026).

Evaluation

"31% of internet users should refuse the use of cookies"

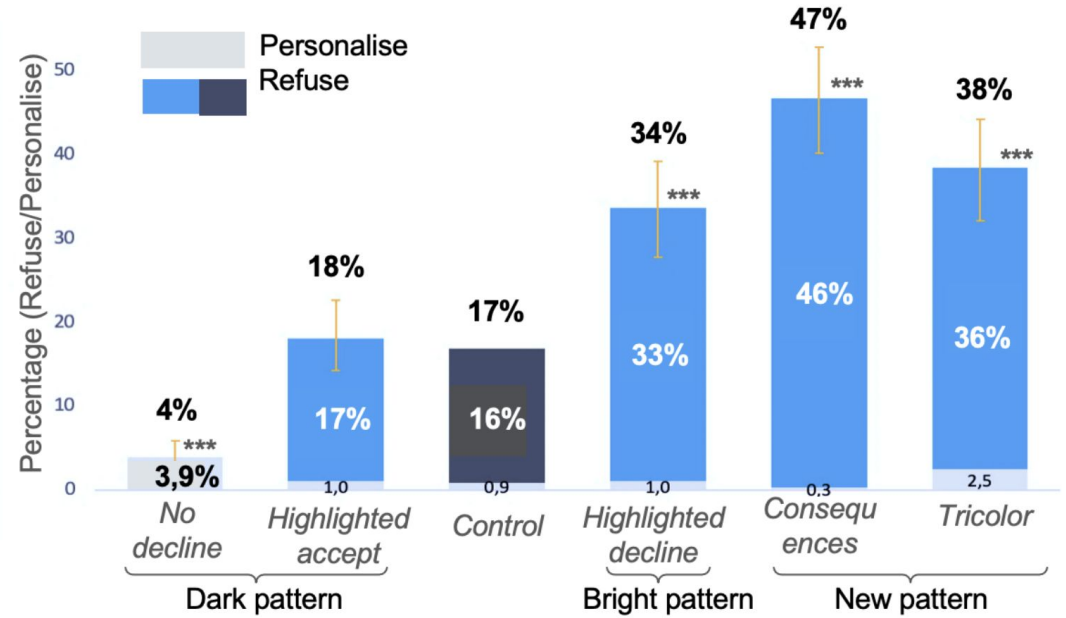


Figure 4: Participants' reported consent decisions (N=3,947) in their interactions with the consent banners during the visit

Evaluation

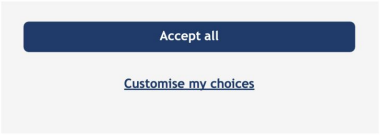
Table 3: Participants' reported time spent and overall satisfaction with the banner they interacted with and the choice they made.

	Control	*No decline*	*Highlighted accept*	*Highlighted decline*	*Consequences*	*Tricolor*
Time spend on first banner (seconds)	4.1*	4.0*	3.8*	4.2*	5.7	5.7
Simplicity level (ease of navigation and understanding)	81%*	79%*	84%	86%	86%	86%
Satisfaction with the banner (wish to see more banners like this one)	78%*	72%*	82%	81%	82%	84%
Satisfied with the choice	54%*	44%*	55%*	58%*	64%	64%

Notable Findings

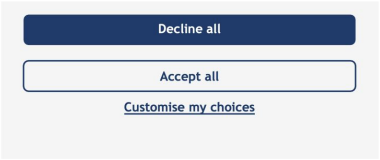
- **Good survey sample size (N=3,947)**
- **No decline** - from 17% denying to 4%
- **Highlighted decline** - from 17% denying to 34%
- **Tricolor -** from 17% denying to 38%
- **Highlighted accept** - No change.
  - 50% said this is out of habit of accepting
- ***Consequences*** *- 16% denying to 46%*

(a) *Control* banner.



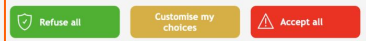
(b) *No decline* banner.

(c) *Highlighted accept* banner.



(d) *Highlighted decline* banner.

(e) *Consequences* banner.



(f) *Tricolor* banner.

Evaluation

"We conclude that all the three behavioral levers introduced in the banners have substantial effect on the outcome of consent decision"

1. Highlight consequences of their choice
2. Pre-select "Refuse all"
3. Use visual aids that can be used as heuristics.

Discussion

"... the experiments are just **re-manipulating users but towards rejection** rather than acceptance and that the goal is **not promoting agency but rather manipulating users again**?..."

Power of Defaults

Helpful for representative or frequent values.

Study shows **86% of default router passwords have never been changed**

89% of respondents have never updated their router firmware

75% of respondents **don't know why** they would need to adjust their router settings

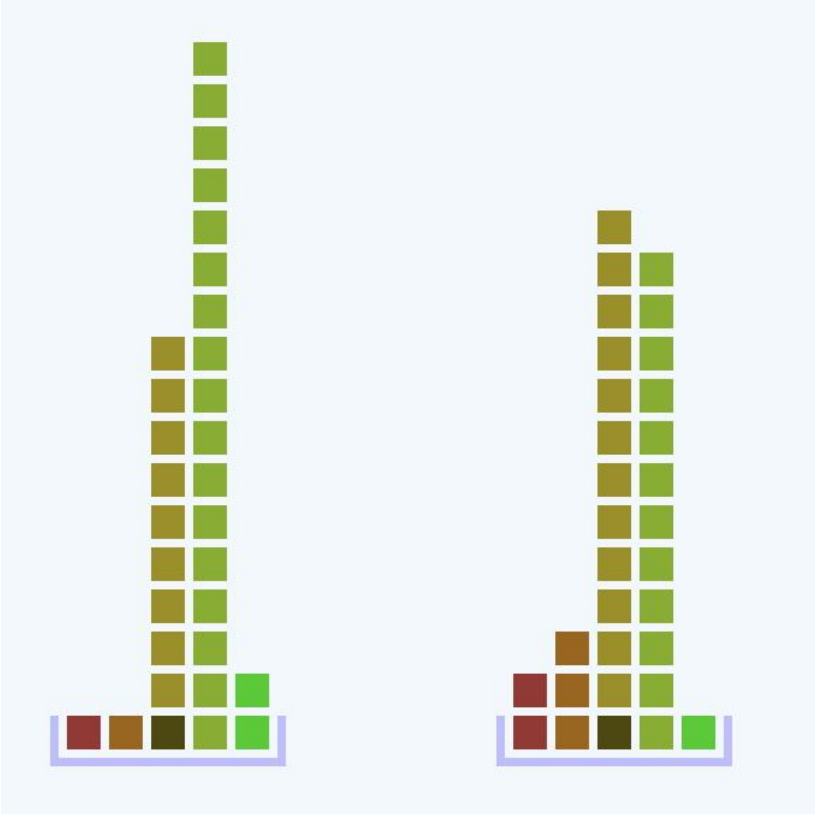
https://www.broadband.co.uk/broadband/help/router-security-research

Swapping top search result - click rate dropped from 42% to 34%

https://www.nngroup.com/articles/the-power-of-defaults/

Users may assume default value is for their best incorrect (poor assumption)

Discussion



Discussion

- **Should we reject a neutral stance on cookie policies?** Why not legally ban all tracking cookies?
- Why are cookies from **banks less trusted** than cookies from social media?
- Scale the survey to larger populations **outside of France**. France has a unique perspective on privacy and government regulation that does not apply everywhere; the work would have more chances being implemented if the results were generalized to additional countries. **Could the GDPR have impacted longitudinal behaviors?**
- The experiment only focuses on e-commerce websites, and should be **extended to other domains, such as health, social media, banking, and news**, to evaluate if context influences a user's consent decision.