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UI Dark Patterns and Their Impact on User Perception in Mobile Applications

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Introduction

What are Dark Patterns?

Dark Patterns are user interfaces intentionally designed to trick users into actions they did not intend to do.

Examples include sneaking items into a shopping cart, forcing unwanted subscriptions, and collecting excessive personal data.

Quote from the paper: “95% of the analyzed apps contain one or more forms of Dark Patterns.”

Problem Definition

The increasing use of **Dark Patterns** in mobile applications deceives users into performing unintended actions such as:

- Unwanted purchases.
- Involuntary data sharing.
- Difficulty in canceling subscriptions or deleting accounts.
- These patterns exploit cognitive biases and violate the principles of ethical UX design.
- The key issue: Users are often unaware of the presence of these manipulative design patterns, leading to negative experiences.

Our Objectives

Identify and classify Dark Patterns in popular mobile applications.

Analyze user perception to understand if users recognize Dark Patterns.

Evaluate the ethical implications of these designs on user experience.

Propose solutions to raise awareness and minimize the use of Dark Patterns in future UI/UX design.

Research Methodology

Analyzed 240 mobile apps across various categories.

Classified Dark Patterns into **five main categories**:

- Nagging
- Obstruction
- Sneaking
- Interface Interference
- Forced Action

Conducted an experiment with 589 participants to gauge user perception.

Table 1. Dark Patterns and their associated subclasses, according to the considered taxonomy. The global label indicates whether the DP can only appear in an app a single time (S) or multiple times (M).

DP Case	Classes	S/M
Ad with interactive game	Disguised Ad	M
Moving Ads button	Aesthetic Manipulation	M
Small close button on Ad	Aesthetic Manipulation	M
A pop-up appears and interrupts the user in their task	Nagging	M
Invite friends to get something in return	Social Pyramid	S
Ad appears as normal content	Disguised Ad	M
A sponsored content not clearly different from rest of the content	Disguised Ad	M
Icons\buttons are Ads, but it is not clear	Disguised Ad	M
Countdown on Ads	Forced Action	M
Daily\weekly rewards or features	Forced Action	S
Login to obtain some rewards\bonus	Forced Action	S
Countdown on rewards	Forced Action	S
Watching Ad to unlock feature	Forced Action	S
There are two or more options, but the one that is more beneficial for them is more prominent	False Hierarchy	M

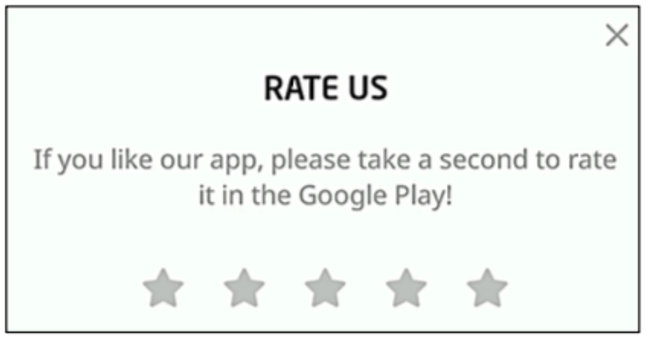
Dark Patterns Categories

1. **Nagging:** Repeated interruptions to redirect user focus (e.g., constant pop-ups).
2. **Obstruction:** Making tasks unnecessarily difficult (e.g., hiding account deletion options).
3. **Sneaking:** Deceptively adding items or costs (e.g., sneaking extra items in the cart).
4. **Interface Interference:** Manipulating design to obscure important information (e.g., using tiny checkboxes).
5. **Forced Action:** Forcing users into an action to gain access (e.g., watching an ad to unlock features).

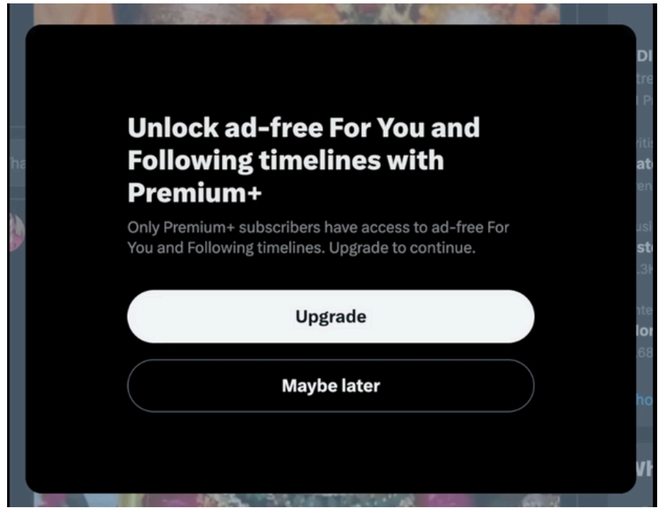
Dark Patterns Categories

Nagging

The Face Reading app contains a popup rating that interrupts the user



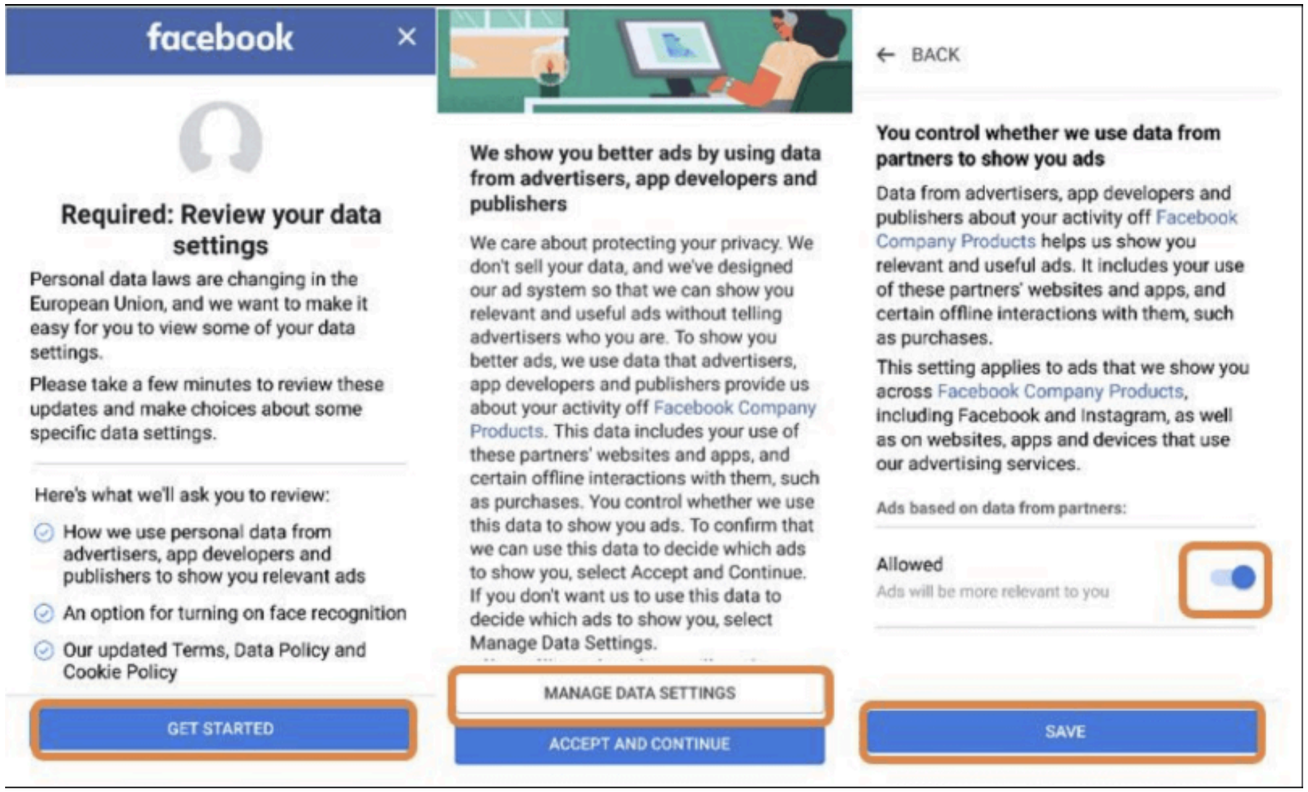
The X/Twitter app contains a pop-up that interrupts the user experience, encouraging them to upgrade to Premium+ for an ad-free timeline.



Dark Patterns Categories

Obstruction

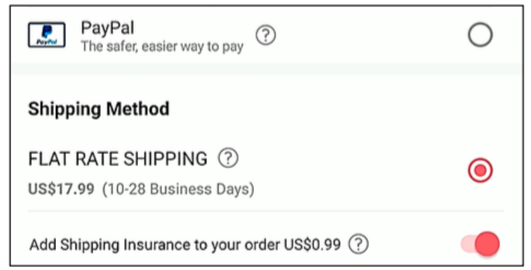
Facebook used an obstruction technique by making it easy to agree to privacy-invading settings but difficult to reject them. Facebook's interface had a button to “accept and continue” with just one click, but to reject the settings, the user had to click an unclear button and toggle a switch to the left. This made it confusing for users, and they couldn't be sure if they successfully protected their privacy.



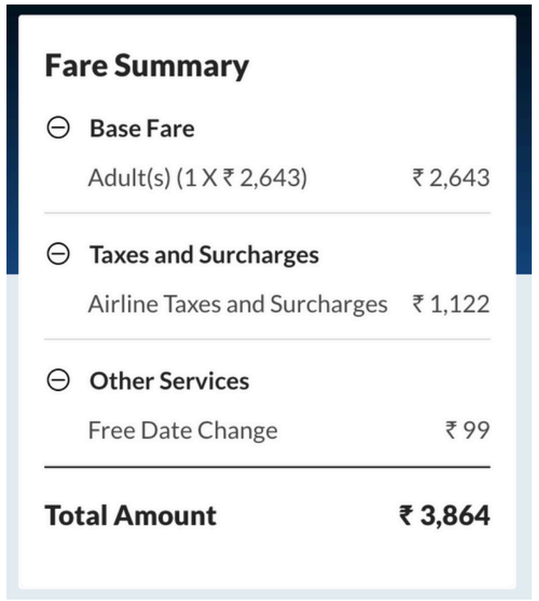
Dark Patterns Categories

Sneaking

The Romwe e-shopping app, adds an insurance by default when checking out



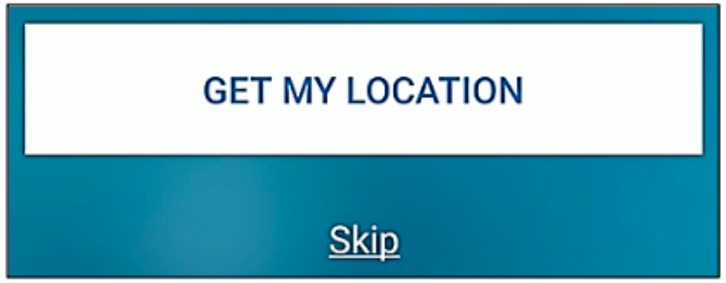
The MakeMyTrip booking app adds optional services like “Free Date Change” by default during the checkout process, increasing the total fare without explicit user consent.



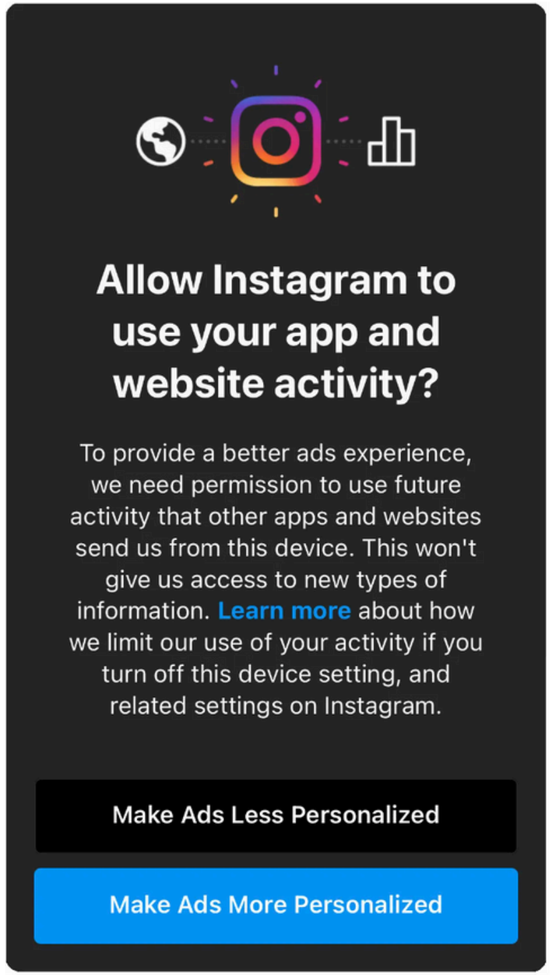
Dark Patterns Categories

Interface Interference

The Talkatone app highlights the "Get my location" option either than the skip one



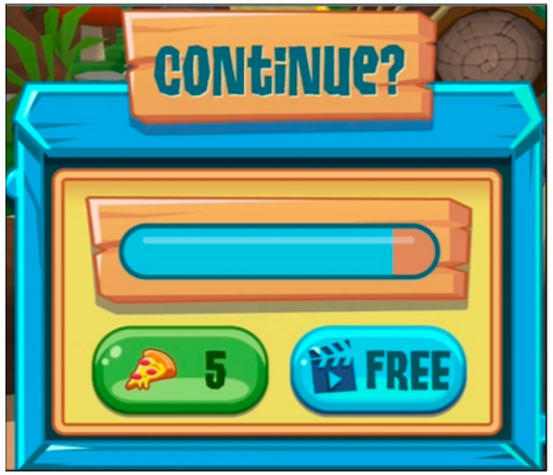
The Instagram prompt highlights the “Make Ads More Personalized” option more prominently than the “Make Ads Less Personalized” option, encouraging users to select the personalized ads option compromising thier privacy.



Dark Patterns Categories

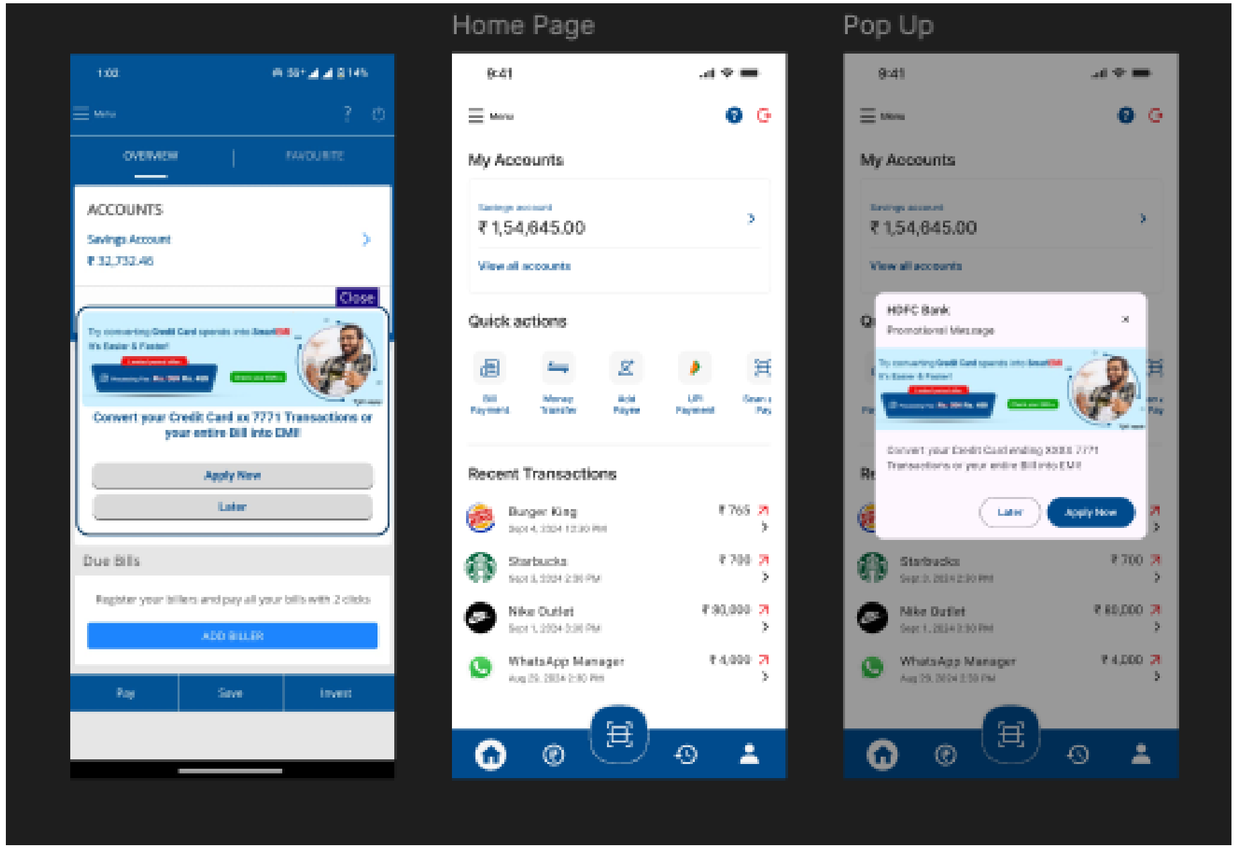
Forced Action

The Tag with Ryan app, asks the user to watch an Ad to continue playing



The Panel app by YouTuber MKBHD prompts users to watch an ad to unlock lower resolution content, while requiring payment to unlock higher resolution options.

Functional Prototype



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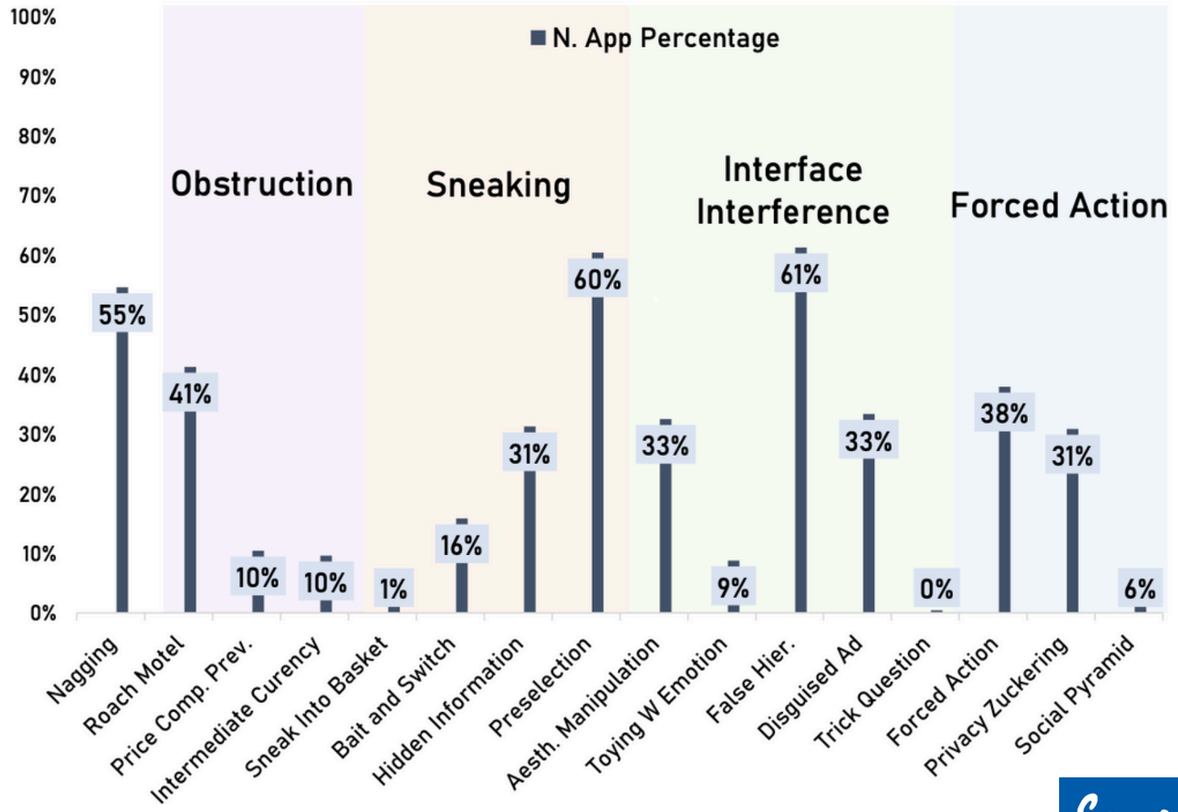
Key Findings

- 95% of apps contained at least one Dark Pattern.
- On average, each app had 7.4 Dark Patterns.
- Most frequent Dark Patterns:
- Nagging (55%)
- False Hierarchy (61%)
- Preselection (60%)



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User Perception Results

- Majority of users failed to detect Dark Patterns.
- 55% of users did not recognize the malicious designs.
- Only 25% of users identified Dark Patterns correctly when prompted.
- Increased awareness led to better detection in subsequent trials.

Table 2. Participants that answered questions regarding each app. Partic. = Amount of participants; Malicious Design = Whether they identified a malicious design on the first app; Same as DP = Whether the malicious designs identified by the participants ("yes" or "not sure") are the same DPs we identified.

App	Partic.	Malicious Design			Same as DP		
		No	Not Sure	Yes	No	Some what	Yes
Face Reading	239	129	39	71	34	18	58
ROMWE	248	159	55	34	47	22	20
Roblox	227	103	66	58	36	41	47
Talkatone	246	135	44	67	34	24	53
Tag with Ryan	218	125	34	59	18	24	51
Lego	589	510	50	29	-	-	-
Total	**1,767**	**1,161**	**288**	**318**	**169**	**129**	**229**

Ethical Implications

- Dark Patterns raise ethical concerns by prioritizing app goals over user needs.
- They manipulate user behavior, often leading to privacy violations and financial consequences.
- Encourages further debate on ethical UI design principles.

Design Principles

Ethical Design Focus: Transparency in user interactions. The study highlights the importance of designing UIs that do not deceive or manipulate users, ensuring clarity in actions like opting into subscriptions or purchasing products.

User-Centered Design: Empathy toward user needs and preferences. The research calls for a design approach that respects user autonomy, avoiding manipulative tactics that prioritize business goals over user experience.

Minimization of Cognitive Load: Simplicity and clear decision-making. Designs that overload users with decisions (e.g., hidden terms, small opt-out options) are flagged as harmful. Ethical design should prioritize straightforward user choices.

Conclusion

Prevalence of Dark Patterns: The study clearly shows that Dark Patterns are highly prevalent, with 95% of apps analyzed containing one or more forms of deceptive design. Popular mobile apps intentionally use UI design to manipulate users, impacting user trust and experience.

User Unawareness: The experiment highlights that the majority of users are unaware of the presence of Dark Patterns in the applications they use daily. DP-blindness (Dark Pattern blindness) is common, where users do not recognize the manipulative design even when interacting with it.

Ethical Concerns: The use of Dark Patterns raises significant ethical concerns. Designers should prioritize user well-being over business gains by avoiding manipulative design practices. Ethical UX design is critical for maintaining user trust and ensuring transparency in interactions with digital products.

Need for Awareness and Education: Raising awareness among users and designers about Dark Patterns is crucial. Users need to be educated on how to recognize these patterns, while designers need to be more conscious of their ethical responsibility. Future tools and systems should focus on detecting and flagging Dark Patterns in both web and mobile applications to protect users.

References

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