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## The Impact of Dark AI Patterns on Consumer Purchase Decisions and Impulsive Buying

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Submitted 13/12/25, 1st revision 29/12/25, 2nd revision 20/01/26, accepted 25/02/26

Huber Gąsiński<sup>1</sup>, Barbara Szymoniuk<sup>2</sup>, Magdalena Maciaszczyk<sup>3</sup>,  
Maria Kocot<sup>4</sup>, Janusz Sobon<sup>5</sup>, Dominik Baldowski<sup>6</sup>, Krzysztof Kandefor<sup>7</sup>

### **Abstract:**

**Purpose:** The purpose of this study is to examine the relationship between consumers' susceptibility to artificial intelligence-based manipulative mechanisms (Dark AI Patterns) and the level of impulsive buying behavior in an e-commerce environment.

**Design/Methodology/Approach:** The study employed a survey method conducted in 2025 among 429 online shoppers. Two composite indices were constructed to measure susceptibility to Dark AI Patterns and impulsive buying behavior. The relationships between variables were assessed using Pearson's correlation coefficient.

**Findings:** The results indicate a moderate level of both susceptibility to AI-based manipulation and impulsive buying, as well as a statistically significant positive relationship between these variables.

**Practical Implications:** The findings highlight the need for responsible design of e-commerce systems and for limiting excessively persuasive algorithmic techniques in order to reduce the risk of uncontrolled purchasing decisions.

**Originality/Value:** The study integrates research on impulsive buying with the analysis of the manipulative potential of artificial intelligence and provides empirical evidence demonstrating the interdependence between these phenomena.

**Keywords:** Artificial intelligence, impulsive buying, purchase decision-making, Dark AI Patterns, e-commerce.

**JEL Codes:** M31, D91, O33.

**Paper Type:** Research article.

**Acknowledgements:** The authors express their gratitude to all participants in the study.

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<sup>1</sup>Ph.D., VIZJA University, Poland, ORCID: 0000-0002-5226-44687, [h.gasinski@vizja.pl](mailto:h.gasinski@vizja.pl);

<sup>2</sup>Ph.D., D.Sc., (Eng.), Assoc. Prof., Lublin University of Technology, Poland,

ORCID: 0000-0002-9227-7159, [b.szymoniuk@pollub.pl](mailto:b.szymoniuk@pollub.pl);

<sup>3</sup>Ph.D., the same as in 2, ORCID: 0000-0001-7225-4921, [m.maciaszczyk@pollub.pl](mailto:m.maciaszczyk@pollub.pl);

<sup>4</sup>Ph.D., University of Economics in Katowice, Poland, ORCID: 0000-0001-5150-3765, [maria.kocot@ue.katowice.pl](mailto:maria.kocot@ue.katowice.pl);

<sup>5</sup>Prof., Jacob of Paradies University, Gorzów Wielkopolski, Poland,

ORCID: 0000-0001-7855-2153, [jsobon@ajp.edu.pl](mailto:jsobon@ajp.edu.pl);

<sup>6</sup>Ph.D., Higher School of Professional Education Wrocław, Poland,

ORCID: 0009-0005-0775-0351, [dominik.baldowski@wskz](mailto:dominik.baldowski@wskz);

<sup>7</sup>Ph.D., Social Academy of Sciences in Łódź, Poland, ORCID: 0000-0002-2532-2060, [kkandefor@san.edu.pl](mailto:kkandefor@san.edu.pl);

## 1. Introduction

In the current business environment, the development of e-commerce and the increasing integration of artificial intelligence into sales platforms have significantly amplified the role of algorithmic mechanisms in consumer purchasing decisions. Advanced recommendation systems, content personalization, time-pressure cues, and solutions referred to as Dark AI Patterns are reshaping the interaction between consumers and digital marketplaces while potentially reinforcing impulsive buying behavior.

Existing literature has primarily examined impulsive purchasing from psychological, situational, and technological perspectives. However, the role of artificial intelligence as a potentially manipulative factor remains insufficiently explored. In particular, little empirical evidence exists on the relationship between consumer susceptibility to AI-driven influence and impulsive buying in online environments.

This study aims to identify and empirically verify the relationship between susceptibility to AI-based manipulation and impulsive purchasing behavior in e-commerce. By integrating research on impulsive buying with the analysis of the manipulative potential of artificial intelligence, the study contributes to understanding the boundary between acceptable persuasion and unethical manipulation in digital commerce. The findings provide quantitative evidence of the interdependence between these phenomena and offer a basis for further research on algorithmic influence in consumer decision-making.

The study extends existing consumer behavior research by conceptualizing Dark AI Patterns as a behavioral determinant of impulsive buying and by empirically positioning algorithmic manipulation within the framework of digital decision-making processes.

## 2. Literature Review

### 2.1 Analysis of Determinants Purchasing and their Impact on Impulsiveness Shopping

Determinants of impulsive buying have been widely examined in both theoretical and empirical research. Previous studies indicate that impulsive consumer decisions are influenced by both situational and structural factors, including the shopping context, marketing stimuli, and product category characteristics (Lehmann *et al.*, 2019; Tanveer *et al.*, 2022; Kurt *et al.*, 2022).

External and internal stimuli play a particularly important role, as they activate spontaneous reactions in consumers (Virvilaitė *et al.*, 2011). Determinants specific to the digital environment are also significant, such as transaction convenience,

information availability, and the design of e-commerce interfaces (Wang *et al.*, 2022; Ling and Yazdanifard, 2015).

In retail settings, impulsive buying may result from a specific configuration of relationships between situational and cognitive factors (Prashar *et al.*, 2015). Meta-analyses further confirm the existence of recurring patterns of determinants across different market contexts (Iyer *et al.*, 2020; Zhao *et al.*, 2022). Cultural conditions also play an important role, differentiating the level of impulsivity across populations (Kacen and Lee, 2002).

The second group of determinants includes individual and emotional factors. These arise from personality traits, lifestyle, and the individual level of impulsiveness as a relatively stable disposition. Research shows that emotions accompanying purchases and perceived risk can either strengthen or weaken tendencies toward impulsive action (Lee and Yi, 2008). The difference between the urge to buy impulsively and actual purchasing behavior is situationally conditioned (Badgaiyan and Verma, 2015).

Internal factors such as hedonic motivation and self-control are also important (Badgaiyan and Verma, 2014). Consumer lifestyle may predispose individuals to more frequent impulsive behavior (Ocel *et al.*, 2023). In tourism services, personality traits and emotional states play a role in activating impulsive decisions (Ahn and Kwon, 2022).

In online shopping environments, impulsiveness as a personality characteristic moderates transaction completion intentions (Asokan-Ajitha, 2021). Additionally, research on online tourism purchasing clearly indicates the importance of internal individual factors in shaping impulsivity (Chih *et al.*, 2012). This opens up a discussion about the potential of AI technology as both a manipulative and protective tool (Prokopowicz, 2024).

More recently, analyses of impulsive buying determinants increasingly incorporate social and technological contexts. Shopping in the presence of others may increase the tendency toward impulsive decisions through normative and emotional mechanisms (Luo, 2005). A segmentation approach to situational factors allows the identification of consumer groups with different levels of susceptibility to impulsive stimuli (Mihic and Kursan, 2010).

Under conditions of market digitalization, technology acceptance models become particularly important, as they explain how usability and ease of use of IT systems influence e-commerce purchasing decisions (Azizah *et al.*, 2022). The COVID-19 pandemic additionally highlighted the role of internal factors in emerging markets, where mobility restrictions intensified online impulsive buying (Lavuri, 2023). Overall, impulsive buying can be understood as the result of interactions between personality-based, situational, social, and technological determinants, whose

strength may vary depending on the level of economic development and market context (Zhao *et al.*, 2022).

## 2.2 AI-Based Manipulation in Purchasing Decisions

The development of artificial intelligence–based tools has significantly transformed the way consumer decision-making processes are shaped. These technologies introduce both decision-support mechanisms and the potential for manipulation. Research shows that human decisions are susceptible to influence by AI systems capable of modeling preferences and predicting user behavior (Sabour *et al.*, 2025).

From a theoretical perspective, artificial intelligence can affect consumer psychology and behavior through content personalization, recommendations, and selective information presentation (Lemsieh and Abarar, 2024). Algorithmic autonomy in recommendation processes strengthens the perceived objectivity of the system, which may increase users' compliance with suggested choices (Fan and Liu, 2022).

In the e-commerce environment, personalization based on behavioral data analysis intensifies influence on consumer choices, often in a manner that remains invisible to the user (Mohsin, 2024). Similarly, generative artificial intelligence acting as a shopping advisor may shape preferences by synthesizing opinions and constructing persuasive product narratives (Lei and Liu, 2025). It should also be noted that the level of trust in robots and AI systems further strengthens their impact on purchasing decisions (Leite, 2024).

At the same time, the literature emphasizes the risk of crossing the boundary between decision support and manipulation, particularly in the context of information asymmetry and limited user awareness.

AI-based manipulative marketing strategies may lead to unethical consumer behavior, while digital competencies play an ambivalent role, they can both protect against influence and increase susceptibility to advanced persuasive techniques (Qadri *et al.*, 2025).

Emotional manipulation implemented through conversational and companion AI systems may shape decisions by building parasocial relationships and strengthening emotional engagement (De Freitas *et al.*, 2025). In response to these threats, regulatory strategies aimed at algorithmic transparency and increased accountability of entities using consumer-support technologies have been proposed (Paterson, 2022).

Overall, the use of artificial intelligence in purchasing decisions creates a complex tension between personalization efficiency and the risk of manipulation, which requires further theoretical and empirical investigation.

### **3. Research Methods and Materials**

The aim of this study was to determine the relationship between consumer susceptibility to artificial intelligence-based purchasing manipulation, known as Dark AI Patterns, and the level of impulsive purchasing behavior in e-commerce.

The study aimed to empirically test whether increased susceptibility to algorithmic influence techniques such as time pressure, limited availability messages, and AI-generated recommendations correlates with an increased tendency to make spontaneous and unplanned purchasing decisions. Based on this, a research hypothesis was formulated, assuming a positive relationship between susceptibility to Dark AI Patterns and consumer purchasing impulsivity.

The research questions addressed the level of consumer susceptibility to artificial intelligence-based manipulation, the degree of impulsive purchasing behavior in the study population, and the nature of the relationship between these variables. The research method used in the study was a survey. It was conducted in 2025 on a sample of 429 respondents shopping online. A diagnostic survey method was employed using an anonymous online questionnaire addressed to individuals making online purchases.

The measurement instrument was developed by the authors based on a review of the literature on impulsive buying behavior and the influence of persuasive mechanisms in the e-commerce environment, referred to as Dark AI Patterns.

The questionnaire included items concerning reactions to time-pressure messages, algorithmic recommendations, limited-availability notifications, and spontaneous purchasing behaviors of respondents. All items were measured using a five-point Likert scale (1 -strongly disagree, 5 – strongly agree).

Based on the responses, two synthetic indicators were constructed: (1) Dark AI Patterns Susceptibility Index - derived from items 7-12, referring to susceptibility to “limited stock” messages, time pressure, and social recommendation cues, impulsive Buying Index -derived from items 29-32, referring to spontaneous and unplanned purchasing decisions

The values of both indices were calculated as arithmetic means of the assigned scale items. To assess the relationship between the analyzed variables, Pearson’s linear correlation coefficient was applied. The analysis revealed a positive relationship between susceptibility to AI-based manipulative mechanisms and impulsive buying behavior ( $r = 0.55$ ).

According to Cohen’s interpretation criteria, this value corresponds to a moderate effect approaching a strong one, indicating a substantial level of covariation between the analyzed constructs.

Due to the cross-sectional nature of the study, the result does not provide grounds for causal inference but confirms the existence of a statistical association between the analyzed phenomena.

The internal consistency of the constructed indices was assessed using Cronbach's alpha coefficient. The Dark AI Patterns Susceptibility Index (items 7-12) demonstrated very high reliability ( $\alpha = 0.921$ ), while the Impulsive Buying Index (items 29-32) showed high reliability ( $\alpha = 0.887$ ). These results indicate satisfactory internal consistency of the measurement scales and confirm the adequacy of the constructed composite indicators for further statistical analysis.

#### 4. Results

Table 1 shows basic statistics descriptive and factor correlation between susceptibility on manipulations Dark AI Patterns a impulsiveness shopping consumers (N = 429).

**Table 1.** Descriptive statistics and correlation between susceptibility to Dark AI Patterns and impulsive buying behavior.

Variable	Mean	Standard deviation	Min	Max	N
Susceptibility to AI manipulations (Dark AI Patterns Index)	2.999	0.848	1.00	5.00	429
Impulsive buying (Impulsivity Index)	2.997	0.838	1.00	5.00	429
Dark AI Patterns → Impulsivity shopping			Factor r ( Pearson ) correlation 0.55		

**Source:** Authors' calculations.

The study aimed to demonstrate the relationship between consumer susceptibility to manipulations such as Dark AI Patterns and the level of impulsive shopping in e-commerce. For this purpose, two synthetic indices were constructed: the AI Manipulation Susceptibility Index and the Impulsive Shopping Index. The indices were based on averaged responses to sets of questions, measured on a five-point Likert scale. Data from 429 respondents were analyzed. This allowed for obtaining stable and statistically reliable descriptive characteristics of the studied variables.

The mean value of the Dark AI Manipulation Susceptibility Index was 2.999. This indicates a moderate level of susceptibility of respondents to algorithmic influence techniques used in online stores, such as time pressure, limited product availability messages, social recommendations, and dynamic shopping interface elements. The standard deviation of 0.848 indicates relatively high variability in responses. This indicates that the study population was not homogeneous in terms of its response to these mechanisms.

Among those exhibiting low susceptibility, there were also individuals characterized by very high sensitivity to manipulative messages generated by AI systems. A minimum index value of 1.00 indicates the presence of respondents completely resistant to the analyzed techniques. The maximum value of 5.00 confirms that some respondents declared extreme susceptibility to the influence of Dark AI Patterns.

Similarly, the mean value of the impulsive buying index was 2.997. This result suggests a moderate level of spontaneous purchasing decisions in the study sample. The standard deviation of 0.838 indicates a comparable degree of variation in this characteristic among respondents as in the case of susceptibility to AI manipulation.

The range of variation of the impulsive buying index also covered the full scale of responses: from a minimum value of 1.00, characterizing individuals who make purchases in a highly rational and planned manner, to a maximum value of 5.00, corresponding to respondents declaring frequent and highly impulsive purchasing behavior.

The Pearson linear correlation analysis revealed a statistically significant positive relationship between the Dark AI Patterns Susceptibility Index and the Impulsive Buying Index ( $r = 0.55$ ;  $p < 0.001$ ). This indicates that higher susceptibility to AI-based manipulative mechanisms is associated with higher levels of impulsive purchasing behavior among respondents.

## **5. Discussion**

The findings allow several conclusions to be drawn regarding the role of artificial Intelligence-based manipulation in consumer purchasing decisions. The results show a moderate level of susceptibility to Dark AI Patterns within the sample, accompanied by considerable variability among respondents.

This suggests that mechanisms such as time pressure, limited availability messages, and algorithmic recommendations are common elements of the online shopping environment, although their influence differs across consumers.

The analysis of impulsive purchasing behavior indicates that spontaneous buying constitutes an important, though not dominant, component of consumer behavior in e-commerce. A clear positive relationship was identified between susceptibility to Dark AI Patterns and the level of impulsive buying. As susceptibility to algorithmic influence increases, so does the tendency to make unplanned purchases.

The results therefore demonstrate the co-occurrence of the analyzed phenomena; however, due to the cross-sectional design, no causal conclusions can be drawn. It can only be concluded that greater susceptibility to Dark AI Patterns is associated with a higher level of impulsive buying behavior.

## **6. Conclusions**

Based on the obtained results, several managerial implications can be formulated for e-commerce companies regarding the responsible use of artificial intelligence in sales processes. In particular, algorithmic pressure techniques - such as countdown timers, limited availability messages, and intensive social recommendation cues - should be applied cautiously and in moderation, especially for users exhibiting a higher susceptibility to impulsive purchasing.

The design of shopping interfaces should balance short-term sales objectives with long-term customer relationships founded on trust, transparency, and perceived control over the decision-making process. Excessive reliance on Dark AI Pattern mechanisms may increase short-term conversion rates at the expense of customer satisfaction and brand reputation.

From a strategic perspective, AI-based solutions should support rather than dominate consumer decision-making. Clear communication of personalization principles is essential, as is providing users with control over recommendations and limiting automated stimuli that create time pressure in high-risk impulsive purchasing situations. Such an approach fosters long-term customer loyalty and strengthens the perception of the company as a socially responsible organization. In the context of growing consumer awareness and emerging AI regulations, this may constitute a significant competitive advantage.

Future research should further examine the relationship between AI-based manipulation and consumer behavior using more diverse methodological approaches. In particular, experimental and quasi-experimental designs would enable the observation of actual purchasing decisions under controlled conditions and facilitate causal inference.

Another important research direction involves analyzing moderating variables such as digital literacy, algorithm awareness, trust in AI, and generational differences, which may differentiate susceptibility to Dark AI Patterns. Future studies could also include cross-sectoral and cross-cultural comparisons, as well as an examination of the long-term effects of algorithmic persuasion on customer loyalty, consumer well-being, and the ethical and regulatory dimensions of AI use in e-commerce.

## **7. Limitations**

The study is subject to several limitations that should be considered when interpreting the findings. First, the use of a survey method results in the declarative nature of the data, meaning that respondents reported their perceived purchasing behavior rather than actual decisions made in real-world settings. Second, the cross-sectional design prevents causal inference regarding the relationship between susceptibility to Dark AI Pattern manipulation and impulsive buying.

Another limitation is the lack of control over the purchasing context in which respondents made decisions, which may affect the interpretation of exposure to algorithmic stimuli. Finally, although the sample size was sufficient for statistical analysis, the results refer to a specific respondent population and therefore cannot be generalized to all consumer groups without further comparative research.

## **8. Conflicts of Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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