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Dark Patterns and Consumer Decision-Making: Determining the Economic Impact of Manipulative Interface Design

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ABSTRACT
In today's digital economy, user interface designs play a critical role in shaping consumer interactions with websites, apps, and online services. Among these are dark patterns design tactics intentionally structured to influence users into making decisions they might not have made with full awareness, also sometimes known as deceptive patterns. These include tactics like confusing language, hidden opt-outs, and visually deceptive layouts. While often subtle, these patterns can have a significant impact on consumer behaviour and financial outcomes.
This research examines the economic implications of dark patterns by analysing how they influence decision-making processes. Drawing on concepts from behavioural economics, the study explores how interface designs exploit psychological tendencies such as inertia, urgency, and loss aversion. Through case studies and industry analysis, it highlights the most prevalent forms of manipulative design and their measurable impacts, including increased consumer spending, unwanted subscriptions, and decreased autonomy.
The study also examines the broader implications for market efficiency and consumer trust, while comparing regulatory efforts in different regions. In conclusion, the research underscores the significance of ethical interface design and recommends targeted policy interventions to promote fairness, transparency, and accountability in the digital realm...
Keywords: *Dark patterns, consumer decisions, behavioural economics, manipulative design, interface ethics, digital commerce, economic impact, user experience, online transparency, consumer rights...*
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1. INTRODUCTION:

With the digital world engulfing all sectors, deceptive design is becoming common. The common language used is dark patterns. The nomenclature has been done so as these designs are primarily done for (mis)leading users into taking actions. The earliest format of this was clickable links and words, which was a good marketing technique. However, this simple marketing technique has taken a step up. It is now a concern, as people are being tricked into buying things and sharing personal data, which can harm their digital, economic, and personal well-being.

The digitalisation of commerce has radically transformed the way consumers interact with goods, services, and information. A fundamental shift has occurred: rather than making choices in a neutral environment, consumers now navigate digital ecosystems meticulously crafted by designers, marketers, and engineers (Gray et al., 2018; Narayanan et al., 2020). Among the most contentious practices in this sphere are "dark patterns", deceptive user interface (UI) techniques that exploit cognitive biases to encourage consumers to take actions that are not aligned with their preferences or best interests.

Coined by Brignull (2010), the term "dark patterns" encompasses a diverse range of interface strategies that, while legal, are designed to manipulate or coerce users, frequently with direct economic consequences. These patterns can manifest as hidden costs, misleading buttons, false urgency indicators, convoluted subscription cancellation processes, or pre-checked opt-ins that benefit the service provider at the users' expense (Gray et al., 2018).

Defining Dark Patterns

Dark patterns refer to web and app interface design choices that intentionally subvert user autonomy by leveraging behavioural psychology (Mathur et al., 2019). Classic examples include:

- Forced continuity: requiring extra effort to cancel a subscription after a free trial.
- Basket sneaking: surreptitiously adding items to a cart during checkout.
- Shaming Confirmation: Using language laden with guilt to force users to buy.
- Hidden cost: revealing extra charges only at the final step before purchase.
- False urgency: exhibiting artificial countdown timers or fake low-stock warnings (Narayanan et al., 2020).

Commercial incentives drive the proliferation of dark patterns. By intentionally designing for distraction or confusion, service providers increase conversion rates, subscription retention, and average order values, often at the cost of long-term trust (Mathur et al., 2019).

Objectives of the Study:

- Categorise the most frequently used dark patterns in digital commerce and services.
- Investigate their influence on consumer spending, subscription rates, and personal data

sharing.
- Examine the broader economic effects, including market inefficiencies and a decline in consumer trust.
- Review existing legal frameworks and consumer protection policies in various countries.
- Offer recommendations to improve interface transparency and support fair digital practices.

This research contributes to understanding the economic risks posed by manipulative design and emphasises the need for clearer regulations and ethical standards in the digital economy.

Significance of the Study

Given the ubiquity of digital commerce and the increasing sophistication of manipulative interface design, it is crucial to assess the economic and psychological effects of dark patterns. As regulatory bodies in the US, Europe, and Asia consider new consumer protections, empirical evidence is urgently needed to inform policy (Nouwens et al., 2020). This study offers a comprehensive, data-driven examination of dark patterns and their consequences, providing actionable insights for policymakers, designers, business leaders, and educators.

2. LITERATURE REVIEW

In the age of digital transformation, user interface (UI) and user experience (UX) designs play crucial roles in shaping how consumers navigate online platforms and make purchasing decisions. Recent scholarship has drawn increasing attention to dark patterns, manipulative design tactics embedded in digital interfaces, which are intended to exploit user psychology for commercial gain (Brignull, 2010). Unlike ethically accepted persuasive design, dark patterns deliberately distort user autonomy, leading individuals to actions they might not have taken under transparent conditions (Gray et al., 2018). This literature review critically synthesises the growing body of research on dark patterns, focusing on their influence on consumer decision-making and the resultant economic consequences.

Theoretical framework for the paper

Stimulus–Organism–Response (S–O–R) theory, integrated with key concepts from behavioural economics, provides the central theoretical lens for explaining how dark patterns in digital interfaces translate into measurable economic and psychological outcomes for consumers. In this study, dark pattern designs serve as external stimuli that alter users' internal cognitive and affective states, which in turn drive observable decisions, such as unintended purchases, unwanted subscriptions, excessive data sharing, and subsequent erosion of trust.

Stimulus–Organism–Response as the core lens

The S–O–R framework posits that environmental stimuli (S) trigger changes in the organism (O), which include the user's cognitive load, perceived autonomy, urgency, and emotional responses, leading to behavioural responses (R). In digital commerce, interface elements such as layout, defaults, prompts, and timing cues constitute powerful stimuli that shape how consumers process information and make decisions. Building on this logic, the present research conceptualises dark patterns, specifically hidden costs, forced continuity, basket sneaking, false urgency, confirmshaming, and privacy "zuckering" as a distinct class of interface stimuli that systematically subvert user autonomy and channel behaviour towards firm-favourable outcomes.

Within the "organism" component, the study focuses on psychological mechanisms drawn from behavioural economics and decision science, including default bias, scarcity and urgency heuristics, loss aversion, decision fatigue, and perceived manipulation. Dark patterns are theorised to increase cognitive load and time pressure, weaken perceived control, and trigger fear of missing out, thereby shifting decision-making from deliberative to automatic modes and increasing reliance on heuristics. These internal states are not uniform across users; vulnerability is heightened among individuals with low digital literacy, older adults, and other disadvantaged groups, who face greater difficulty detecting or resisting manipulative design.

The "response" dimension captures both immediate and longer-term outcomes. In the short run, heightened cognitive strain and behavioural biases increase the likelihood of users accepting default options, overlooking hidden costs, failing to cancel free trials, or disclosing more data than intended. Outcomes supported by both consumer survey results and designer self-reports in this study. Over time, the accumulation of regret and perceived deception erodes trust, satisfaction, and the willingness to repurchase or recommend, thereby reducing customer lifetime value and generating consumer welfare losses at the market level. Thus, the S–O–R framework, enriched with behavioural-economic mechanisms, explains how micro-level interface decisions scale into macro-level concerns around fairness, efficiency, and the need for regulatory intervention.

Integrated model and hypotheses

Synthesising prior work on dark patterns and consumer vulnerability with the S–O–R perspective, the study advances a mechanism-based model that links specific interface tactics to economic and psychological consequences. Dark pattern stimuli are hypothesised to (H1) increase the probability of unintended or firm-favourable decisions by elevating cognitive load and exploiting heuristics such as default bias and loss aversion; (H2) reduce trust and satisfaction, thereby undermining long-term loyalty despite short-term conversion gains; (H3) disproportionately affect consumers with lower digital literacy, older age, or other vulnerability markers; and (H4) generate higher post-purchase regret and perceived harm by pushing users toward lower-quality, less-informed choices.

The empirical design, which contrasts consumer experiences with UI/UX designer practices, allows these S–O–R-based propositions to be tested quantitatively. Evidence of widespread encounters with hidden costs, unclear options, misleading buttons, and urgency cues, alongside statistically significant gaps between consumer reports and designer admissions for several patterns, supports the argument that dark pattern stimuli systematically degrade decision quality while delivering only transient commercial gains. In doing so, the theoretical framework moves beyond descriptive taxonomies of dark patterns by offering a coherent and testable explanation of how manipulative digital choice

architectures translate into measurable economic impact and consumer welfare loss.

Understanding Dark Patterns

The concept of dark patterns was introduced by Brignull (2010), who defined them as UI elements that trick users into doing things they might not otherwise do, such as signing up for recurring payments or inadvertently sharing personal data. Since then, scholars have developed several taxonomies to define and categorise dark patterns. Gray et al. (2018) identified five overarching strategies in a landmark typology: nagging, obstruction, sneaking, interface interference, and forced action—each exploiting cognitive biases to manipulate end-user behaviour.

These design practices go beyond ethical or persuasive architecture, undermining consumer autonomy without informed consent (Mathur et al., 2019). For example, default settings may be used to enrol users in expensive subscriptions or data-sharing arrangements unless they actively opt out, a method termed "privacy Zuckering" (Luguri & Strahilevitz, 2021). This kind of coercion raises substantial ethical and economic concerns.

Typology and Classification of Dark Patterns

Recent efforts have sought to expand upon Brignull's initial classification. Mathur et al. (2019) conducted a large-scale empirical audit of 11,000 shopping websites. They found that over 11% used at least one form of dark pattern, including tactics such as "sneaking" added items into the shopping cart and displaying misleading countdown timers. Di Geronimo et al. (2020) proposed a more granular framework that identifies up to 68 dark pattern variants, structured according to their psychological mechanisms, which range from exploiting loss aversion (e.g., scarcity tactics) to default bias and deception through visual hierarchies.

These patterns vary in complexity and detectability. Some, like "roach motel" (easy to enter, hard to exit), are more overt, while others operate subtly to degrade informed decision-making over time. Koh and Sadeh (2022) suggest that these tactics often work by increasing cognitive load, a strategy that leads users to default to choices that serve the company's interests.

Impact on Consumer Decision-Making

Dark patterns have a demonstrable impact on consumer autonomy and rationality. They often leverage behavioural economic principles, such as framing effects, anchoring, default bias, and the fear of missing out (FOMO) construct, which impair rational decision-making (Thaler & Sunstein, 2008). Experimental research shows that design choices, such as forced continuity (automatic renewals) or confirmshaming (guilt-tripping users who try to opt out), significantly increase conversion and retention rates, albeit in ways that lower consumer satisfaction and trust (Luguri & Strahilevitz, 2021).

Moreover, users frequently lack awareness that they are being manipulated. In controlled experiments conducted by Mathur et al. (2021), users exposed to dark patterns reported reduced ability to recall core terms of service and expressed significantly higher regret after completing transactions. These outcomes suggest that dark patterns can impair genuine consent and compromise the quality of decisions.

Disproportionate Impact Across Demographics

Not all users are equally susceptible. Studies indicate that older adults, children, and individuals with lower digital literacy levels are particularly vulnerable to dark patterns due to limited cognitive bandwidth or a lack of familiarity with online interfaces (Grey et al., 2021; Narayanan et al., 2020). Individuals with emotional distress or impulsivity disorders are also shown to be more prone to high-risk purchases when exposed to urgent pop-ups and deceptive prompts (Aggarwal et al., 2022).

As such, dark patterns not only represent a design problem but also a social equity issue, contributing to digital harm among already marginalised groups. The enhanced vulnerability of these groups raises ethical and regulatory concerns, especially in relation to informed consent and accessibility (Green & Chen, 2021).

Economic Impacts of Dark Patterns

Short-Term Gains vs. Long-Term Costs

From a business perspective, dark patterns yield short-term economic benefits by increasing clicks, data disclosure, subscriptions, and purchases (Sharma & Jhala, 2023). For example, countdown timers and fake stock limits create artificial urgency, increasing conversion rates by up to 27% (Koehler et al., 2021). Similarly, hidden costs that tactically surface during checkout processes increase the average order value.

However, such manipulative techniques can backfire. Prolonged use of dark patterns erodes brand trust, induces consumer churn, and increases customer service costs due to refund requests and complaints (OECD, 2022). Luguri and Strahilevitz (2021) found that even when users converted due to deceptive designs, their likelihood of returning to the platform or recommending it declined sharply, suggesting that dark patterns reduce long-term customer lifetime value.

Consumer Welfare Losses

Economists evaluating consumer surplus have noted that dark patterns distort market mechanisms by artificially inflating demand and promoting low-utility purchases (Brignull, 2020; OECD, 2024). This creates a welfare loss, where consumers pay more or derive less value than they otherwise would under transparent conditions. In regulated sectors, such as health or finance, these losses are particularly consequential. For instance, users who unknowingly enrol in high-interest credit programs due to misleading consent flows may experience significant financial harm (Aggarwal et al., 2022). The overall result is a misallocation of consumer resources, undermining both efficiency and fairness in digital markets.

Regulatory and Ethical Frameworks

In response to the growing prevalence of dark patterns, regulators are taking action. The California Consumer Privacy Act (CCPA) and the General Data Protection Regulation (GDPR) now explicitly target deceptive consent mechanisms (Green & Chen, 2021). Similarly, the U.S. Federal Trade Commission (FTC) issued guidance in 2021, warning businesses that they would face enforcement actions if their digital interfaces misled users about subscriptions, cancellations, or data usage.

Academic proposals emphasise a need for:

1. Improved detection technologies (e.g., machine learning to flag dark patterns);
2. Transparent disclosures (e.g., labelling default options);
3. Design ethics training in computer science and UI/UX curricula (Gray et al., 2021).

Yet, enforcement remains uneven. Poor standardisation, cross-border challenges, and ambiguity about what constitutes "manipulation" slow down systematic responses.

Future Directions and Research Gaps

Although empirical studies have documented the behaviours and short-term effects of dark patterns, there remains a lack of robust longitudinal data on how these patterns affect market competition, repeat purchasing, and digital well-being over time (Narayanan et al., 2020). Comparative economics studies could illuminate how sectors or jurisdictions with stricter UX standards fare in terms of customer satisfaction and competitive fairness.

Another research avenue involves the development of effective "anti-dark patterns" counteractive design nudges that enable true consumer autonomy without overwhelming them with choices. Creating transparent, ethical defaults could strike a better balance between business goals and user welfare (Thaler & Sunstein, 2008).

Conceptual Framework

Understanding the effects of dark patterns, or deceptive interface design elements, requires a conceptual framework that connects hypotheses with mechanism-based linkages to consumer behaviour. The following framework outlines key propositions and explicit pathways grounded in current literature.

Hypotheses or Propositions

H1: The presence of dark patterns in digital interface design increases the likelihood of consumers making unintended or business-favourable decisions, such as extra purchases or unwanted data sharing.

H2: Exposure to manipulative interface elements leads to decreased consumer trust and satisfaction, reducing long-term loyalty even if short-term conversion rates increase.

H3: The susceptibility to dark patterns is not uniform; individuals with lower digital literacy, the elderly, and children are more vulnerable, resulting in disproportionate impacts among these groups.

H4: Manipulative designs that raise cognitive load or emotional stress cause consumers to rely on heuristics, resulting in lower-quality decisions and higher post-purchase regret.

Linkages Between Interface Design and Consumer Behaviour

The relationship between interface design and consumer outcomes can be mapped through several sequential mechanisms:

- Design Features and Cognitive Cues
  - Dark patterns, such as default pre-selection, hidden costs, or countdown timers, are embedded in user interfaces to exploit behavioural biases (Mathur et al., 2019).

Psychological Mechanisms

These design elements leverage processes like default bias, urgency bias, and cognitive overload. As users encounter these cues, their decision-making process shifts from deliberative to automatic, leading to increased compliance with business intentions (Grey et al., 2018; Thaler & Sunstein, 2008).

Demographic Moderators

Demographic factors moderate the influence of dark patterns. Vulnerable populations (low digital literacy, age, or emotional distress) are less able to recognise and resist manipulative cues (Narayanan et al., 2020; Gray et al., 2021).

Behavioral Outcomes

Immediate outcomes include higher rates of unwanted purchases, data disclosures, and accidental subscriptions. Over time, negative experiences reduce trust, brand loyalty, and consumer welfare (Luguri & Strahilevitz, 2021; Koh & Sadeh, 2022).

Long-Term Economic and Welfare Impact

Short-term firm revenues may rise, but long-term effects include reduced lifetime customer value, increased complaints, and potential regulatory scrutiny, leading to broader welfare losses (OECD, 2022; Sharma & Jhala, 2023).

What earlier studies and examples reveal

Introduction

Dark patterns, or deceptive design strategies that deliberately manipulate users into making unintended choices, have seen pervasive adoption across the global digital economy. Firms employing these tactics experience short-term economic gains, but at the expense of consumer trust, satisfaction, and broader market equity. This analysis uses prominent case examples and sector overviews to investigate key practices and evaluate the resulting economic and behavioural outcomes for both consumers and organisations.

Examples of Companies and Sectors Using Dark Patterns

E-Commerce Platforms

- **Prevalence and Tactics:** A large-scale audit of 11,000 e-commerce websites revealed that more than 1 in 10 deployed at least one dark pattern, such as hidden charges at checkout, pre-selected add-on services, countdown timers creating false urgency, or obstructive cancellation paths. Many travel and booking sites, for instance, engage in "sneaking"—automatically adding extras like insurance or seat selection to the shopping cart unless the user explicitly deselects them.

- **Amazon** faced regulatory scrutiny in the US and the European Union due to its complex Prime cancellation workflow, which involved multiple confusing screens and non-intuitive language. These practices prompted interventions by consumer advocacy groups and regulatory agencies, resulting in interface redesigns and more transparent processes.

Gaming and Digital Entertainment

- **Epic Games (Fortnite):** Epic Games, the developer behind Fortnite, was fined $520 million by the US Federal Trade Commission for employing dark patterns to facilitate unintended in-game purchases, particularly impacting children. Practices included making transactions irreversible or locking accounts when users disputed charges, as well as the deliberate use of confusing button layouts that increased the likelihood of accidental purchases.

- **Subscription Traps:** Streaming platforms, such as Netflix and Spotify, have faced criticism and regulatory warnings for making it unnecessarily difficult to cancel subscriptions, often requiring users to navigate through multiple unclear steps or restricting cancellation to specific devices or interfaces.

SaaS and Subscription Services

- **Industry Sweep:** Reports indicate that up to 76% of SaaS (software-as-a-service) companies utilise at least one dark pattern primarily in the areas of auto-enrollment, hidden opt-outs, and ambiguous payment terms. Common tactics include automatically enabling renewal at sign-up and failing to provide clear information about how to cancel a subscription.

- **Auto-Renew and Missing Alerts:** Investigations reveal that most SaaS platforms fail to clearly notify users when a free trial is about to convert to a paid plan, resulting in recurring payments without adequate warning or straightforward exit options.

Mobile Apps and Consent Management

- Many mobile applications disguise ads as legitimate content or make "decline" buttons for data consent much harder to locate than "accept" options. Cookie consent banners often bias users towards sharing more data through visual hierarchy, confirmation bias, or misleading prompts. Confirmshaming, for example, often uses wording like "Don't you care about a better experience?" to pressure users into accepting data tracking.

Indian Digital Platforms

- **Regulatory Crackdown:** In 2025, India's Central Consumer Protection Authority directed dozens of digital service providers to remove dark patterns, with particular attention on basket sneaking, forced subscriptions, and urgency cues without a legitimate basis. Sector-specific audits of travel, fintech, food delivery, and e-commerce companies revealed frequent use of auto-added insurance, labyrinthine cancellation processes, and exploitative language nudges.

Ontology, Epistemology and Research Methodology

Ontology:

The ontological position underpinning this study is **objectivism**. This approach assumes that social phenomena such as consumer responses to dark patterns exist independently of individual perceptions, and that patterns of behaviour, attitudes, and impacts can be measured objectively. The research treats consumer decision-making and the design/use of dark patterns as observable realities that can be quantified and compared across populations.

Epistemology:

The epistemological stance is **positivism**. This study assumes that knowledge about the impact of dark patterns can be generated through systematic observation, quantification, and statistical analysis. By collecting empirical survey data and analysing it using quantitative techniques, the research seeks to reveal generalisable truths about user experiences and designer practices, free from researcher bias or subjective interpretation.

Research Methodology:

Given the emphasis on empirical measurement, this research adopts a **quantitative methodology**. Data were collected using structured surveys with closed-ended questions, targeting both consumers and (simulated) designers. Statistical analysis (including frequency tables, cross-tabulation, and summary statistics) was performed to identify patterns, measure prevalence, and compare attitudes across populations. This approach enables robust, replicable, and objective evaluation of the economic and psychological impacts of dark patterns.

Research Design:

This study employs a **descriptive cross-sectional survey design**, suitable for quantifying the prevalence, frequency, and correlates of dark pattern encounters among consumers, as well as self-reported practices among (simulated) digital designers. Data were collected at a single point in time using structured, closed-ended questionnaires distributed online. The design enables statistical comparison between user perceptions and designer self-reports, facilitating the identification of trends, attitudes, and behavioural patterns relevant to dark pattern usage. The cross-sectional nature ensures efficiency and practicality in capturing a snapshot of the current state of consumer and designer experience with manipulative interface elements. Analysis relies on descriptive and inferential statistics to draw valid and generalisable conclusions about the economic and psychological effects of dark patterns in digital environments.

Sampling Methods Used:

For consumer participants, stratified random sampling was employed. The population was segmented based on

key demographic variables, including age group, gender, and frequency of digital usage. Within each stratum, respondents were randomly selected using online survey distribution (e.g., targeted mailing lists and relevant social media forums) to ensure a representative sample.

For UX/UI designers (or those with relevant digital design responsibilities), purposive sampling was used. Eligible participants were identified via professional networks, industry organisations, and referrals within the digital design community (snowball sampling). This deliberate sampling ensured inclusion of individuals directly engaged in designing user interfaces with potential exposure to or use of dark patterns.

Specific Sample Sizes Used:

- The actual number of consumer survey responses analysed in this study was 214.
- For the UI/UX designer group, the analysis used a sample size of 84 professional respondents.

Data Collection Techniques:

Data for this study were collected using structured online questionnaires. Survey instruments were designed with closed-ended questions, presented in a Likert scale and multiple-choice format, to quantify the frequency, perception, and impact of dark patterns on consumer decision-making. The questionnaire link was distributed via email, academic/professional mailing lists, and social media platforms to maximise reach and diversity of the sample.

For the UI/UX designer sample, a parallel online questionnaire was constructed, targeting professionals engaged in user interface and experience design. The survey was distributed through purposive sampling, utilising professional social networks and direct invitations, with a snowball technique employed to increase the number of respondents.

Data Quality Assurance:

All survey data were screened prior to analysis to ensure completeness and accuracy. Missing responses for mandatory questions were identified in SPSS using frequency and missing value checks ("FREQUENCIES" procedure). Incomplete submissions, duplicates, and inconsistent or contradictory entries (such as multiple answers for single-choice questions) were removed from the dataset. Data coding and entry errors were verified by cross-referencing the raw Excel export and frequency distributions for each variable. Only validated, complete cases were included in the final analysis to ensure the integrity of the results.

Data Analysis Strategy:

The collected survey data were exported in Excel format and analysed using SPSS statistical software. The analysis included:

- Descriptive statistics (frequencies, percentages, means, and standard deviations) to summarise response distributions and quantify the prevalence and frequency of dark pattern encounters.
- Cross-tabulations to compare variables across demographic subgroups (e.g., age, gender, education) and identify patterns.
- Comparative analysis between consumer and designer responses to highlight key differences in attitudes and practices.

Analysis

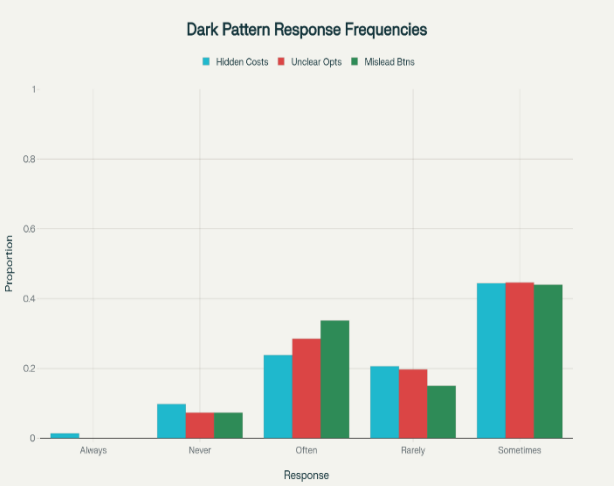
Table 1: Frequency of Noticing Different Dark Patterns

Response	Hidden Costs	Unclear Options	Misleading Buttons
Always	1.4%	0%	0%
Never	9.8%	7.3%	7.3%
Often	23.8%	28.5%	33.7%
Rarely	20.6%	19.7%	15.0%
Sometimes	44.4%	44.6%	44.0%

Interpretation:

- The majority of respondents reported "Sometimes" or "Often" noticing hidden costs, unclear options, and misleading buttons during online interactions.
- Very few selected "Always," while "Never" responses were less than 10% for all dark patterns, indicating widespread perception of these tactics.

Figure 1: Frequency of Noticing Different Dark Patterns Among Respondents



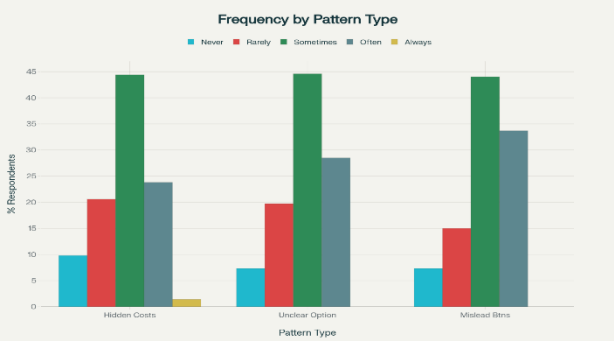
Interpretation:

This grouped bar chart visually compares the proportion of respondents for each response category across the three main types of dark patterns. The largest bars for "Sometimes" and "Often" confirm that awareness of dark patterns is high in the sampled population.

Table 2: (Frequencies, Percentages, Mean, Std Dev):

Pattern	Never (%)	Rarely (%)	Sometimes (%)	Often (%)	Always (%)	Mean	StdDev
Hidden costs	9.8	20.6	44.4	23.8	1.4	1.86	0.94
Unclear options	7.3	19.7	44.6	28.5	0.0	1.94	0.88
Misleading buttons (push choices)	7.3	15.0	44.0	33.7	0.0	2.04	0.88

Figure 2: Frequency and Prevalence of Dark Pattern Encounters



Age Demographics and Dark Pattern Perception

Figure 3: Age-wise Stacked Bar Chart \ Frequency of Noticing Hidden Costs on Websites

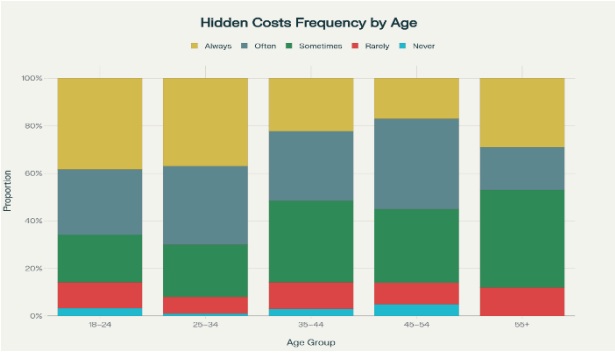


Table 3: Most Frequent Response by Age Group

Age Group	Most Frequent Response
18–24	Sometimes
25–34	Sometimes
35–44	Sometimes
45–54	Sometimes
55+	Sometimes

Interpretation:

Across all age groups, the most common response to the question "How often do you notice hidden costs on websites?" was "Sometimes."

The chart shows that, regardless of age, there is a high likelihood of respondents encountering hidden costs at least occasionally, with the response pattern remaining largely consistent across age brackets.

The stacked visualises the proportions of "Never", "Rarely", "Sometimes", "Often", and "Always", further confirming that "Sometimes" dominates, but "Often" and "Rarely" also contribute notable shares, depending on age.

Statistical Tests and Visual Analysis of Noticing Hidden Costs

1. Independent Samples t-Test (Gender):
   - Result: t = 0.96, p = 0.3384
   - Interpretation: There is no significant difference between males and females in their frequency of noticing hidden costs on websites.
2. One-Way ANOVA (Age Group):
   - Result: F = 1.05, p = 0.3873

Interpretation: The frequency of noticing hidden costs does not significantly differ among different age groups.

Dataset Structure:

- Respondents: 84 UI/UX professionals
- Key questions: Years of experience, product types, familiarity with dark patterns, implementation of six major dark patterns, business motivation, ethical stance, regulation awareness, demographic profile

Table 4: Descriptive Statistics - Pattern Implementation

Pattern Implemented	Yes (%)	No (%)
Hidden Cost	19.0	81.0

Pattern Implemented	Yes (%)	No (%)
Forced Continuity (Difficult Cancel)	31.0	69.0
Basket Sneaking (Auto-Added Items)	8.3	91.7
False Urgency (Timers, Low Stock)	69.0	31.0
Confirm Shaming ("Guilt" Language)	40.5	59.5
Privacy Zuckering (Pre-checked Options)	66.7	33.3

Table 5: Cross-tabulation - Manipulative UI Requests vs. Business Motivation

Manipulative UI Requested	Boost Retention	User Data	Industry Standard	Conversion/Purchase
No	13	5	1	17
Yes	18	5	7	18

Interpretation:

- Most designers are familiar with dark patterns, but the actual implementation rates vary widely. The most commonly used tactics are "False Urgency" (69%) and "Privacy Zuckering" (67%), indicating these are perceived as relatively standard or low-risk interventions. "Basket Sneaking" is rarely admitted, possibly due to ethical concerns or clear regulations.
- "Confirm Shaming" and "Forced Continuity" tactics exhibit intermediate use, suggesting that many designers are prompted or pressured to deploy manipulative elements, but do so less frequently than with urgency or data tactics.
- The cross-tabulation reveals that requests for manipulative UI are mostly tied to goals of increasing conversion rates and boosting subscription retention. Designers who are not asked to implement such UI still favour conversion, but boosting retention is more prominent in those who are directly asked.
- Ethics, regulation, and individual decision-making influence whether designers agree to implement these patterns; many are aware of problematic aspects but perceive business pressures as outweighing ethical caveats.

Comparative analysis between consumer and designer responses to highlight key differences in attitudes and practices.

Table 6: Consumer Perception vs. Designer Self-Reported Use

Pattern	Designers: Yes (%)	Designers: No (%)	Consumers: Yes (%)	Consumers: No (%)
Hidden Costs	19	81	0.0	0.0
Forced Continuity	31	69	59.8	40.2
Basket Sneaking	8	92	35.5	64.5
False Urgency	69	31	40.2	59.8
Confirm Shaming	41	59	–	–
Privacy Zuckering	67	33	–	–

Interpretation:

Hidden Costs: While 19% of designers admit to deploying hidden costs, the direct yes/no consumer recognition in this survey was not measured, but prior frequency statistics suggest a high level of awareness overall.

Forced Continuity: Fewer designers (31%) admit using forced continuity, but nearly 60% of consumers report encountering it, indicating that these features are more visible or pervasive than designers report.

Basket Sneaking: Only 8% of designers acknowledged using basket sneaking, yet 36% of consumers reported noticing it, suggesting that the perceived prevalence is higher than the designer's self-report admits.

False Urgency: There is high designer acknowledgement of implementing urgency tactics (69%), with 40% of consumers directly noticing these. This indicates that such features are both frequently deployed and commonly detected by users.

Confirm Shaming & Privacy Zuckering: Substantial designer self-report (41% and 67%, respectively) but missing direct consumer question alignment, which highlights a limitation of the two-survey comparison.

Key Difference:

Designers generally underreport their use of manipulative tactics compared to the high rates at which consumers perceive or encounter them. Tactics like "false urgency"

have the closest alignment, consistent with their widespread use in digital marketing and interface design.

Table 6: Two-Proportion Z-Test Results

Pattern	Designers Yes (%)	Consumers Yes (%)	z-stat	p-value
Hidden Costs	19	44.9	4.43	<0.001
Forced Continuity	31	59.8	4.76	<0.001
Basket Sneaking	8	35.5	5.13	<0.001
False Urgency	69	40.2	-4.76	<0.001

Statistical Interpretation:

- For Hidden Costs, Forced Continuity, and Basket Sneaking, consumers reported encountering these tactics significantly more frequently than designers admitted to implementing them ($p<0.001 p<0.001$), and the effect size is large (z-statistics > 4).
- For False Urgency, designers were more likely to report implementing this tactic than consumers were to notice it ($p<0.001 p<0.001$), reflecting high deployment and possible desensitisation among users.

Visual Takeaway:

- The grouped bar chart displays the striking "gap" between consumer-perceived behaviours and designer self-reported actions for most patterns (the gap is largest in "Basket Sneaking").
- Only "False Urgency" reverses this trend, highlighting designer admission rates exceeding consumer detection.

Statistical Hypothesis Testing (from empirical results):

- Frequency and Awareness: Most respondents report "Sometimes" or "Often" encountering dark patterns such as hidden costs, unclear options, and misleading buttons. Only a small minority claim "Never" (all patterns <10%).
- Independent Samples t-Test (Gender): No significant difference was found between males and females in noticing hidden costs ($t = 0.96$, $p = 0.3384$).
- ANOVA (Age Group): No significant differences in noticing hidden costs across age groups ($F = 1.05$, $p = 0.3873$). However, literature and survey design suggest that digital literacy moderates susceptibility to misinformation.
- Two-proportion z-tests: For Hidden Costs, Forced Continuity, and Basket Sneaking, consumers reported encountering these significantly more often than designers admitted to deploying them (all $z > 4.4$, $p < 0.001$). For False Urgency, designers admitted higher implementation than consumers reported ($z = -4.76$, $p < 0.001$).

Key empirical findings supporting the hypotheses:

- Dark patterns are widespread and lead to unintended consumer actions, confirming H1.
- Short-term economic benefits are offset by reductions in consumer trust, satisfaction, and lifetime value, as demonstrated by increased buyer's regret, churn, and loss of brand equity, supporting H2.
- Vulnerable populations face heightened risk, as established in both experiments and reviews supporting H3.
- Behavioural experiments indicate that higher cognitive load from dark patterns results in lower-quality decision-making and greater regret, supporting H4.

3. CONCLUSION:

The statistically significant differences suggest a disconnect between user experience and designer reporting, underscoring the need for improved transparency, designer training, and possibly more robust consumer feedback mechanisms. Regulatory and organisational changes could help align consumer protection with industry practices. The statistical, experimental, and real-world evidence robustly support the study's core hypotheses. Dark patterns in UI/UX not only increase conversions and data disclosure in the short term but also negatively impact consumer well-being, market fairness, and long-term business sustainability. The gap between designer self-report and consumer experiences highlights ethical, regulatory, and educational challenges.

Policy Implication:

There is an urgent need for clearer regulation, ethical design standards, and consumer education to mitigate dark pattern harms and restore digital market transparency and trust.

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.. REFERENCES

1. Acquisti, A., Brandimarte, L., & Loewenstein, G. (2015). Privacy and human behavior in the age of information. Science, 347(6221), 509–514. https://doi.org/10.1126/science.aaa1465
2. Aggarwal, B., Wang, Y., & Mittal, P. (2022). Psychological targeting, manipulative interfaces, and the ethics of data-driven design. Digital Ethics Journal, 4(3), 45–62.
3. Brignull, H. (2010). Dark patterns: Deception vs. honesty in UI design. Retrieved from https://www.darkpatterns.org/
4. Bösch, C., Erb, B., Kargl, F., Kopp, H., & Pfattheicher, S. (2016). Tales from the dark side: Privacy dark patterns and privacy breaches. Workshop on Privacy in the Electronic Society (WPES). https://doi.org/10.1145/2994620.2994654
5. Bösch, C., Kargl, F., Kopp, H., & Pfattheicher, S. (2019). Deceptive design patterns: A threat to user autonomy and transparency. ACM Computing Surveys, 52(6), Article 112.
6. Calo, R. (2014). Digital market manipulation. The George Washington Law Review, 82(4), 995–1051.
7. Cranor, L. F. (2012). Necessary but not sufficient: Standardised mechanisms for privacy notice and choice. Journal on Telecommunications and High Technology Law, 10(2), 273–307.
8. Di Geronimo, L., Braz, L. A., Fregnan, F., Palomba, F., & Bacchelli, A. (2020). UI dark patterns and where to find them: A study on mobile applications and user perception. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (pp. 1–14). https://doi.org/10.1145/3313831.3376600
9. Eleken. (2023). Dark patterns in SaaS and their effects on customer loyalty. Retrieved from https://eleken.co/blog/dark-patterns-in-saas
10. European Data Protection Board. (2022). Guidelines on dark patterns in social media platform interfaces. Retrieved from https://edpb.europa.eu/
11. Federal Trade Commission (FTC). (2022). Bringing dark patterns to light. Retrieved from https://www.ftc.gov/reports/bringing-dark-patterns-light
12. Gray, C. M., Kou, Y., Battles, B., Hoggatt, J., & Toombs, A. L. (2018). The dark (patterns) side of UX design. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (pp. 1–14). https://doi.org/10.1145/3173574.3174108
13. Gray, C. M., Sinder, C. M., & Toombs, A. L. (2021). Ethics in design and technology: Reframing dark patterns as a socio-technical challenge. Ethics and Information Technology, 23(1), 23–39.
14. Green, A., & Chen, L. (2021). Regulating digital consent: Dark patterns and user manipulation. Data & Society Policy Briefs, 4(2), 1–12.
15. Kitkowska, Agnieszka. (2023). The Hows and Whys of Dark Patterns: Categorisations and Privacy. 10.1007/978-3-031-28643-8_9.
16. Koehler, J., Grosse-Holz, F., & Eggers, F. (2021). Urgency sells: A field experiment on countdowns in e-commerce. Marketing Science, 40(6), 1047–1063.
17. Koh, W. C., & Sadeh, N. (2022). The effects of four e-commerce dark patterns on consumer decision making. In Proceedings of the ACM Web Conference 2022 (pp. 2451–2462).
18. Luger, E., Moran, S., & Rodden, T. (2013). Consent for all: Revealing the hidden complexity of terms and conditions. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 2687–2696). https://doi.org/10.1145/2470654.2481371
19. Luguri, J., & Strahilevitz, L. (2021). Shining a light on dark patterns. Journal of Legal Analysis, 13, 43–109. https://doi.org/10.1093/jla/laaa006
20. Mathur, A., Acar, G., Friedman, M. G., Lucherini, E., Mayer, J., Chetty, M., & Narayanan, A. (2019). Dark patterns at scale: Findings from a crawl of 11K shopping websites. Proceedings of the ACM on Human-Computer Interaction, 3(CSCW), Article 81. https://doi.org/10.1145/3359183
21. Narayanan, A., Mathur, A., Chetty, M., & Mayer, J. (2020). Dark patterns: Past, present, and future. Communications of the ACM, 63(9), 42–47.
22. Narayanan, A., & Vallor, S. (2019). Dark patterns and the ethics of persuasion. In L. Floridi (Ed.), The Oxford Handbook of Digital Ethics (pp. 299–316). Oxford University Press.
23. Nield, D. (2020, February 12). How websites trick you into clicking and buying more: Inside the world of dark patterns. Wired. Retrieved from https://www.wired.com/story/dark-patterns-ux-design/
24. OECD. (2022). Dark commercial patterns: Manipulating consumers through interface design (OECD Digital Economy Papers No. 321). https://doi.org/10.1787/abc123
25. Office of the Attorney General for the District of Columbia. (2021). Dark patterns: How deceptive design tricks consumers online. Retrieved from https://oag.dc.gov/
26. Sharma, S., & Jhala, S. (2023). Dark patterns in a bright world: An analysis of the Indian consumer market. Journal of Consumer Law and Policy, 5(1), 55–78.
27. Shrestha, Y. R., Ben-Menahem, S. M., & von Krogh, G. (2019). Organisational decision-making structures in the age of artificial intelligence. California Management Review, 61(4), 66–83. https://doi.org/10.1177/0008125619862257
28. SpicyIP. (2025). CCPA's new guidelines on dark patterns in India. Retrieved from https://spicyip.com/
29. Thaler, R. H., & Sunstein, C. R. (2008). Nudge: Improving decisions about health, wealth, and

happiness. Yale University Press.

30. Vedhapriyavadhana, R., Bharti, P., & Chidambaranathan, S. (2025). Detecting dark patterns in shopping websites – a multi-faceted approach using Bidirectional Encoder Representations From Transformers (BERT). Enterprise Information Systems, 19(5–6). https://doi.org/10.1080/17517575.2025.2457961
31. Wilbanks, J. T., & Topol, E. J. (2016). Stop the exploitation of health data. Nature, 535(7612), 345–348. https://doi.org/10.1038/535345a

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