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The Impact of Dark UX on E-Commerce Consumer Decisions: A Qualitative Analysis and Ethical Design Recommendations

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A B S T R A C T

Dark UX is an interface design practice that manipulates users into taking actions that benefit the service provider, often at the expense of the consumer. This study explores how dark UX influences consumer decision-making in e-commerce applications, identifies user issues, and develops recommendations for developers. A qualitative approach with purposive sampling was used to select 15 informants aged 25-45 who actively shop through e-commerce applications. Data were collected through in-depth semi-structured interviews and document analysis, then analyzed using thematic coding using Miles and Huberman's interactive model. Findings indicate that misleading urgency (limited stock notifications), sneak-into-basket (automatic item additions), and roach motel patterns (cancellation barriers) induce significant psychological distress, particularly the fear of missing out, which drives impulse purchases. Hidden costs that emerge only at the checkout stage and manipulated product reviews also erode user trust. The study recommends the implementation of ethical design principles, including up-front price transparency, easy-to-understand terms and conditions, real-time behavioral interventions, and regular dark UX audits. Stronger regulations and digital literacy programs are needed to create a healthy and sustainable e-commerce ecosystem.

INTRODUCTION

E-commerce is now one of the largest economic sectors in the digital era. According to Zion Market Research, the value of global e-commerce transactions is estimated to reach USD 28.02 trillion in 2028 with a compound annual growth rate (CAGR) of 14.8% [1]. This growth has driven intense competition among digital platforms, and some developers have responded by adopting manipulative interface designs, known as dark UX or dark patterns, to artificially boost sales conversions [2]. Dark UX is a design strategy that aims to confuse, mislead, or manipulate users into making choices that benefit the platform, often without the consumer's knowledge [3]. Techniques commonly found in e-commerce include:

a) Misleading urgency, namely "limited stock" messages or countdowns that put consumers under pressure to buy without careful consideration.
b) Sneak into basket, which is the automatic addition of products to a shopping cart without explicit consent.
c) Roach motel pattern, where registration or subscription is very easy but cancellation is very difficult.
d) Hidden costs, namely additional costs that only appear towards the end of the transaction.
e) Forced continuity, namely a condition where consumers cannot stop recurring subscriptions without going through complicated procedures [4].

Empirical studies show that dark UX practices do increase sales in the short term, but significantly erode consumer trust and loyalty in the long term [5]. Reported psychological impacts include stress, frustration, and post-purchase regret, which ultimately harm consumers financially and damage the reputation of e-commerce platforms [6]. In line with

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increasing consumer awareness of digital ethics, regulations restricting dark UX have begun to develop in various countries [7].

While the international literature on dark UX continues to grow, studies specifically exploring the experiences of Indonesian consumers remain very limited. Most existing research focuses on quantitative experimental testing [6] or platform content analysis [8][9], and few have explored the qualitative perspectives of domestic e-commerce users in depth. This gap is the primary reason for this research.
Based on the above background, this study attempts to answer two main questions:

a) How dark ux practices influence consumer decision-making processes in e-commerce applications.
b) What are the psychological and financial impacts of these manipulative techniques on consumers?

The findings of this study are expected to provide a deeper understanding of the mechanisms of dark UX in the Indonesian context, as well as ethical design recommendations that can be implemented by e-commerce application developers. The term dark patterns was first introduced by Harry Brignull in 2010 to describe interfaces that are intentionally designed to deceive or manipulate users for the benefit of others [12]. Gray et al. [12] identified five main dark UX strategies:

a) Nagging, a recurring interruption that distracts the user, such as a notification request pop-up that cannot be permanently closed.
b) Obstruction, blocking certain tasks, such as deliberately making subscription cancellation procedures difficult.
c) Sneaking, the hiding of important information, including hidden costs that are only revealed at the end of the purchasing process.
d) Interface interference, the manipulation of an interface to confuse the user, such as hiding or selecting options by default to the user's detriment.
e) Forced action, forcing a specific action before the user can proceed with the main activity. This taxonomy provides an analytical framework used to guide the data coding in this study.

An experimental study by Sin et al. [6] involving respondents from various countries found that limited stock messages and limited-time offers were proven to significantly increase impulse purchases. However, nudges in the form of brief warnings about the consequences of decisions effectively reduced these manipulative effects. Kang and Yun [13] in an experiment with 100 users in South Korea also found that dark UX worsened the user experience and decreased the intention to retransact, with a greater emotional impact when user goals were not met.

Singh et al. [5] added a brand equity dimension, finding that false confirmations and limited-time offers can boost short-term sales, but erode customer trust and loyalty in the long run. Nimkoompai [8] analyzed the risks of dark UX to e-commerce users' personal data, and showed that manipulative interfaces can lead users to unknowingly hand over sensitive information or agree to self-defeating terms.

Various mitigation approaches have been proposed in the literature. Lu et al. [9] designed a consumer empowerment intervention through co-design workshops and a technology probe study, and found that the web augmentation-based intervention successfully improved consumers' understanding of manipulative design intentions. On the technical side, Chen et al. [15] developed an automatic dark pattern detection system using computer vision and natural language processing, which enables lay users to detect manipulative elements in real time. Mathur et al. [18] proposed large-scale dark UX audits as an enforcement mechanism, while Luguri and Strahilevitz [19] emphasized the need for government regulation and platform transparency.

From a governance perspective, Jung [2] analyzed the limitations of South Korean e-commerce regulations in responding to dark UX practices, and found that many manipulative techniques are not covered by existing laws. This finding underscores the need for a more comprehensive regulatory framework that can keep pace with the dynamics of digital design.

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METHOD

Research Approach and Design

This study used a descriptive qualitative approach with an interpretive phenomenological design [11]. This approach was chosen because the primary objective of the study was to deeply understand the perceptions, experiences, and meanings consumers construct when interacting with dark UX practices, something that cannot be adequately captured through quantitative instruments. The study was conducted from January to May 2025.

Participants and Sampling Techniques

Participants were selected using purposive sampling technique with the following inclusion criteria:

a) Aged 18–50 years.
b) Actively shopped through e-commerce applications at least twice per month in the last six months.
c) Have experienced at least one incident identified as a dark ux practice.
d) Willing to provide informed consent to participate in research.

A total of 15 participants participated, consisting of 8 women and 7 men, with an age range of 23-44 years. The majority resided in Mataram City (12 informants) and Central Lombok (3 informants). Data saturation was reached after the 13th interview, with two additional interviews conducted for confirmation. Participant profiles are summarized in Table 1.

Table 1. Research Participant Profile

Code	Age	Gender	Education	Shopping Frequency	Main Platform
P01	27	P	S1	4x/month	Tokopedia, Shopee
P02	32	L	S2	3x/month	Shopee, Lazada
P03	23	P	S1	6×/month	Tokopedia
P04	44	L	S1	2x/month	Lazada, Blibli
P05	29	P	D3	5x/month	Shopee
P06	35	L	S1	3x/month	Shopee, Tokopedia
P07	25	P	S1	4x/month	TikTok Shop
P08	38	L	S2	2x/month	Blibli, Tokopedia
P09	30	P	S1	5x/month	Shopee
P10	26	L	S1	3x/month	Lazada
P11	42	P	S2	2x/month	Tokopedia
P12	28	L	S1	4x/month	TikTok Shop, Shopee
P13	33	P	S1	3x/month	Shopee
P14	24	L	D3	6×/month	Tokopedia, Shopee
P15	41	P	S1	2x/month	Blibli

Data collection technique

Data collection used two complementary techniques (two-source cross-checking): semi-structured in-depth interviews and document analysis. Interviews were conducted online via Google Meet, lasting 45-75 minutes per session. The interview guide covered three main domains:

a) Concrete experience with dark ux techniques.
b) Psychological and behavioral responses that arise.
c) Perceptions of regulations and expected design solutions.

Each session was recorded after obtaining explicit consent from the informants and then transcribed verbatim. Document analysis included industry reports, the privacy policies of the e-commerce platforms used by the informants, and relevant academic literature.

Data Analysis Techniques

The data was analyzed using the Miles and Huberman interactive analysis model which consists of three stages, namely:

a) Data reduction, sorting and condensing interview transcripts into relevant meaning units.
b) Data presentation, organizing units of meaning into coherent themes using a thematic matrix.
c) Drawing conclusions and verification, namely testing the consistency of findings through source triangulation (between informants) and method triangulation (interviews vs. documents) [11].

Coding was done manually using document processing software, with peer-debriefing involving two members of the research team to ensure dependability.

Research Ethics

This research was conducted in accordance with applicable research ethics principles. All informants received a participant information sheet and signed an informed consent form before the interview began. Data were stored in an encrypted system and accessible only to the research team. Informant identities were anonymized using codes P01-P15 throughout the report. Participation was voluntary, and informants could withdraw at any time without any consequences.

RESULTS AND DISCUSSION

Most Common Dark UX Techniques and Their Usage Patterns

The thematic coding process resulted in five main themes encompassing 127 units of meaning from the entire transcript. Of the five dark UX techniques codified based on Gray et al.'s [12] taxonomy, three techniques emerged most frequently with the most pronounced impact, as summarized in Table 2.

a) Misleading urgency (13 of 15 informants).
b) Hidden costs (12 informants).
c) Sneak into basket (9 informants).

Table 2 summarizes the distribution of dark UX techniques based on the number of informants who mentioned them, the taxonomic category according to Gray et al. [12], and the main impacts reported.

Table 2. Distribution of Dark UX Techniques Based on Frequency and Impact Reported by Informants

Dark UX Techniques	n Inf.	Taxonomic Categories (Gray et al.)	Major Psychological Impacts	Most Vulnerable Groups
Misleading urgency	13/15	Sneaking (distortion of time information)	FOMO, impulse buying (aware-yet-susceptible)	Young consumers (23–29 years), high shopping frequency
Hidden costs	12/15	Sneaking (distortion of price information)	Post-purchase regret, erosion of trust (sunk cost exploitation)	Across demographic groups
Sneak-into-basket	9/15	Interface interference (default opt-out)	Confusion, feeling cheated (often combined with hidden costs)	Young consumers, high shopping frequency
Review manipulation	14/15	Sneaking (distortion of product reputation information)	Consumer epistemic crisis, skepticism towards the entire platform information system	Across demographic groups
Terms and conditions are not transparent	15/15	Forced action / Obstruction (forced consent)	Weak bargaining position, paradox of consent, informational powerlessness	All user groups

Misleading urgency was the most dominant dark UX technique, reported by 13 out of 15 informants (86.7%). In Gray et al.'s [12] taxonomy, this technique falls under the sneaking category, which is the hiding or distortion of information to trigger hasty decisions. This finding aligns with Koh and Seah [4] who identified a similar pattern in the Southeast Asian e-commerce context, and Sin et al. [6] who experimentally demonstrated that “limited stock” messages increase impulse purchases. What distinguishes this research's findings from previous studies is the "aware-yet-susceptible" phenomenon that is prominent in the context of Indonesian users. Twelve out of thirteen informants who recognized the manipulative nature of misleading urgency still made unplanned purchases after being exposed to the technique, indicating that digital literacy alone does not automatically result in behavioral immunity.

"I knew it was definitely not true, but I still felt nervous. I ended up buying it, even though I had planned to think it over first."
(P03, female, 23 years old)

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Statement P03 describes a mechanism that can be explained by Kahneman's dual-process theory [2011]: System 1 (intuitive-emotional) reacts more quickly to urgency stimuli than System 2 (analytical-rational) which already recognizes the manipulation. This differs from the findings of Sin et al. [6] who placed user ignorance as the primary cause of vulnerability. In this study, vulnerability appears to be more affective than cognitive, and this is important for designing interventions: if the problem is not ignorance, then education alone is not sufficient as a solution.

Hidden costs (reported by 12 informants, 80%) represent a different form of sneaking: not a time distortion, but rather a distortion of price information. A consistent pattern is the progressive disclosure of additional costs in the opposite direction, with the actual price only appearing at the checkout page. This mechanism exploits the sunk cost fallacy: once a user has invested time and attention in the product selection process, the psychological cost of canceling the transaction is perceived as greater than the unexpected additional financial cost.

"When I was about to pay, an insurance fee was suddenly automatically added. I didn't realize it until the total price was different from what I had calculated."
(P08, male, 38 years old)

Case P08 also illustrates the combination of two techniques: hidden costs combined with sneak-into-basket (opt-out default). The pre-checked shipping insurance is an example of interface interference in Gray et al.'s [12] taxonomy, where the interface design actively helps the platform accumulate revenue without the user's explicit consent. The financial impact reported by informants ranged from IDR 15,000 to IDR 350,000 per incident, with an average estimated loss of around IDR 75,000 per affected transaction. These numbers may seem small individually, but when multiplied across millions of transactions, they constitute a significant monetization mechanism for the platform and a systemic harm to consumers.

Psychological Impact: Fear of Missing Out and Impulse Buying

All 15 informants (100%) reported experiencing fear of missing out (FOMO) triggered by limited-stock or limited-time notifications, making it the most prevalent psychological impact in this study. FOMO in the e-commerce context is a distinct emotional construct from the social FOMO widely studied in the social media literature. Here, FOMO is transactional: the fear of missing out is not a social experience, but rather a specific price or product. This impact emerged across ages and education levels, although its intensity varied. Scientifically interesting is that this difference in intensity was not correlated with formal education level, but rather with platform usage frequency and level of emotional engagement with online shopping activities. Informants with high shopping frequency (4 times per month or more) tended to report greater and more recurring impacts: Informants with high shopping frequency (4 times per month or more) tended to report greater and more recurring impacts:

"If it says '3 items left' or a countdown timer, I can't think straight. I just check out, even if I regret it later."
(P05, female, 29 years old)

"I once purchased two products that were automatically added to my cart: one was shipping insurance, and the other was a bundled item I hadn't requested. I only realized this when I checked my confirmation email."
(P12, male, 28 years old)

These findings confirm and extend the results of Sin et al. [6] who experimentally demonstrated that misleading urgency increases impulse buying. Unlike Sin et al.'s experimental study, which was conducted under controlled conditions, this study documents the impact in a real-life shopping scenario with actual financial consequences. From a methodological standpoint, the ecological validity of naturalistic research is higher for understanding real consumer behavior. Furthermore, P12's narrative demonstrates how two dark UX techniques (sneak-into-basket and hidden costs) operate synergistically, rather than as isolated incidents. The platform appears to systematically design a combination of these techniques to maximize revenue per transaction, a finding that goes beyond previous studies that analyzed these techniques separately.

Erosion of Trust and Barriers to Loyalty

Twelve informants (80%) stated that dark UX experiences affected their trust in the platform in question. However, an interesting phenomenon emerged: most of them continued using the same platform despite feeling manipulated, due to lock-in factors such as habit, exclusive promotions, or the lack of perceived better alternatives:

"I know Shopee often uses methods like that, but all my friends shop there too. They also offer more vouchers. So I still use them."
(P09, female, 30 years old)

"I switched to Tokopedia after a bad experience on Lazada, but it turned out to be similar there, though not as bad. I ended up registering on all platforms and choosing the one with the most honest pricing per product."
(P04, male, 44 years old)

This phenomenon aligns with the findings of Singh et al. [5] who identified a tension between the positive impact of dark UX on short-term sales and long-term brand equity erosion. However, this study adds a layer of analysis not present in Singh et al.'s study: the phenomenon of platform multi-homing as an adaptive consumer response. Rather than truly switching platforms, Indonesian consumers tend to register on all major platforms at once and choose based on price per product. This strategy, as seen in P04's statement, reflects consumers' awareness of manipulation, but also reveals their structural powerlessness in an oligopolistic market. From a digital economy perspective, this condition creates an inefficient equilibrium: platforms remain incentivized to maintain dark UX as long as consumers do not truly leave, while consumers continue to bear the costs of manipulation because there are no alternatives free from similar practices. This balance can only be intervened through external regulation, not market mechanisms.

Product Reviews as a Vulnerable Source of Trust

User reviews were the most frequently cited purchasing decision factor by informants (14 out of 15). However, trust in these reviews was fragile, as most informants were already aware of the potential for manipulation:

"I always read reviews first, but now I'm starting to have doubts. I once bought something that had a 4.9-star rating, but it was actually very small and made of poor quality material. The reviews seemed to be fabricated."
(P07, female, 25 years old)

These findings confirm and extend Nimkoompai's [8] findings, which identified review manipulation as a form of dark UX that increases consumers' risk of financial loss. This research adds an epistemological dimension: review manipulation not only harms consumers financially, but also undermines the foundation of information trust that underpins the entire online shopping system. When consumers no longer trust reviews, they lose the only independent verification mechanism available. This creates an epistemic crisis for digital consumers: no information can be fully trusted. Under these conditions, consumers develop skeptical heuristics such as only trusting reviews with photos or verified negative reviews, but this approach requires additional time and cognitive energy, indirectly increasing transaction costs for users.

Perceptions of Terms and Conditions and Transparency

All 15 informants admitted to rarely or never reading terms and conditions in full. Consistent reasons were that the text was too long, the language too technical, and there was no incentive to actually read it:

"It's really long, the language is hard to understand, and if you don't agree, you can't shop. So I just tick 'agree'." (P02, male, 32 years old)

This situation reflects a deliberate structural information imbalance, a form of dark UX in the category of sneaking [12] that weakens consumers' bargaining position. P02's statement reveals a fundamental paradox of consent: consent given under conditions where refusal would mean loss of access to a service cannot be considered truly freely given consent. This is a structural problem that goes beyond digital literacy; even consumers with legal backgrounds tend not to read terms and conditions documents because the incentive structure does not support it. From a design perspective, long and complex terms and conditions functionally operate as a dark UX technique that protects platforms from accountability without the need for active deception. Regulations such as the European Union's GDPR, which mandates a plain-language privacy summary and requires granular consent, are relevant policy references for the Indonesian context [2]. It should

be noted that Indonesia does not yet have regulations specifically prohibiting dark patterns in digital interfaces, so consumer protection from this practice still relies on the interpretation of general consumer protection laws.

Vulnerable Groups and Demographic Variations

A cross-case analysis based on informants' demographic profiles yielded a fairly consistent pattern of vulnerability differentiation. Consumers aged 23-29 with high shopping frequency (at least 4 times/month) reported the highest susceptibility to misleading urgency and sneak-into-basket, while consumers aged 38-44 were more resilient to urgency-based techniques but proportionally more affected by hidden costs. This pattern suggests that longer shopping experience does not necessarily increase resistance to all types of manipulation, but rather shifts the vulnerability profile toward more subtle techniques based on asymmetric information. From an intervention design perspective, these findings strengthen the argument that a one-size-fits-all approach is not optimal. Effective interventions need to be tailored to the vulnerability profile: for younger consumers, approaches that slow down the decision process (cooling-off nudges) may be more appropriate; for more experienced consumers, total price transparency from the beginning of the purchase process is more crucial. Differences in the platforms used by each age group are also worth noting: younger TikTok Shop users encounter an interface with more aggressive gamification elements compared to Blibli, which is more commonly used by informants in the older age group.

Discussion: Cross-Thematic Synthesis and Theoretical Contributions

Overall, the findings of this study form a coherent process model of how dark UX influences e-commerce consumer behavior in Indonesia. This model operates in three sequential stages. First, the exposure stage: consumers interact with an interface containing dark UX that combines misleading urgency, sneak-into-basket behavior, and hidden costs. Second, the psychological response stage: this exposure activates the emotional system (System 1) through the FOMO mechanism, resulting in pressure to make hasty decisions even when the cognitive system (System 2) already recognizes the manipulation. Third, the consequence stage: at the individual level, impulse buying and financial loss occur; at the relational level, trust erodes and consumers shift to multi-homing strategies as an adaptation; and at the systemic level, the market is trapped in an inefficient equilibrium because platforms have no incentive to stop dark UX until consumers actually abandon them.

This research's theoretical contributions to the dark UX literature include three underdocumented aspects. First, the aware-yet-susceptible phenomenon: contrary to the implicit assumption of many previous studies that consumer vulnerability stems from ignorance, this research demonstrates that cognitive awareness of manipulation does not automatically confer behavioral immunity. This has important implications for intervention design: digital literacy programs that simply raise awareness are insufficient; interventions that alter the choice architecture itself are needed. Second, the equilibrium model is inefficient in oligopolistic e-commerce markets: when all major platforms implement similar dark UX, consumers have no choice but to switch to platforms free from manipulation. This explains why market mechanisms fail to correct themselves, and why regulation is an urgent need. Third, the synergy between dark UX techniques: this research documents that dark UX techniques not only operate in parallel but also reinforce each other within a single transaction flow designed to maximize conversions and incremental revenue per transaction.

Compared to studies from South Korea by Kang and Yun [13] and Jung [2], the Indonesian context has several unique characteristics. The higher market concentration in Indonesia, dominated by Shopee and Tokopedia, compared to the more fragmented South Korean market, reinforces the inefficient equilibrium dynamics described above. Furthermore, the absence of specific dark UX regulations in Indonesia differs from South Korea, which already has relevant provisions in its e-commerce law, although Jung [2] notes the limitations of these provisions. These unique contexts emphasize the need to adapt foreign regulatory solutions, rather than simply import them, to suit Indonesia's market structure and regulatory capacity.

Ethical Design Recommendations

Based on the field findings and the cross-thematic synthesis presented, this study formulates four clusters of recommendations for e-commerce application developers, regulators, and researchers. Each cluster is directly rooted in empirical findings, not simply generic normative recommendations. The cluster order reflects the priority based on the impacts reported by informants, from the most urgent to those requiring broader coordination.

Cluster 1 – Price and Information Transparency

a) Display the final price (including taxes, shipping, and additional fees) on the product page, not just on the checkout page.
b) Provide a summary of the terms and conditions in plain Indonesian (plain language summary) with highlights of points that have a financial impact.
c) All default options that involve additional fees must be unchecked (opt-in, not opt-out).

Cluster 2 – User-Driven Ethical Design

a) Integrate user-centered design principles at every stage of the development cycle, with dedicated testing to detect potential interface manipulation.
b) Involve users in co-design to identify interface elements that are considered manipulative.

Cluster 3 – Real-Time Behavioral Interventions

a) Add behavioral nudges in the form of informative pop-ups at impulsivity-prone points, such as when stock is showing low or a countdown is active, that display details of similar products and historical price comparisons.
b) Provide explicit confirmation with a summary of the items before finalizing payment.

Cluster 4 – Audit and Enforcement

a) Conduct regular dark UX audits using tools like UIGuard [15] and A/B testing to evaluate the impact of design on user behavior.
b) Support the development of national regulations that specifically prohibit dark UX practices, along with easily accessible reporting mechanisms for consumers.

This recommendation is consistent with the framework proposed by Lu et al. [9] and Chromik et al. [14], and is in line with the direction of international regulations such as the EU Digital Services Act which is starting to require transparency of digital interfaces.

CONCLUSION

This study examines the impact of dark UX on consumer decision-making in e-commerce applications through in-depth, semi-structured interviews with 15 informants and document analysis. Findings indicate that dark UX techniques, particularly misleading urgency, hidden costs, and sneak-into-basket, significantly create psychological pressure that encourages impulse purchases, even among consumers who already recognize the manipulative nature of these techniques. Fear of missing out is the primary emotional mechanism exploited by platforms, and the aware-yet-susceptible phenomenon documented in this study suggests that consumer vulnerability is more affective than cognitive. At the trust level, dark UX erodes trust-based loyalty and replaces it with forced compliance, while consumers respond with adaptive multi-homing strategies that do not address the underlying structural issues. The most vulnerable group is young consumers with high shopping frequency for urgency-based techniques, while hidden costs impact all demographic groups equally.

This study makes three main scientific contributions. First, an empirical contribution: it provides systematic documentation of Indonesian e-commerce consumers' experiences with dark UX, filling a gap in the literature dominated by experimental studies from Western and South Korean contexts. Second, a theoretical contribution: it introduces the aware-yet-susceptible concept as a crucial nuance in understanding consumer susceptibility to dark UX, and proposes an inefficient equilibrium model to explain why market mechanisms are unable to suppress the proliferation of dark UX in oligopolistic markets. Third, a practical contribution: it formulates four clusters of ethical design recommendations rooted in empirical findings. The main limitations of this study are its limited geographic scope to the Mataram region and its surrounding areas and the relatively small number of informants, so the findings cannot be claimed as nationally representative. Further research is recommended using a national-scale mixed-methods design to validate and expand these findings; a longitudinal study to test the long-term effects of dark UX on brand loyalty; a controlled experiment to measure the effectiveness of the proposed nudging intervention; and a comparative regulatory analysis between the Indonesian legal framework and countries with more advanced dark UX regulations.

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