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PSYCHOLOGICAL AND BEHAVIORAL DETERMINANTS OF CONSUMER VULNERABILITY TO DARK AI PATTERNS IN E-COMMERCE

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Purpose: The aim of the article is to analyze the relationship between psychological and behavioral factors and consumer susceptibility to manipulations such as Dark AI Patterns in e-commerce.
Design/methodology/approach: The survey was conducted using a survey method in 2025 on a sample of 429 respondents, using the analysis of descriptive statistics and the Pearson correlation.
Findings: The results indicate significant positive and negative relationships between the analyzed variables and susceptibility to algorithmic manipulation.
Research limitations/implications: The study is based on declarative data and is cross-sectional, which limits the possibility of generalizing results and inferring cause-and-effect relationships.
Practical implications: The results underline the importance of transparent design of AI systems and strengthening consumer awareness.
Originality/value: The article brings value by analyzing the relationships between the determinants of vulnerability, building on existing research in this area.
Keywords: dark AI patterns, consumers, e-commerce, company, manipulations.
Category of the paper: research paper.

1. Introduction

Nowadays, the e-commerce environment is undergoing constant and dynamic changes. They remain a consequence of rapid digitization, the intensive development of digital technologies, and in particular solutions based on artificial intelligence (AI). Undoubtedly, modern technologies contribute to increasing the efficiency of procurement processes. They also improve the user experience through personalization and automation. However, at the same time, they create conditions that are conducive to the use of increasingly advanced

techniques to influence consumer decisions. The scientific literature emphasizes the fact that the mechanisms referred to as Dark AI Patterns can be considered as a development of classical manipulation techniques, which are enhanced by the ability of algorithms to analyze data and predict user behavior (Maciaszczyk et al., 2026). However, it can be said that these interactions have a real impact on purchasing decisions and consumer impulsivity. This is confirmed by the results of empirical research (Gąsiński et al., 2026).

The growing scale and complexity of these phenomena make them an important and current research problem. Studies indicate that Dark AI Patterns are becoming an integral element of digital marketing strategies, exploiting cognitive biases, time pressure, and information asymmetry to shape consumer behavior (Singh et al., 2024, 2026; Marwaha et al., 2026). At the same time, the use of AI in recommendation systems and interface design increases the effectiveness of these mechanisms, often limiting consumer autonomy and blurring the boundary between support and manipulation (Silva et al., 2026; Spasovski, Jönsson, 2025).

Addressing this issue becomes fully justified, covering both the cognitive and practical dimensions. Therefore, it becomes necessary to determine the level of susceptibility of consumers to manipulation, as well as to diagnose the mechanisms that underlie it. Previous research has focused mainly on identifying the level of vulnerability to Dark AI Patterns in the e-commerce environment (Maciaszczyk et al., 2026) and analyzing their impact on purchasing decisions and consumer impulsivity (Gąsiński et al., 2026).

In parallel, the literature emphasizes the multidimensional nature of manipulation in e-commerce, combining technological, behavioral, and psychological aspects. Research highlights the role of factors such as trust in platforms (Beatty et al., 2011), personalization (Widyatmoko, 2025), and the increasing importance of user-generated content and opinion systems, which may also be subject to manipulation (Wang et al., 2023, 2024; Xu et al., 2015). Moreover, the development of AI-based tools enables more advanced forms of influence, including adaptive content, emotional targeting, and automated manipulation detection systems (Avolicino et al., 2022; Al Wahshat et al., 2023).

However, knowledge about the relationship between psychological and behavioral factors and susceptibility to such influences still seems insufficient. Despite the growing body of research, there is still a noticeable gap in the literature regarding the integrated analysis of psychological and behavioral determinants of consumer susceptibility to such manipulative mechanisms. In particular, insufficient attention has been paid to the relationships between variables such as trust in AI, perception of personalization, awareness of algorithms, and critical attitudes toward marketing messages, and their combined effect on vulnerability to manipulation.

Taking into account economic practice, this problem assumes a key role for the design of sales systems, which should balance efficiency with respect for user autonomy. Addressing this research gap is important both from a theoretical and practical perspective. From a theoretical standpoint, it contributes to a better understanding of the mechanisms underlying consumer

behavior in highly automated digital environments. From a practical perspective, it provides guidance for the design of more transparent and ethically responsible e-commerce systems, balancing efficiency with respect for user autonomy (Hadi, 2025; Silva et al., 2026).

The article is a continuation and development of previous research on Dark AI Patterns in e-commerce, included in the paper on the level of consumer susceptibility to algorithmic manipulation (Maciaszczyk et al., 2026) and research on the impact of these mechanisms on purchasing decisions and impulsivity (Gąsiński et al., 2026).

Therefore, the main objective of this article is to analyze the relationships between selected psychological and behavioral factors and the level of consumer susceptibility to manipulations such as Dark AI Patterns in the e-commerce environment. Unlike previous studies, this study focuses on the analysis of the relationship between selected psychological and behavioral variables, which include the perception of personalization, trust in artificial intelligence or awareness of algorithms, and the level of susceptibility to manipulation. The study extends previous research by moving beyond a descriptive approach toward a relational analysis that enables the identification of both the direction and strength of relationships between the analyzed constructs.

The article has an added value, which is revealed in the transition from a descriptive approach to relational analysis, allowing for the identification of the direction and strength of the links between the analyzed constructs. The structure of the article includes a theoretical part - it discusses the essence of Dark AI Patterns and the determinants of consumer vulnerability, a methodological part that presents the research assumptions and methods used, an empirical part including the results of statistical analyses, as well as a discussion and conclusions relating to the results obtained and their theoretical and practical implications.

1.1. Istota Dark AI Patterns w e-commerce

The literature on Dark AI Patterns and consumer behavior in e-commerce can be grouped into three main research streams: technological, focusing on algorithmic systems and interfaces; behavioral, analyzing consumer responses and susceptibility to influence; and regulatory-ethical, addressing transparency and user protection. This classification helps organize existing research and highlights the complexity of the phenomenon.

In the literature on the subject, the issue of Dark AI Patterns in the e-commerce environment remains a broad discourse of theoretical and practical analyses. It is seen as an important manifestation of contemporary forms of digital manipulation, combining classic persuasive techniques with the capability's characteristic of the use of artificial intelligence. Literature analysis indicates that the use of recommendation systems and personalization mechanisms leads to greater effectiveness in influencing consumer decisions, while limiting their decision-making autonomy (Maciaszczyk et al., 2026; Gąsiński et al., 2026). In review analyses, there is a view that dark patterns can be considered an integral element of marketing strategies

in e-commerce. These solutions exploit the mechanisms of social influence, time pressure, and information asymmetry (Singh et al., 2024, 2026). In this aspect, the issue of regaining control by users operating in conditions of intensive automation of purchasing processes is of great importance. This is reflected in considerations on consumer autonomy in the era of AI (Silva et al., 2026).

An important stream of research is focused on the analysis of the mechanisms of operation and technological foundations of Dark AI Patterns, which is manifested especially in the area of user experience design and digital interfaces. It should be noted that the automation of manipulation patterns and their adaptation to user behavior contribute to increasing the difficulty of identification and the potential for impact (Spasovski, Jönsson, 2025; Kitkowska, 2025). In experimental studies, attention is paid to the role of emotions and cognitive responses of users. These can be used by AI-based systems to enhance the effectiveness of messages (Avolicino et al., 2022). At the same time, the trend of technical research is developing dynamically, focusing on the identification and automatic detection of manipulative patterns in the digital environment. This is reflected in analyses using machine learning models and pattern detection methods in e-commerce interfaces (Ramteke et al., 2024; Sawant et al., 2025; Kirthiga et al., 2024; Yada et al., 2023).

The above considerations are complemented by contextual and applied research. They relate to specific platforms and market and regulatory conditions. Case studies have revealed a dynamically increasing scale of the use of dark patterns in global e-commerce platforms, which is visible, for m.in, in research on the functioning of selected shopping websites (Erdem, 2026). At the same time, attempts are being made to define strategies to mitigate the negative effects of these phenomena, including through regulatory actions and the design of more transparent systems (Hadi, 2025). The roles of factors such as trust, risk and user diversity in assessing the impact of dark patterns should also be indicated, which indicates the multidimensional nature of the analyzed phenomenon (Marwaha et al., 2026).

1.2. Analysis of consumer vulnerability to manipulation in e-commerce

In the literature on the subject, the issue of consumer susceptibility to manipulation in the e-commerce environment is widely addressed, which is part of a broader stream of research on digital persuasion and influence mechanisms used by sales platforms. The modern shopping environment is constantly saturated with impact techniques, combining elements of dark patterns and digital nudging. They aim to shape consumer decisions in a way that prevents unambiguous identification (Singh et al., 2024). Trust in platforms also plays a big role in the functioning of e-commerce. It can both support the decision-making process and strengthen the vulnerability to manipulative messages (Beatty et al., 2011). At the same time, the rapid development of digitization and cutting-edge technologies is conducive to the use of increasingly advanced forms of influence, such as the manipulation of product images or the

adaptation of content to the individual characteristics of users. This influences the perception of the offer and purchasing decisions (Chatrath et al., 2022; Widyatmoko, 2025). There is also a growing role of reputation manipulation and rating systems, which can artificially shape the perceived credibility of products and sellers (Xu et al., 2015; Zhang et al., 2024).

Literature and practical analyses are focused on the analysis of manipulation mechanisms based on the content generated by users and their impact on consumer behavior. Great importance can be attributed to the manipulation of opinions and reviews. They are one of the most important sources of information in the purchasing decision-making process (Wang et al., 2023, 2024). This phenomenon is taking on more and more complex forms. These include coordinated actions and those using strategic models. This is confirmed in analyses dealing with manipulation on e-commerce platforms (Xu et al., 2025). In parallel, research is being conducted on automatic manipulation detection, especially using advanced language models such as GPT-4 and classification methods based on machine learning (Al Wahshat et al., 2023; Chen, Lin, 2013). There is also a need to take into account the security and integrity aspects of e-commerce systems. Here, countermeasures to more advanced forms of manipulation, including logistical and operational processes, should be indicated (Hao et al., 2026).

The above considerations can be complemented by research that focuses directly on consumer behavior and their reaction to manipulative elements of interfaces and marketing messages. It is indicated that manipulation within the design of the user interface can result in an increase in purchasing impulsiveness and a reduction in the rationality of decisions (Singh, 2025). At the same time, previous research on human-computer interaction indicates the growing importance of the way information is presented and the ability to directly manipulate interface elements, which remains extremely important for shaping the user experience (Capozzo et al., 2003). In this aspect, analyses that concern the issue of consumer susceptibility to manipulations based on artificial intelligence are also of significant importance. They point to the problem of the complexity of the relationship between psychological factors and responses to algorithmic stimuli (Maciaszczyk et al., 2026). These results are part of a broader stream of research on the multidimensional nature of manipulation in e-commerce, encompassing both technological and behavioral aspects, which highlights the need for further analyses to integrate these perspectives.

2. Methods

The aim of the research was to determine the relationship between selected psychological and behavioral variables and the level of consumer susceptibility to manipulations such as Dark AI Patterns in the e-commerce environment. Particular attention was focused on identifying the role of such factors, which included the perception of personalization, trust in artificial

intelligence systems, awareness of algorithms, purchasing impulsiveness, sense of purchase pressure, intensity of use of AI recommendations, and criticism of marketing messages in shaping consumer reactions to algorithmic forms of influence.

The study adopted a research hypothesis – according to it, psychological and behavioral variables remain significantly related to the level of susceptibility to algorithmic manipulation. It was assumed that a higher level of personalization perception, greater trust in AI systems, and more intensive use of AI-based recommendations would foster an increase in vulnerability to such influences. At the same time, it was assumed that the awareness of algorithms and a critical approach to marketing messages will serve as factors that limit susceptibility to manipulation. In addition, it has been assumed that vulnerability to Dark AI Patterns is related to purchasing impulsiveness and a sense of buying pressure.

In connection with the above, research questions have been formulated. They referred to the nature and strength of the relationship between the analyzed variables. It was analysed whether and to what extent the perception of personalization, trust in AI and the intensity of the use of algorithmic recommendations are related to susceptibility to manipulation. In addition, answers were sought to the questions whether awareness of algorithms and criticism of marketing messages show relationships of the opposite nature to vulnerability. The analysis also included the issue of determining the relationship between susceptibility to manipulation and purchasing impulsiveness and the feeling of purchase pressure.

The survey method was adopted as a research method. The survey was conducted in 2025. An online survey questionnaire was used for this purpose. The research sample included 429 respondents who met the criterion of shopping activity in the e-commerce environment. The collected data were subjected to statistical analysis. In the first place, it included the calculation of basic measures of descriptive statistics, such as the mean and standard deviation for individual variables. Next, a relationship analysis was performed using Pearson's linear correlation coefficients. This allowed to determine the direction and strength of the links between the analyzed constructs.

To ensure the reliability of the measurement scales, an approach based on their construction and consistency with previous research was adopted. The measurement items used for the analyzed constructs, such as trust in artificial intelligence, perception of personalization, and algorithm awareness, were multi-item in nature, which allows their internal consistency to be considered satisfactory. In terms of validity, the constructs were operationalized based on a review of the literature on e-commerce, consumer behavior, and the use of artificial intelligence. Content validity was ensured through the alignment of questionnaire items with the theoretical definitions of the analyzed variables. The use of Likert-type scales and their reference to previous studies allow the construct validity to be considered as maintained.

3. Results

The research used empirical data collected as part of a survey conducted among e-commerce users. The analysis was based on a set of variables. They included both reactions to selected forms of algorithmic influence, as well as psychological constructs that related to the functioning of consumers in the digital environment, such as the perception of personalization, trust in artificial intelligence systems, awareness of algorithms, purchasing impulsiveness and a sense of purchase pressure. These variables were assigned numerical values, based on a five-point measurement scale. This allowed for further statistical analyses, including correlation analysis.

In the course of the research, preliminary characteristics of the variables used in the further analysis of the relationships were made, including both the level of susceptibility to algorithmic influence and selected psychological and behavioral constructs. The analysed variables were measured using a five-point scale, allowing for their quantitative interpretation.

The average level of vulnerability to manipulation of the Dark AI Patterns was at the level of 3.00. This indicates a moderate susceptibility of respondents to the influence of this type of stimuli. Similar values were recorded in the case of purchasing impulsivity (M = 2.97) and the feeling of buying pressure (M = 3.05). This suggests a relative balance between spontaneous responses and perceived situational influence.

With regard to psychological variables, the highest average value was obtained for trust in AI systems (M = 3.25). This confirms the relatively high level of acceptance and positive assessment of the algorithms by respondents. Slightly lower values were observed in the perception of personalization (M = 3.18) and the intensity of using AI-based recommendations (M = 3.21). Such variables indicate a moderate, but noticeable level of contact with algorithmic solutions in the procurement environment.

A relatively lower level of was obtained in relation to the awareness of algorithms (M = 2.89). This confirms the limited knowledge of the mechanisms behind the functioning of recommendation systems. On the other hand, criticism of marketing messages reached an average value of 3.12, which suggests a moderate value, which "stands" behind the tendency of respondents to reflectively evaluate the content presented.

The variation of responses, measured by standard deviation, was included in the range from 0.68 to 0.81, confirming the moderate level of dispersion of the results and the relative homogeneity of the tested sample in terms of the analyzed variables. The obtained statistical parameters can be considered as the basis for further analyses of the relationships between variables. This is mainly possible in terms of identifying the direction and strength of the links between psychological constructions and susceptibility to algorithmic manipulation.

On the basis of the presented characteristics of the variables, the analysis of the Pearson linear correlation was performed. Its results are presented in Table 1. Thanks to the results obtained, it is possible to identify the direction and strength of the relationship between the analyzed psychological and behavioral constructs and susceptibility to manipulation such as Dark AI Patterns.

Table 1.
Relationships between psychological and behavioral variables and susceptibility to Dark AI Patterns (Pearson correlation coefficients)

Variable	Susceptibility to AI Manipulation	Impulsive Buying	Perceived Purchase Pressure
Perceived Personalization	0.42	0.38	0.35
Trust in AI	0.47	0.33	0.29
Algorithm Awareness	-0.44	-0.31	-0.28
Intensity of AI Recommendation Use	0.39	0.36	0.41
Critical Attitude toward Marketing Messages	-0.36	-0.40	-0.34

Source: Own study.

In the first place, a positive relationship can be noted between the perception of personalization and susceptibility to algorithmic manipulation (r = 0.42). This indicates a moderate strength of the connection. In addition, at the same time, the perception of personalization is positively correlated with purchasing impulsivity (r = 0.38) and the feeling of buying pressure (r = 0.35), indicating the co-occurrence of these phenomena in consumer behavior.

The highest value of the correlation coefficient in relation to susceptibility to manipulation was recorded in the case of trust in artificial intelligence (r = 0.47), which indicates a relatively stronger relationship compared to the other variables. This variable also shows positive correlations with purchasing impulsivity (r = 0.33) and the feeling of buying pressure (r = 0.29), despite the fact that their strength is slightly lower.

In the case of awareness of the algorithms' operation in the course of the research, negative values of correlation coefficients were obtained in all analysed relationships. The correlation with manipulation susceptibility is r = -0.44, indicating a moderate inverse relationship. A similar trend was affected in relation to purchasing impulsivity (r = -0.31) and the feeling of purchasing pressure (r = -0.28). The strength of these relationships remains at a moderate level.

Positive dependencies are also noted in the case of the intensity of use of AI-based recommendations. The correlation with manipulation susceptibility is r = 0.39. On the other hand, with purchasing impulsiveness, it is r = 0.36. The highest value in this case was obtained for the relationship with the feeling of purchasing pressure (r = 0.41), confirming a clear link between this variable and the perceived situational impact.

When it comes to the critical attitude towards marketing messages, each of the correlation coefficients received assumes negative values. In the case of susceptibility to manipulation, the value of r = -0.36 can be indicated for a moderate inverse relationship, while in relation to purchasing impulsivity, the value of r = -0.40 was recorded. This is one of the higher absolute

values in the analyzed matrix. In turn, the correlation with the feeling of buying pressure reached the level of r = -0.34.

The results, presented in Table 1, indicate the presence of both positive and negative relationships between the analysed variables, and their strength ranges from weak to moderate.

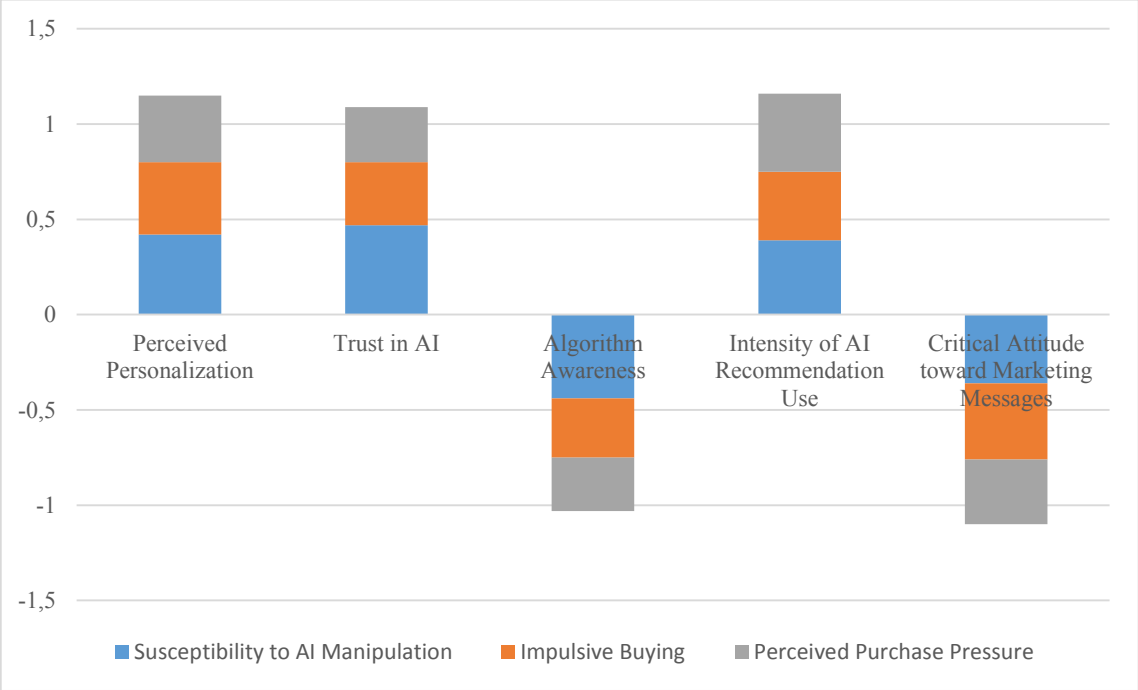

Figure 1. Stacked column chart.

Source: Own study.

On the basis of the correlation analysis presented in Table 1, a visualization of the results in the form of a cumulative column graph is presented (Fig. 1). It allows for a synthetic approach to the relationships between the analyzed variables. Figure 1 reflects both the direction and the relative strength of the links between psychological and behavioural factors and manipulation vulnerability and related consumer responses. This makes it easier to compare their meanings. It is also possible to point out a clear differentiation between variables of a vulnerability-reinforcing nature, such as trust in artificial intelligence or perception of personalization, and limiting factors, such as awareness of algorithms or a critical approach to marketing messages. Thanks to the presented visualization, it is therefore possible to confirm the conclusions that resulted from Table 1. At the same time, the relational nature of the analysed relationships and their mutual proportions were emphasized in a more transparent way.

It should be noted that Figure 1 has primarily an illustrative and organizational character, allowing for a synthetic visualization of the relationships presented in Table 1. However, its analytical value is limited, as it does not provide additional insights beyond the numerical data already included in the table. Therefore, the figure serves a complementary role, supporting the interpretation of the results rather than constituting a separate analytical tool.

4. Discussion

On the basis of the conducted research, several conclusions can be drawn that concern the mechanisms shaping the susceptibility of consumers to manipulations such as Dark AI Patterns in the e-commerce environment. Based on the results of the research, it can be indicated that factors related to the perception of technology play a key role. In particular, it is trust in artificial intelligence systems and the perception of personalization of messages. Positive relationships indicate that the higher the level of acceptance and belief in the accuracy of algorithms, the greater the tendency to succumb to the stimuli generated by them. An analogous direction of dependency can be observed in the case of the intensity of the use of AI recommendations, confirming the significant role of the frequency of contact with technology in shaping user reactions.

At the same time, the importance of protective factors can be pointed out. Awareness of algorithms and a critical approach to marketing messages reflect the opposite of vulnerability to manipulation. Therefore, they can be considered as key mechanisms that limit the impact of algorithmic forms of influence. The increase in cognitive competence and reflectivity of users is closely related to the reduction in the level of vulnerability, indicating the importance of knowledge and the ability to interpret digital messages in the shopping environment. These dependencies highlight the role of consumer education in the aspect of the growing presence of technologies that operate on artificial intelligence algorithms.

In addition, the results of the research suggest the co-occurrence of susceptibility to manipulation with behavioral reactions, such as purchasing impulsiveness and feelings of buying pressure. Positive relationships between these variables confirm that susceptibility to algorithmic influence is inscribed in the broader context of consumer behavior. Emotions and situational decision-making stimuli play an important role in such a process. These dependencies suggest that manipulation mechanisms are linked to the general style of purchasing decisions and take on a complex and multidimensional character.

The results obtained in the analyzed article are consistent with the findings of other researchers. This is especially evident in relation to the importance of trust and personalization in the e-commerce environment. A positive relationship was found between trust in AI and susceptibility to manipulation, which corresponds to findings indicating that trust is one of the determinants of user behavior in e-commerce and their propensity to make purchasing decisions (Beatty et al., 2011). On the other hand, the positive relationship between the perception of personalization and susceptibility to algorithmic influence has been confirmed in studies indicating that personalization strategies increase the effectiveness of marketing influence and influence consumer purchasing decisions (Widyatmoko, 2025). Therefore, the results obtained in this study are part of a broader stream of research indicating that mechanisms that increase the alignment of the message and the credibility of the platform can simultaneously strengthen the vulnerability of users to digital impact.

At the same time, the obtained results are consistent with studies on digital persuasion and manipulation mechanisms in e-commerce, which indicate that the use of dark patterns and algorithmic solutions may significantly influence consumer behavior, including increasing impulsiveness and perceived decision pressure (Singh, 2025, 2024, 2026). The positive relationship identified between the intensity of AI-based recommendation use and susceptibility to manipulation also corresponds with research emphasizing the growing role of automated and adaptive systems in shaping consumer decisions (Spasovski, Jönsson, 2025; Kitkowska, 2025). In turn, the negative relationships observed in relation to algorithm awareness and a critical attitude toward marketing messages confirm the protective role of cognitive factors, as indicated in studies on user perception and resistance to manipulation (Avolicino et al., 2022; Silva et al., 2026). The results are also in line with research on manipulation in review and reputation systems, which demonstrate their significant impact on purchasing decisions in e-commerce environments (Wang et al., 2023, 2024; Xu et al., 2015).

It should be emphasized that the relationships identified in this study are correlational in nature and do not imply causality. Due to the cross-sectional design of the research, the observed associations between variables such as trust in AI and susceptibility to manipulation should be interpreted with caution. Therefore, the results indicate co-occurrence rather than cause-and-effect relationships, and any directional interpretations require further verification using longitudinal or experimental research approaches.

5. Conclusions

Based on the results obtained, recommendations can be formulated for enterprises operating in the e-commerce environment. These refer to the responsible use of AI-based tools. In particular, it seems reasonable to limit the use of excessively intensive stimuli, which are based on personalization and mechanisms that strengthen trust in AI systems in a way that may lead to unconscious influence on consumer decisions. It is advisable to design transparent solutions so that users can identify which content is recommendatory and which results from algorithmic activities. This approach can help in the process of building relationships that are based on credibility rather than short-term manipulative effectiveness.

Among the important directions of research, we can point to strengthening users' awareness of the functioning of algorithms and ways of generating shopping content. Implementing solutions that increase the transparency of recommendation systems, such as explanations regarding product selection or the ability to verify the sources of recommendations, will reduce susceptibility to manipulation. On the other hand, the introduction of interfaces that promote reflective purchasing decisions, for example by enabling easy comparison of offers or

introducing mechanisms that delay the completion of the purchase, promotes more informed consumer choices.

In addition, in the process of designing sales systems, it is reasonable to take into account issues related to purchasing impulsiveness and felt decision-making pressure. On the basis of the conducted research, it can be concluded that these factors are closely related to susceptibility to algorithmic influence. This means that strengthening them can lead to exacerbated undesirable behavioral effects. Therefore, it is recommended to use solutions that minimize time pressure and limit the excess of stimuli that stimulate quick decisions. In the long run, this approach leads to more balanced customer relationships. It also strengthens their trust in e-commerce platforms.

The conducted research is subject to certain limitations. They should be taken into account when interpreting the results obtained. The choice of the survey method meant that the data is based on respondents' declarations, and this fact may be associated with the risk of distortion. They are the result of subjective assessment of one's own behaviour, the effect of self-presentation or limited awareness of the influence of algorithmic mechanisms. It should also be added that the study took on a cross-sectional character, making it impossible to capture changes over time, as well as making it difficult to determine cause-and-effect relationships between the analyzed variables. The limitations also include the presence of the structure of the research sample. Despite the diversity, it did not fully reflect the population of all e-commerce users. And this limited the possibility of generalizing the results. In addition, the analysis was based on generalized psychological constructions, it did not take into account the situational context of purchasing decisions or actual consumer behavior, which in turn could be a significant complement to the results obtained.

In future research, it seems reasonable to deepen the analysis of the mechanisms determining the susceptibility of consumers to manipulations such as Dark AI Patterns. In particular, it would be interesting to take into account psychological variables that are related to the regulation of emotions, decision-making style and cognitive resilience. It is also worth considering extending the scope of research to include a longitudinal approach. It would make it possible to observe changes over time and identify the long-term effects of exposure to algorithmic forms of influence. It would also be interesting to use experimental methods. Such an approach would allow for a more precise determination of cause-and-effect relationships. It would also make it possible to compare the effectiveness of different types of manipulation in different purchasing contexts. In addition, differences between consumer groups, including cultural and demographic conditions, could be taken into account. The future direction of research could also be the analysis of the impact of legal regulations and ethical standards on the way AI-based systems are designed in the e-commerce environment.

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