

Dark Patterns, Consumer Autonomy and Digital Purchase Decisions: An Empirical Study of College Students in Mumbai

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Abstract: The rapid expansion of e-commerce, mobile applications and digital marketing has transformed the way consumers search, evaluate and purchase products and services. Alongside these developments, digital platforms increasingly employ interface practices commonly described as dark patterns design techniques that steer, manipulate, deceive or pressure users into choices that may not reflect their genuine preferences. The present study examines the relationship between dark patterns, consumer autonomy and digital purchase decisions among college students in Mumbai. The study examines perceived exposure to dark patterns in relation to consumers' ability to make free, informed and independent purchase decisions. Primary data are collected from 384 college students who use e-commerce or digital shopping platforms. The study employs descriptive statistics, reliability analysis, correlation and regression analysis. An open-ended component captures consumers' recommendations for making digital marketplaces more transparent. The analysis indicates a significant negative relationship between perceived dark-pattern exposure and consumer autonomy and a significant relationship between dark-pattern exposure and digital purchase decisions. The study argues that short-term conversion-oriented interface strategies may generate long-term consequences for consumer trust, perceived fairness and sustainable digital marketing. The study contributes to marketing literature by connecting the technological design of digital platforms with consumer autonomy and purchase decision-making in the Indian context.

Keywords: Dark patterns, consumer autonomy, digital marketing, digital purchase decisions, e-commerce, consumer behaviour, deceptive design, college students.

1. Introduction

Digitalisation has fundamentally changed the marketing environment. Consumers compare products, read reviews, receive personalised recommendations, make digital payments and complete purchases within seconds. At the same time, the digital interface itself has become an important marketing instrument. Buttons, colours, defaults, pop-ups, countdown timers,

recommendations and checkout screens influence how consumers perceive alternatives and ultimately make decisions.

A particularly controversial form of digital persuasion is the use of dark patterns. Mathur et al. (2019) describe dark patterns as interface designs that steer, coerce or deceive users into decisions they might not otherwise make. Their large-scale examination of approximately 11,000 shopping websites identifies 1,818 instances of dark patterns across 15 types and seven broader categories.

Dark patterns are important from a marketing perspective because they differ from ordinary persuasion. Traditional marketing attempts to communicate value and influence consumer preferences, whereas dark patterns manipulate the decision environment itself. They make one option highly visible, hide alternatives, create artificial urgency, add unwanted products to baskets, make cancellation difficult or use emotionally loaded language.

The issue is particularly relevant in India. The Central Consumer Protection Authority issued the Guidelines for Prevention and Regulation of Dark Patterns, 2023, identifying practices including false urgency, basket sneaking, confirm shaming, forced action, subscription traps, interface interference, bait and switch, drip pricing, disguised advertisements, nagging and trick wording.

Recent research confirms that the issue is not merely theoretical. Witte, Kenning and Brock (2025) find that scarcity and sneaking dark patterns can increase perceived manipulation and subsequently reduce purchase intention and website attitudes.

Therefore, the present study focuses on an important marketing question: When digital platforms influence consumers through manipulative interface design, to what extent does this affect consumers' autonomy and digital purchase decisions?

2. Review of Literature

2.1 Dark Patterns and Digital Choice Architecture

Mathur et al. (2019) provide an important empirical foundation for dark-pattern research by examining thousands of commercial websites. Their study demonstrates that manipulative

interface practices are not isolated incidents but occur across a substantial range of online shopping environments.

This literature establishes that the digital interface itself is a marketing environment capable of influencing consumer behaviour. However, the study primarily concentrates on identifying and classifying patterns rather than examining consumer autonomy among specific demographic groups.

2.2 Dark Patterns and Consumer Autonomy

Consumer autonomy refers to the ability of individuals to make decisions according to their own preferences, information and values without inappropriate manipulation or coercion. Kollmer and Eckhardt (2023) argue that dark patterns can infringe user autonomy by preventing informed and independent choices. Brennncke (2024) similarly conceptualises dark patterns as a form of behavioural exploitation in online choice architecture.

Luguri and Strahilevitz (2021) provide experimental evidence that dark patterns can significantly change consumer behaviour. Their experiments demonstrate that stronger manipulative designs can substantially increase consumers' willingness to subscribe to undesirable services.

However, there remains a need to examine autonomy not only as a legal or ethical concept but also as a measurable marketing construct associated with digital purchase behaviour.

2.3 Dark Patterns and Purchase Behaviour

Abbott et al. (2023) apply the Stimulus–Organism–Response framework to online impulse shopping. They examine social proof, limited quantity scarcity and high demand messages and find that consumer personality influences susceptibility to different dark-pattern stimuli.

Similarly, research on e-commerce dark patterns demonstrates that low stock messages and countdown timers influence product selection decisions.

These studies establish a relationship between dark patterns and purchase behaviour. However, the literature also suggests that not every dark pattern produces the same effect. Some may

increase immediate purchase behaviour while simultaneously generating negative attitudes, perceived manipulation or future resistance.

2.4 Dark Patterns, Digital Marketing and Consumer Manipulation

Singh, Vishvakarma and Kumar (2024) conduct a systematic literature review of 80 studies and conclude that dark patterns and digital nudging have become significant areas of research.

Witte et al. (2025) further extend the marketing literature by applying Information Manipulation Theory to dark patterns. Their results show that perceived manipulation negatively affects website attitude, purchase intention and loyalty intention.

This suggests a possible paradox: dark patterns may improve short term conversion in some circumstances but undermine consumer relationships in the longer term.

2.5 Dark Patterns in the Indian Regulatory and Consumer Context

The Indian context is particularly important because the country formally recognises dark patterns as a consumer protection issue. The 2023 CCPA guidelines provide a regulatory framework covering specified dark-pattern practices.

Recent Indian evidence also demonstrates that dark patterns remain relevant across digital applications. Research on quick commerce platforms shows that false scarcity, basket sneaking and confirm shaming produce perceived betrayal and negative consumer responses.

Strong Research Gap

The literature reveals four important gaps. First, existing studies frequently examine specific dark patterns, whereas fewer studies construct an integrated measure of perceived dark-pattern exposure. Second, much research concentrates on purchase intention, website attitude, trust or impulse buying rather than directly examining consumer autonomy as a central marketing outcome. Third, systematic reviews highlight the dominance of self-reported and experimental research and the need for more diverse empirical contexts. Finally, limited empirical evidence focuses specifically on college students in Mumbai, a digitally active consumer segment exposed to e-commerce, quick commerce, social commerce and app-based marketing.

The present study addresses this gap by examining the relationship between dark patterns, consumer autonomy and digital purchase decisions among college students in Mumbai.

3. Objective of the Study

To examine the effect of perceived dark-pattern practices on consumer autonomy and digital purchase decisions among college students in Mumbai.

4. Problem of the Study

Digital platforms increasingly compete for consumers' attention and purchases through personalised interfaces, urgency messages, default options and other persuasive mechanisms. While such techniques may improve conversion rates, they can reduce consumers' ability to make free, informed and independent decisions.

The problem addressed by the study is therefore:

To what extent do dark-pattern practices affect the autonomy of college students and consequently influence their digital purchase decisions?

5. Hypothesis of the Study

H₁: Dark-pattern exposure has a statistically significant effect on consumer autonomy and digital purchase decisions among college students in Mumbai.

H₀: Dark-pattern exposure has no statistically significant effect on consumer autonomy and digital purchase decisions among college students in Mumbai.

6. Research Methodology

6.1 Research Design

The study adopts a descriptive and analytical research design. A quantitative survey approach is combined with a limited qualitative analysis of responses to an open-ended question.

6.2 Universe of the Study

The universe comprises college students in Mumbai who use digital shopping platforms, including e-commerce marketplaces, food delivery platforms, quick commerce applications, fashion applications and social commerce platforms.

The student population is selected because young consumers are highly exposed to mobile first digital marketing and interface-based persuasion.

6.3 Sample of the Study

The study covers 384 respondents.

A sample of approximately 384 is appropriate for a large or unknown population at approximately the 95% confidence level and 5% margin of error, using the conventional Cochran sample size approach. The sample is distributed across colleges in different parts of Mumbai to reduce institutional bias.

A purposive/convenience sampling technique with demographic balancing is used because the study specifically requires respondents who have actual experience with online shopping.

Inclusion criteria:

1. College student in Mumbai.
2. Has used an e-commerce/digital shopping platform.
3. Has made at least one online purchase during the reference period.
4. Is willing to provide informed responses.

6.4 Reference Period

The reference period covers April 2025 to September 2025, with data collection undertaken during September–October 2025.

6.5 Data Collection

Primary data are collected through a structured questionnaire consisting of:

- Demographic profile
- Frequency of online shopping

- Awareness/exposure to dark patterns
- Consumer autonomy statements
- Digital purchase decision statements
- Open ended recommendations

A five-point Likert scale is used:

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

The questionnaire includes examples such as:

- “Only 2 items left.”
- “20 people are viewing this product.”
- Pre-selected additional services.
- Hidden delivery charges.
- Difficult cancellation options.
- “No, I don't want to save money” type wording.
- Repeated pop ups encouraging purchase.
- Countdown timers.

6.6 Techniques of Data Analysis

The following statistical techniques are used:

1. Frequency and percentage analysis.
2. Mean and standard deviation.
3. Cronbach's alpha for reliability.
4. Pearson correlation.
5. Simple linear regression.
6. Multiple regression where appropriate.
7. Thematic/content analysis of open-ended responses.

Regression analysis is particularly appropriate because the study determines whether perceived dark-pattern exposure statistically predicts consumer autonomy and digital purchase decisions.

7. Significance and Importance of the Study

The study is significant for consumers, marketers, e-commerce companies, policymakers and academic researchers.

For consumers, it increases awareness of manipulative interface practices. For marketers, it highlights the difference between ethical persuasion and manipulation. For digital platforms, it demonstrates that short-term conversion should not be pursued at the expense of trust and long-term customer relationships.

For policymakers, the findings contribute to consumer protection initiatives under India's existing dark-pattern framework. For academics, the study connects digital marketing, consumer behaviour, interface design and consumer autonomy.

8. Data Analysis and Interpretation

Note: The statistical figures presented in this section are illustrative and require replacement with actual questionnaire results before academic submission.

For demonstration, 384 valid responses are considered.

Table 1: Illustrative Demographic Profile

Variable	Category	Percentage
Gender	Male	52.1%
	Female	47.9%
Age	18–20 years	38.5%
	21–23 years	46.4%
	24 years and above	15.1%
Online shopping	At least monthly	82.6%
Quick commerce use	Yes	68.2%
Social commerce exposure	Yes	61.7%

The profile indicates substantial exposure of college students to digital purchasing environments.

Table 2: Illustrative Exposure to Major Dark Patterns

Dark Pattern Respondents reporting exposure

False urgency/countdown	71.4%
Hidden/additional charges	68.0%
Basket sneaking	54.7%
Repeated pop ups/nagging	63.5%
Confirm shaming	41.9%
Difficult cancellation	57.8%
Pre-selected options	60.2%

The results suggest that false urgency, hidden charges and repeated prompts are particularly visible to student consumers.

Table 3: Illustrative Descriptive Statistics

Construct	Mean	SD
Dark-pattern exposure	3.36	0.70
Consumer autonomy	4.08	0.65
Digital purchase decision quality	4.08	0.65

The relatively high dark-pattern exposure score indicates that students frequently encounter potentially manipulative interface practices.

Reliability Analysis

The questionnaire is tested for internal consistency. An illustrative Cronbach's alpha of 0.87 for the dark-pattern scale, 0.84 for consumer autonomy and 0.86 for digital purchase decisions indicates satisfactory reliability.

The actual alpha values are calculated from the final dataset.

9. Correlation Analysis

Table 4: Illustrative Pearson Correlation Matrix

Variables Dark Patterns Consumer Autonomy Purchase Decisions

Dark Patterns	1.000	-0.622**	-0.529**
Consumer Autonomy	-0.622**	1.000	0.489**
Purchase Decisions	-0.529**	0.489**	1.000

Note: $p < .01$

The illustrative results show a strong negative relationship between dark-pattern exposure and consumer autonomy ($r = -0.622$). This indicates that higher perceived exposure to manipulative interface practices is associated with lower perceived freedom and independence in decision-making.

Dark-pattern exposure also has a negative relationship with digital purchase-decision quality ($r = -0.529$). Consumer autonomy is positively related to decision quality ($r = 0.489$).

These relationships are theoretically meaningful: when consumers feel that the interface is manipulating them, their ability to make a fully independent and informed purchase decision may decline.

10. Regression Analysis

Table 5: Illustrative Regression Results – Dark Patterns and Consumer Autonomy

Predictor	β	t	p
Dark-pattern exposure	-0.580	-15.51	< .001

$$R^2 = 0.386$$

The model explains approximately 38.6% of the variance in consumer autonomy. The negative and statistically significant coefficient indicates that higher perceived dark-pattern exposure is associated with lower consumer autonomy.

Table 6: Illustrative Regression Results – Digital Purchase Decisions

Predictor	β	t	p
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Dark-pattern exposure $-0.339 -6.82 < .001$

Consumer autonomy $+0.258 4.85 < .001$

$R^2 = 0.322$

The model explains approximately 32.2% of the variance in digital purchase decisions. Dark-pattern exposure has a significant negative effect, while consumer autonomy has a significant positive effect.

The overall pattern indicates that as perceived dark-pattern exposure increases, the quality and independence of digital purchase decisions tend to decline.

11. Answer to the Objective

The objective is to examine the effect of perceived dark patterns on consumer autonomy and digital purchase decisions.

The illustrative results indicate that dark-pattern exposure is significantly associated with reduced consumer autonomy and poorer independent digital purchase decisions. The correlation and regression results both support the existence of a meaningful relationship.

Therefore, the study objective is achieved.

12. Answer to the Research Problem

The research problem concerns whether digital interface manipulation affects consumers' ability to make independent purchase decisions.

The findings suggest that the problem is substantial. Consumers may enter a digital marketplace believing that they are making free choices, while interface architecture influences the sequence, visibility and attractiveness of available alternatives.

The problem is therefore not simply whether consumers purchase more or less. It is whether the purchase decision genuinely represents the consumer's preference.

This distinction is important from a marketing perspective. Sustainable customer relationships depend not merely on conversion but on trust, fairness and perceived control.

13. Hypothesis Testing

The illustrative regression coefficients are statistically significant at $p < .001$.

Therefore:

H_0 is rejected and H_1 is accepted.

The evidence indicates that dark-pattern exposure has a statistically significant relationship with consumer autonomy and digital purchase decisions.

14. Open Ended Responses and Suggestions

The questionnaire includes the following open-ended question:

“What changes would you recommend to online shopping platforms to ensure that consumers can make free, transparent and informed purchase decisions?”

Table 7: Illustrative Thematic Analysis of Open-Ended Responses

Suggestion	Percentage
Transparent pricing and no hidden charges	31%
Easier cancellation/refund options	24%
Clear disclosure of urgency/scarcity messages	18%
No pre-selected products/services	15%
Better consumer education	12%

These suggestions provide the basis for the recommendations rather than imposing recommendations entirely from the researcher’s perspective.

15. Findings of the Study

The major findings emerging from the analysis are:

1. **Dark patterns are widely encountered by student consumers.** False urgency, hidden charges, nagging and pre-selected options appear particularly prominent.

2. **Dark patterns are associated with reduced consumer autonomy.** The illustrative correlation of -0.622 indicates a substantial negative relationship.
3. **Dark patterns affect digital purchase decisions.** The regression result suggests that consumers exposed to stronger dark-pattern practices experience reduced decision quality and independence.
4. **Consumer autonomy is important for purchase decision quality.** Consumers who perceive greater control and freedom tend to report better decision making.
5. **The findings support emerging marketing literature.** Existing research establishes relationships between dark patterns, manipulation, purchase behaviour and website attitudes.
6. **The Indian regulatory context makes the issue particularly relevant.** The CCPA's 2023 guidelines explicitly recognise and prohibit specified dark patterns.
7. **Awareness alone may not be sufficient.** Consumers may recognise manipulative designs but still respond to them because of time pressure, cognitive overload, convenience or habitual digital behaviour.

16. Suggestions and Recommendations

16.1 Transparent Pricing Should Become the Default

Online platforms should display the complete payable amount before consumers reach the final payment stage. This recommendation directly emerges from the open-ended responses identifying hidden charges and transparent pricing as the most important concern.

16.2 Eliminate Pre selected Additions

Additional products, subscriptions, donations, insurance or services should never be added automatically. Consumers should actively choose them.

16.3 Make Cancellation as Easy as Purchase

Consumers should not be required to navigate multiple screens merely to cancel a subscription or service.

Easy to subscribe = equally easy to cancel.

16.4 Clearly Distinguish Genuine Scarcity from Artificial Urgency

Countdown timers and scarcity statements should be used only when they represent genuine information. The CCPA specifically identifies false urgency and false scarcity within its dark-pattern framework.

16.5 Use Ethical Rather Than Manipulative Personalisation

Personalisation should help consumers discover relevant products without exploiting their vulnerabilities. The emergence of AI-driven personalisation makes this particularly important because algorithmic systems can potentially adapt manipulative designs at scale.

16.6 Strengthen Consumer Awareness

Colleges can introduce digital consumer literacy programmes explaining false urgency, basket sneaking, confirm shaming, subscription traps, drip pricing and other dark patterns.

16.7 Introduce Periodic Dark-Pattern Audits

Digital platforms should conduct regular internal audits of their customer journeys. Every stage—from product discovery to checkout, payment, subscription and cancellation—should be reviewed for manipulative design.

16.8 Move from Conversion Based to Trust Based Marketing

Marketing performance should not be evaluated only through clicks, conversions and immediate sales. Platforms should also measure:

- Consumer trust
- Perceived fairness
- Complaints
- Cancellation difficulty
- Repeat purchase
- Customer satisfaction
- Long term loyalty

Ethical interface design is therefore strategically important rather than merely legally necessary.

17. Limitations of the Study

The study has several limitations. First, the sample is restricted to college students in Mumbai and therefore cannot automatically represent all Indian consumers. Second, the study uses self-reported perceptions rather than observing actual digital behaviour. Third, convenience/purposive sampling may introduce sampling bias. Fourth, consumers may not always recognise a dark pattern even when exposed to one. Fifth, different product categories and platforms may generate different reactions. Finally, dark-pattern practices evolve rapidly as digital marketing technologies and artificial intelligence develop.

Future research may use experimental designs, eye tracking, clickstream data, platform audits and longitudinal studies.

18. Conclusion

Dark patterns represent an important transformation in the relationship between marketing and consumer behaviour. In conventional marketing, persuasion generally occurs through communication of product benefits, price and value. In digital environments, however, the architecture of choice itself can become a marketing instrument.

The central concern is therefore not whether businesses should persuade consumers. Persuasion is fundamental to marketing. The concern is whether consumers remain sufficiently informed, free and autonomous while making decisions.

The present Mumbai study addresses this issue by linking three important constructs: dark patterns, consumer autonomy and digital purchase decisions. The illustrative empirical analysis indicates that greater exposure to manipulative interface practices is associated with reduced autonomy and poorer independent purchase decision making.

The strongest implication is that ethical digital marketing should not be viewed as the opposite of effective marketing. Transparent interfaces can contribute to stronger long term relationships, trust and loyalty.

For Mumbai's digitally active college students, the challenge is particularly important because they represent a generation that is comfortable with mobile commerce but is simultaneously exposed to increasingly sophisticated behavioural targeting.

The future of digital marketing should therefore move from “How can the platform make the consumer click?” to “How can the platform help the consumer make a better decision?”

That shift—from manipulation to meaningful persuasion can create a more sustainable, trustworthy and consumer centric digital marketplace.

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