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Dark patterns in online retailing: an analysis based on information manipulation theory

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Abstract

Purpose – The purpose of this paper is to provide a theoretical explanation and empirical foundation for understanding the mechanisms through which dark patterns influence customer behavior and specific consequences of their use. To achieve this, the authors introduce information manipulation theory to the domain of marketing research on dark patterns.

Design/methodology/approach – This study incorporates a 2 × 2 between-subjects design to collect data (n = 372). Structural equation modeling is used to assess relationships between the constructs of interest.

Findings – Dark patterns (scarcity and sneaking) influence the perceived violation of communication maxims, which in turn positively relates to perceived customer manipulation. Further, perceived customer manipulation is negatively associated with purchase intention and attitude toward the website. Nonetheless, dark patterns differ in their effects. While scarcity only violates the quantity and relevance maxims, sneaking and the combination of both dark patterns additionally violates the quality and clarity maxims

Research limitations/implications – Scholars can draw on the results of this study to further examine the consequences of dark patterns in marketing. Further, while this research is limited to survey data, the authors encourage scholars to validate the findings of this study through behavioral data.

Practical implications – The results suggest that companies should reconsider the use of dark patterns. Although their use may offer short-term benefits, the long-term negative consequences should be taken into account. Different dark patterns can have different outcomes, highlighting the need for careful consideration when implementing them.

Originality/value – This research contributes to the literature on dark patterns by providing a theoretical explanation of the outcomes of their use. The authors introduce information manipulation theory to explain the consequences of different dark patterns, addressing the existing lack of theorizing in this area.

Keywords Dark patterns, Consumer behavior, Digital marketing, Information manipulation theory

Paper type Research paper

1. Introduction

While persuasive techniques have long been applied in marketing (Kirmani and Zhu, 2007), digital technologies enable marketers to influence customers and users in subtler, more efficient and more scalable ways than ever before (Moran, 2020). In this endeavor, user

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interface designs that steer customer behavior to the benefit of organizations, with less regard for potential negative consequences for customers, are often referred to as "dark patterns" (Mathur *et al.*, 2019). Nowadays, these dark patterns are ubiquitous (Di Geronimo *et al.*, 2020; European Commission, 2023; Mathur *et al.*, 2019), with 97% of the most popular websites and mobile applications using at least one dark pattern (Lupiáñez-Villanueva *et al.*, 2022).

One main driver for this development is that companies use dark patterns to increase customer outreach, customer data, revenues and profit (Singh *et al.*, 2025; Voigt *et al.*, 2021; Waldman, 2020). However, although the application of dark patterns is, on first sight (e.g. because of increased sales; Naheyan and Oyibo, 2024), appealing for marketing practice, marketing research has indicated that such application could lead to negative long-term effects (Narayanan *et al.*, 2020). For example, in the context of product reviews, previous research has shown that customers who perceive an online retailer as manipulative are less likely to be loyal (Koukova *et al.*, 2023). Further, encountering dark patterns may diminish customer autonomy (Botes, 2023), which could lead to customers reconsidering their purchase choices (Naheyan and Oyibo, 2024), a worse online customer experience (Rose *et al.*, 2012) and a reduction of the customers' power (Wang *et al.*, 2022). As a consequence, low-power customers, who are known to exhibit increased variety-seeking (Wang *et al.*, 2022), might exhibit such variety-seeking in response to dark patterns. In addition, recent studies have reported that the application of dark patterns could be perceived as manipulative (Oyibo, 2025) and, thus, result in negative emotions (Luguri and Strahilevitz, 2021), reduced brand trust (Voigt *et al.*, 2021) and increased unfairness perceptions (Kim *et al.*, 2023) connected to purchase behavior and word of mouth (Kalyanaram and Winer, 2022). However, scholars such as Oyibo (2025) have found that perceived manipulativeness does not always transfer to reduced trustworthiness and credibility of a website, indicating somewhat contradictory findings.

In addition, most of the aforementioned research has focused on outcomes involving one or more dark patterns in an explorative way. This leaves open the questions of *why* and *how* dark patterns influence customer behavior. Thus, marketing research is still lacking theory to explain the reasons why this kind of customer manipulation results in the outcomes elucidated (Voigt *et al.*, 2021).

To address this gap, we draw on information manipulation theory (McCornack, 1992), originally developed in the context of interpersonal communication, as a theoretical framework for understanding manipulative communication. Information manipulation theory assumes that every communication should follow four communication maxims: quality, quantity, clarity and relevance (Grice, 1989). According to the theory, information or communication can be considered manipulative if at least one of four maxims is violated (Grice, 1989). In online retailing, communication occurs through user interface designs. Here, consumers can be influenced through, for instance, the dark pattern visual interference (Mathur *et al.*, 2019), which uses visual presentations to influence behavior (Mathur *et al.*, 2019) and, thus, violates the clarity of information presented. Therefore, we apply information manipulation theory (McCornack, 1992) to explain the consequences of dark pattern use and underlying mechanisms and theorize that dark patterns represent violations of the communication maxims.

In addition, following a call by Runge and colleagues (2022), this paper sheds light on the mechanisms underlying the consequences of using dark patterns. Thus, we enable more differentiated and theory-driven discussions on this topic and enable marketing managers to make more informed decisions regarding the application of dark patterns.

This paper makes three contributions: First, we introduce information manipulation theory to marketing research on dark patterns (McCornack, 1992) and provide a theoretical framework for understanding the consequences of perceived dark patterns. Therefore, we enhance the theory's external validity by extending its application from interpersonal to organizational communication contexts. Second, we empirically test the theory by applying it to specific types of dark patterns, thereby advancing knowledge regarding consequences of dark patterns. Third, we contribute to theory development by identifying a habituation effect, which represents a starting point for further development of information manipulation theory from a static structural theory toward a dynamic process theory. To achieve these contributions, we develop hypotheses regarding the perception and consequences of dark patterns, drawing on information manipulation theory (McCornack, 1992). Subsequently, we empirically test our hypotheses using covariance-based structural equation modeling, discuss the results and develop theoretical and managerial implications.

Theoretical background and hypothesis development

Dark patterns

"Dark patterns are user interface design choices that benefit an online service by coercing, steering, or deceiving users into making decisions that, if fully informed and capable of selecting alternatives, they might not make" (Mathur *et al.*, 2019, p. 2). Generally, dark patterns are used to drive customers to make decisions that are foremost beneficial for the organization (Gray *et al.*, 2018; Santos *et al.*, 2025). Compared to other practices, such as promotions, dark patterns only focus on the organization's benefits without considering potential benefits for the customer (Mathur *et al.*, 2019). Further, the use of manipulative techniques (e.g. dark patterns) should be distinguished from nudging; while nudging aims to engage individuals' deliberative capacities, dark patterns operate by subverting or bypassing these capacities (Sunstein, 2016). Since the term "dark patterns" was introduced by Brignull (2010), various classifications have been established (Bösch *et al.*, 2016; Conti and Sobiesk, 2010; Gray *et al.*, 2018). One of the most prominent was provided by Mathur and colleagues (2019), who differentiated seven types of dark patterns: sneaking, urgency, scarcity, misdirection, social proof, forced action and obstruction. *Sneaking* refers to hiding or delaying information to mislead customers (Mathur *et al.*, 2019). *Urgency* combines techniques that make customers feel they must decide quickly and thereby uses scarcity bias. The same bias is exploited by dark patterns in the *scarcity* categories, which include "limited-time" or "high-demand" messages (Mathur *et al.*, 2019). *Misdirection* aims at influencing customers' choices by playing upon their emotions or using misleading visuals or language (Mathur *et al.*, 2019). *Social proof* techniques use social norms and *forced action* steers customers' behavior by compelling them to act in a specific way to achieve their intended goal (Mathur *et al.*, 2019). Finally, *obstruction* involves complicating actions that are not in the company's interests (Mathur *et al.*, 2019). Further, Mathur *et al.* (2019) characterized different dark patterns based on six attributes: asymmetric, restrictive, disparate treatment, covert, deceptive and information-hiding. The *asymmetric* attribute refers to the uneven presentation of choices; for example, options that are advantageous for the company may be presented much more prominently than options that would be advantageous for customers. The *restrictive* attribute refers to the action of eliminating options that might be beneficial for the customer, while *disparate treatment* describes treating different customer groups dissimilarly. When the mechanisms used to influence customers are hidden, this is seen as *covert* action, while dark patterns are defined as *deceptive* in case false beliefs are induced or misleading information is presented. Finally, the

information-hiding attribute depicts the concealment of relevant information (Mathur *et al.*, 2019).

The above-described attributes are fulfilled to varying degrees by the different dark patterns mentioned above. For example, sneaking entails a high degree of information-hiding and some deception, but is neither asymmetric nor covert; scarcity, on the other hand, comprises partly covert, partly deceptive and partly information-hiding practices.

Irrespective of the aforementioned types, the goals of using dark patterns can be diverse. Initially, dark pattern usage could be intended to increase sales or revenue (Maier and Harr, 2020) or to collect customer data (Waldman, 2020). While there is preliminary evidence on the effectiveness of dark patterns (Luguri and Strahilevitz, 2021), there are also initial findings regarding backfire effects, such as reduced brand trust or commitment (Fröbel *et al.*, 2024; Voigt *et al.*, 2021). Thus, empirical studies have shown conflicting outcomes associated with the use of dark patterns. On the one hand, current research has demonstrated positive effects of dark patterns regarding their effectiveness, for example in terms of increased subscription rates (Luguri and Strahilevitz) or purchase decisions (Singh *et al.*, 2025). On the other hand, dark patterns have been found to negatively impact central marketing constructs, such as brand trust (Voigt *et al.*, 2021), customer autonomy (Botes, 2023) and customers' emotions (Luguri and Strahilevitz, 2021). Despite this, theoretical understanding of the underlying mechanisms for these outcomes is lacking. Additionally, there is a dearth of research exploring the factors that determine when the positive or negative effects of dark patterns prevail. Further research is, thus, needed to theoretically explain these inconclusive findings in a differentiated way and to develop managerial implications on when and how the use of dark patterns may be reasonable from a company perspective. We aim to address this need in the following sections by introducing information manipulation theory to this field of marketing research.

Information manipulation theory. There are myriad theories aimed at explaining customer behavior in digital contexts, such as the persuasion knowledge model, the elaboration likelihood model and the technology acceptance model (Davis, 1989; Friestad and Wright, 1994; Güngör and Çadırcı, 2022; Petty and Cacioppo, 1986; Schmitt, 2019). However, these theories often do not include risk factors (Güngör and Çadırcı, 2022), such as perceived deceptiveness or manipulation, which are essential for understanding the aforementioned backfire problem. In this regard, in information manipulation theory, the concept of manipulation is key (McCornack, 1992). Moreover, information manipulation theory has successfully been used to explain perceptions of dishonest or deceptive messages in interpersonal communication (Jacobs *et al.*, 1996; Levine *et al.*, 2003). Therefore, we have reason to believe that information manipulation theory (McCornack, 1992) might be able to explain which mechanisms underlie the perception of a manipulation. This ability is particularly important because a manipulation is likely to be subtler than an overt attempt at persuasion – that is, based on facts and arguments (Sunstein, 2016) – and could be covered by the persuasion knowledge model (Friestad and Wright, 1994). Accordingly, we posit that information manipulation theory might be suitable to explain responses to perceptions of dark patterns, in terms of both positive and backfire effects. That is, although there are other theories (e.g. the persuasion knowledge model; Friestad and Wright, 1994) that could be used in this context, we suggest that information manipulation theory (McCornack, 1992) is appropriate to explain the meaning of dark patterns for marketing purposes. Hence, we apply information manipulation theory (McCornack, 1992) and evaluate it in terms of its ability to explain variances in responses to the perception of dark patterns.

The core idea of information manipulation theory (McCornack, 1992) is that violation of at least one of the four communication maxims (quality, quantity, relevance and clarity) will

lead to customers perceiving a message as dishonest and even manipulative (Grice, 1989). Within information manipulation theory, the *quality maxim* refers to the perceived truth or accuracy of the information given (Grice, 1989; McCornack, 1992; Ormond and Warkentin, 2015). Violations include information that is false or inaccurate, or that has insufficient evidence (Grice, 1989; McCornack, 1992; Ormond and Warkentin, 2015). The *quantity maxim* refers to the amount of information, which should be adequate for the aim of the communication. This means that the communication should be exactly as informative as required (McCornack, 1992). Violations include a surplus or dearth of information (Grice, 1989; McCornack, 1992; Ormond and Warkentin, 2015). The *relevance maxim* refers to the perceived applicability of the information provided. It is violated by omitting pertinent, or giving extraneous, information (Grice, 1989; McCornack, 1992). Finally, the *clarity maxim* refers to the information's presentation (Grice, 1989; McCornack, 1992) and, thus, refers not to what is said but to how it is said (McCornack, 1992). According to information manipulation theory, violations of these maxims lead to the messages being perceived as manipulative, such that the communication is perceived as dishonest, misleading or deceptive (McCornack, 1992; McCornack *et al.*, 1992).

Especially in online contexts, customers might have less access to information compared to in brick-and-mortar environments (Moran, 2020). Additionally, digital technologies enable companies to specifically vary information across different customers (Berdichevsky and Neuenschwander, 1999), which enables subtle violations of the communication maxims. To exploit this informational asymmetry, companies use dark patterns as a tool to manipulate customers (Gray *et al.*, 2018). Drawing on the attributes used by Mathur and colleagues (2019) to describe dark patterns, we assume that, in particular, dark patterns that are covert, information-hiding and deceptive violate the communication maxims. Further, dark patterns such as sneaking often violate the quantity maxim through the omission or delay of crucial information. They may also violate the quality maxim by presenting inaccurate or misleading information, as is particularly evident in deceptive scarcity claims. Furthermore, by presenting irrelevant information and, thus, distracting from key details, certain dark patterns violate the relevance maxim. Finally, the frequent employment of misleading language or visuals via dark patterns to mislead customers represents a clear violation of the clarity maxim. Overall, dark patterns are manipulative user interface design choices (Mathur *et al.*, 2019; Gray *et al.*, 2018) that violate the communication maxims, per information manipulation theory, to steer customer behavior.

Accordingly, we assume that the use of certain types of dark patterns (i.e. sneaking and scarcity) is perceived as a violation of the communication maxims. Additionally, we suggest that violation of the communication maxims affects consumer behavior. Thus, information manipulation theory could contribute to explaining the inconclusive findings to date regarding consequences of the use of dark patterns. Therefore, we assume that:

H1a–d. The perception of dark patterns increases perceived violation of the (a) quality, (b) quantity, (c) clarity and (d) relevance maxims.

Dark patterns differ in their characteristics, as well as in their prevalence. The dark pattern scarcity, for example, is among the most commonly used dark patterns, while sneaking is still relatively rare (Mathur *et al.*, 2019). Drawing on the persuasion knowledge model (Friestad and Wright, 1994), we assume that individuals who frequently shop online have been exposed to the dark pattern scarcity many times. Over time, these individuals may have developed persuasion knowledge (Friestad and Wright, 1994; Kirmani and Campbell, 2009) and become desensitized to this specific dark pattern. As a result, they might be less likely to consider scarcity as a perceived violation of certain communication maxims. Scarcity claims

provide additional information that typically do not exist in brick-and-mortar environments and might be considered irrelevant. Hence, we assume that familiarity with online shopping moderates the relationship between scarcity and perceived violation of the quantity and relevance maxims. We, thus, hypothesize the following:

H2. Familiarity with online shopping moderates the relationship between the dark pattern scarcity and the perceived violation of the quantity and relevance maxims, such that customers displaying high levels of familiarity will be less likely to consider scarcity as a perceived violation of these maxims.

Customer manipulation. Prior marketing and consumer research has shown that dark patterns can give rise to negative effects – such as disengagement, negative emotions or annoyance – on important customer-related outcomes (Luguri and Strahilevitz, 2021; Voigt *et al.*, 2021). Dark patterns aim to hinder customers from making informed decisions and, therefore, to restrict their autonomy (Kollmer and Eckhardt, 2022). Luguri and Strahilevitz (2021) empirically demonstrated that the use of dark patterns can stimulate negative emotions. This suggests that customers perceive a manipulation as such and that consequences result from this conscious perception. Manipulation, per definition, usually aims to drive an action or decision that is in the manipulator's interest (Sunstein, 2016) in a more- or less-hidden way (Susser *et al.*, 2018), thus restricting the individual's perceived (though not their actual) autonomy (Handelman, 2009; Sunstein, 2016). In line with Witte (2025, p. 17), we define perceived customer manipulation as the customer's perception of an organization's attempt to influence their decision-making process "in a hidden, targeted and often selfish manner." As this definition mainly focuses on the customer's decision-making process, it can be assumed that this process is influenced via communication – or, more specifically, the information available to the customer. When one or more of the communication maxims, as outlined in information manipulation theory (McCornack, 1992), are violated, the manipulating organization strategically influences the information available to the customer during their decision-making process, which complicates the customer's cognitive, rational decision-making. As discussed above, information manipulation theory suggests that individuals can detect violations of communication maxims and are, thus, suspicious about possible deceptions and untruthfulness. Thus, it can be assumed that violation of the communication maxim leads to customers perceiving the attempt at manipulation through dark patterns. Accordingly, we posit:

H3a–d. The higher the perceived violation of the (a) quality, (b) quantity, (c) clarity and (d) relevance maxims, the higher the perceived customer manipulation.

Further, little is known about mechanisms underlying the consequences of using manipulative techniques such as dark patterns. For example, Voigt *et al.* (2021) demonstrated that dark pattern usage leads to perceived annoyance and is negatively related to perceived brand trust, while Luguri and Strahilevitz (2021) noted that such usage triggers negative emotions. However, none of the studies explained the mechanisms underlying these negative consequences. Given the definition and characteristics of customer manipulation – where, unlike ethical marketing, the focus is primarily on benefiting the organization rather than addressing the customer's needs – we propose that perceived customer manipulation is a key factor that negatively impacts critical marketing outcomes, such as the customer's attitude. This is particularly important in e-commerce, where attitude toward the website represents a key success factor as it positively predicts brand choice and positively influences customers' confidence in purchasing decisions (Lee *et al.*, 2004). In digital marketplaces, for example,

the informativity of a post or interface is central for building positive attitudes (Chang *et al.*, 2020). In other contexts (e.g. brick-and-mortar stores), it has been empirically demonstrated that inferences of manipulative intent negatively influence attitudes toward the context (e.g. store atmosphere) and the provider (Lunardo and Mbengue, 2013).

Drawing on self-determination theory (Ryan and Deci, 2000), we assume that perceived customer manipulation threatens customers' perceived autonomy (Weismueller *et al.*, 2020), where autonomy represents one of three innate psychological needs (Ryan and Deci, 2000). When customers perceive manipulative tactics, such as dark patterns, they might see their autonomy threatened, triggering psychological reactance – a motivational state aimed at restoring lost freedom (Brehm, 1966; Weismueller *et al.*, 2020). To retain their autonomy or freedom of choice, customers might be less likely to purchase the specific product (Wicklund *et al.*, 1970) or may reverse their preferences (Wertenbroch *et al.*, 2020) and develop more negative attitudes toward the website as the source of threat. Previous research has shown similar effects. For instance, when consumers perceive a high level of manipulative intent, it leads to negative evaluations of products, services, companies and brands (Karabas *et al.*, 2020; Kirmani and Zhu, 2007). Furthermore, this phenomenon may be partly attributed to the application of persuasion knowledge (Friestad and Wright, 1994), as customers with high persuasion knowledge are more likely to apply coping mechanisms when facing a persuasive or manipulation attempt (Friestad and Wright, 1994). Specifically, in online contexts, customers have been observed to react to perceived manipulation tactics by showing a decreased intention to make purchases (Karabas *et al.*, 2020). Among other reactions, such as forming negative attitudes toward the organization or brand, this reduced purchase intention can be considered as a coping mechanism, per the persuasion knowledge model (Friestad and Wright, 1994; Rahmani, 2023). However, to apply a coping mechanism, the manipulation needs to be perceived beforehand. Thus, we propose:

H4a and b. Perceived customer manipulation negatively relates to (a) purchase intention and (b) attitude toward the website.

Finally, drawing on the theory of reasoned action (Fishbein and Ajzen, 1975), we propose that attitude toward the website and purchase intention predict loyalty intention. As attitude describes the favorability of an object (Dick and Basu, 1994), we assume that a positive attitude toward the website positively influences loyalty intention, as shown in previous research (Hsu *et al.*, 2006). In online retailing, cultivating a positive customer attitude toward the website is crucial for fostering loyalty (Blut *et al.*, 2014). This positive attitude helps customers transcend social norms and situational factors when considering alternatives to their current provider (Dick and Basu, 1994). Further, previous experiences with the provider in the form of an initial purchase might increase loyalty intention. Thus, we suggest that attitude toward the website and purchase intention positively influence loyalty intention.

H5a and b. (a) Purchase intention and (b) attitude toward the website positively relate to loyalty intention.

The conceptual model is presented in Figure 1.

Methodology

Method

To empirically test our hypotheses, we used a 2 × 2 between-subjects design. Each participant was randomly assigned to one of four scenarios, which we adapted from Voigt *et al.* (2021). Participants were shown a fictitious website and asked to imagine that they

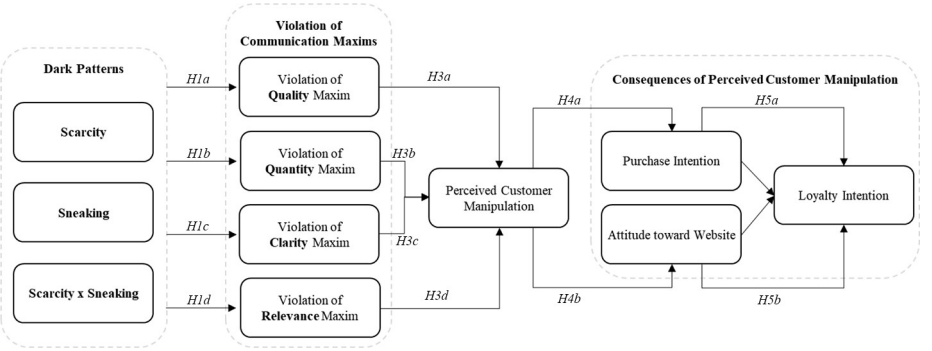

Figure 1. Research model
Source: Authors' own work

wanted to buy a hoodie. We selected this stimulus because hoodies are very popular and are available in various price categories. Moreover, they are a relevant purchase object for a large number of people, regardless of demographic criteria (e.g. gender and age) and have been used in similar studies (Silva *et al.*, 2021; Voigt *et al.*, 2021). The scenarios included:

- no dark pattern,
- scarcity,
- sneak-into-basket (premium shipping is surreptitiously placed into the customer's basket) and
- a combination of scarcity and sneak-into-basket.

We chose these two dark patterns for two reasons: First, they are very diverse in usage. While scarcity is highly prevalent, sneak-into-basket (where a product is surreptitiously placed into the customer's basket) is rarely used (Mathur *et al.*, 2019). Second, the two dark patterns are different in nature: Scarcity refers to low-stock or high-demand messages, which do not directly affect the customer. As scarcity aims at exploiting scarcity bias and the company's intention is not fully obvious, it is partially covert (Mathur *et al.*, 2019) and to some degree deceptive (Mathur *et al.*, 2019). Sneak-into-basket, on the other hand, is more overt because customers can immediately see that an item has been added to their shopping cart without their explicit consent (Mathur *et al.*, 2019); however, it might be considered somewhat more deceptive than scarcity (Mathur *et al.*, 2019), because it demonstrates a more direct intent to mislead. In addition, the variation in prevalence between the selected patterns allows us to evaluate whether customers might learn from being confronted with dark patterns, as scarcity is highly prevalent while sneak-into-basket is not (Mathur *et al.*, 2019).

In the scarcity condition, participants were informed that there were only three hoodies left and that 53 potential customers had looked at the hoodie recently. In the sneak-into-basket condition, participants were confronted with additional costs for premium shipping being added to their cards automatically. The third treatment group was confronted with both types of dark patterns (see Appendix for the scenarios and a detailed description of our data collection process).

Using a filter question, we ensured that only participants who would generally buy hoodies online at a price level used in the scenarios were included. Specifically, participants were initially presented with a range of products and tasked with selecting those they would

contemplate purchasing online. Only those who selected the hoodie proceeded to the next stage. Subsequently, we assessed their willingness to pay for the hoodie, advancing only those who were willing to meet or exceed the predetermined scenario price of 39.99 euros. In addition, we conducted manipulation checks by asking each participant to identify the scarcity claim and shipping method (standard or premium) presented in their scenario. This resulted in the exclusion of 162 participants for failing these checks, with the distribution as follows: 31 from the control group, 20 under the scarcity condition, 57 in the sneaking condition and 54 in the combination condition. Furthermore, seven participants were excluded for straight-lining or speeding. Thus, the final sample comprised 372 participants (M_{age} = 41.42, SD_{age} = 12.39 and female = 38.4%).

Measurement

Except for purchase intention, which was measured as a single item, all constructs were measured using established multi-item scales. Violations of the communication maxims were measured using a seven-point semantic differential scale taken from McCornack and colleagues (1992). We measured attitude toward the website using a seven-point semantic differential scale adapted from Shobeiri *et al.* (2015). All further constructs were measured using a seven-point Likert scale. Perceived customer manipulation was measured using the dimensions of perceived restriction of autonomy, poor information quality and the feeling of being tricked, as suggested by Witte (2022). We adapted the scale used by Choi *et al.* (2022) to measure loyalty intention. Within the whole operationalization, four items were eliminated because of low internal consistency as demonstrated by Cronbach's alpha, communalities and factor loadings (violation of the relevance maxim: one item; perceived restriction of autonomy: one item; and feeling of being tricked: two items). Considering its complexity, the final measurement model indicated a good fit (χ^2 = 1,572.255, df = 641; χ^2/df = 2,453; CFI = 0.936; and RMSEA = 0.065) (Hair *et al.*, 2014). All validity and reliability measures are presented in Table 1.

Composite reliability for all constructs exceeded the threshold of 0.6 (Bagozzi and Yi, 1988). In addition, all standardized factor loadings were above 0.7 and significant (Hair *et al.*, 2014) and the average variance extracted exceeded 0.5, demonstrating convergent validity (Fornell and Larcker, 1981; Hair *et al.*, 2014).

To validate the second-order construct, we compared the model to one that pulled all items together and treated the construct as a first-order construct only. Because of the inferior fit of the second model, the second-order structure was preferred. Discriminant validity was supported because all square roots of the average variance extracted were greater than correlations with other constructs (Table 2; Fornell and Larcker, 1981). To include the scenarios in our structural equation model, we built three dichotomous dummy variables, each representing one treatment scenario and referring to the reference group (no dark pattern).

Common method variance is likely to be a problem when relying on survey data (Malhotra *et al.*, 2006). To ensure high validity and reliability of our research outcomes, we used a twofold approach to tackle common method variance. First, we used Harman's single-factor test, which is a widely accepted approach to evaluate common method variance (Malhotra *et al.*, 2006; Podsakoff *et al.*, 2003). The results showed that a single factor accounted for less than 50% of the total variance, indicating that common method bias was unlikely to have occurred in our data. However, despite its popularity, Harman's single-factor test has been criticized (Podsakoff *et al.*, 2003). Thus, to further mitigate the potential impact of common method variance, we used a theoretically unrelated marker variable "attitude toward the color blue" (Lindell and Whitney, 2001; Malhotra *et al.*, 2006). After correcting the correlation matrix for correlations with the marker variable, all correlations remained statistically significant, indicating that the risk of common method bias was minimized.

Table 1. Psychometric properties and results of confirmatory factor analysis

Item	Standardized loadings	Cronbach's alpha	Composite reliability	AVE
Violation of quality maxim[a]		0.919	0.942	0.803
Distorted – accurate (r)				
Altered – authentic (r)	0.909			
Fabricated – genuine (r)	0.903			
False – true (r)	0.892			
Violation of quantity maxim[a]		0.941	0.923	0.749
Uninformative – informative (r)	0.888			
Incomplete – complete (r)	0.852			
Nondisclosive – disclosive (r)	0.909			
Concealing – revealing (r)	0.810			
Violation of relevance maxim[1]		0.901	0.900	0.752
Inappropriate – appropriate (r)	0.885			
Nonapplicable – applicable (r)	0.899			
Impertinent – pertinent (r)	0.815			
Violation of clarity maxim[1]		0.935	0.936	0.787
Ambiguous – clear (r)	0.781			
Indefinite – definite (r)	0.945			
Vague – precise (r)	0.896			
Obscure – straight forward (r)	0.917			
Perceived customer manipulation *(Restriction of autonomy)*[b]		0.940	0.942	0.763
I felt free to do things my own way	0.834			
I felt that I had a lot of control over my visiting experiences at this online shop	0.816			
I believe that I had a choice over whether to buy the product	0.883			
I felt like it was my own choice as to buy the product	0.919			
I feel like I decided by myself	0.912			
Perceived customer manipulation *(Bad information quality)*[b]		0.954	0.954	0.777
The information provided is consistent	0.827			

(*continued*)

Table 1. Continued

Item	Standardized loadings	Cronbach's alpha	Composite reliability	AVE
The information provided is objective	0.819			
The information provided is believable	0.929			
The information provided is trustworthy	0.931			
The information provided is credible	0.899			
The information provided is reasonable	0.877			
Perceived customer manipulation *(Feeling tricked)*[b]		0.901	0.902	0.649
To accomplish its own objectives, the online shop alters the facts slightly	0.756			
To accomplish its own objectives, the online shop promises to do things without actually doing them	0.790			
The online shop attempted to close the sale before all of my concerns were addressed	0.829			
The online shop kept pushing me toward one product when I was interested in another	0.911			
The online shop was more interested in selling me his or her recommendation than the product I wanted	0.839			
Attitude toward the website[a]		0.942	0.943	0.801
This website is bad – This website is good	0.891			
I dislike this website – I like this website	0.892			
I react unfavorably toward this website – I react favorably toward this website	0.915			
I have negative feelings toward this website – I have positive feelings toward this website	0.892			
Purchase intention[b]				

(*continued*)

Table 1. Continued

Item	Standardized loadings	Cronbach's alpha	Composite reliability	AVE
How likely is it that you would have completed the purchase?				
Loyalty intentions[b]		0.946	0.947	0.856
I will choose this online shop in the future	0.915			
I will prefer to choose this online shop over other online shops	0.936			
I will recommend this online shop to someone else	0.924			
Perceived customer manipulation *(second order)*			0.794	0.573
Restriction of autonomy	0.695			
Bad information quality	0.948			
Feeling tricked	0.580			

Note(s): [a] measured on semantic differential scales; [b] measured on seven-point Likert-scales; AVE = average variance extracted
Source(s): Authors' own work

Table 2. Descriptive statistics and correlations

	Correlation coefficients							
Description	1	2	3	4	5	6	7	8
1 Violation of quality maxim	*0.896*							
2 Violation of quantity maxim	0.765	*0.866*						
3 Violation of relevance maxim	0.736	0.848	*0.867*					
4 Violation of clarity maxim	0.815	0.786	0.774	*0.887*				
5 Perceived customer manipulation	0.543	0.662	0.635	0.577	*0.760*			
6 Attitude toward the website	−0.648	−0.634	−0.613	−0.588	−0.572	*0.897*		
7 Purchase intention	−0.419	−0.396	−0.396	−0.413	−0.370	0.643	-	
8 Loyalty intentions	−0.495	−0.463	−0.445	−0.444	−0.384	0.766	0.657	*0.925*
Mean	4.858	5.021	5.106	5.045	3.012	4.2	3.495	3.168
SD	1.341	1.36	1.238	1.37	1.131	1.436	1.842	1.57
Average variance extracted (AVE)	0.803	0.750	0.752	0.787	0.573	0.806	-	0.856

Note(s): All correlations are significant at $p < 0.001$. The italic values along the diagonal are the square roots of the AVE
Source(s): Authors' own work

Results

To test the hypotheses, we applied structural equation modeling with maximum likelihood estimation using Amos 27. The model showed good fit (χ^2 = 2,231.979, df = 951; χ^2/df = 2,347; CFI = 0.924; and RMSEA = 0.06) (Hair *et al.*, 2014). The results of the structural equation model revealed that, compared to the control group, the use of scarcity as a

treatment positively and significantly influenced the perceived violation of the quantity (β = 0.223; $p < 0.001$) and relevance (β = 0.191; p = 0.003) maxims. There was no significant influence on the violation of the quality (β = 0.04; p = 0.535) and clarity (β = 0.098; p = 0.12) maxims. The use of sneaking significantly and positively influenced the violation of all four communication maxims (β = 0.194; p = 0.002 for quality; β = 0.238; $p < 0.001$ for quantity; β = 0.247; $p < 0.001$ for relevance; and β = 0.245; $p < 0.001$ for clarity). The combination of both dark patterns significantly predicted the perceived violation of all communication maxims (β = 0.139; $p < 0.027$ for quality; β = 0.322; $p < 0.001$ for quantity; β = 0.316; $p <$ 0.001 for relevance; and β = 0.211; $p < 0.001$ for clarity). Thus, *H1b* and *H1c* are supported, while *H1a* and *H1d* are partially supported because we did not find the effect for scarcity only.

Further, violation of the quality and quantity maxims significantly influenced perceived customer manipulation (β = 0.216; p = 0.032 for quality; and β = 0.326; p = 0.025 for quantity). However, we did not find a significant effect of the violation of other communication maxims on perceived customer manipulation (β = 0.234; p = 0.107 for relevance; and β = 0.110; p = 0.275 for clarity). Hence, *H3a* and *H3b* are supported, while *H3c* and *H3d* are not.

Perceived customer manipulation was negatively related to attitude toward the website (β = −0.863; $p < 0.001$) and purchase intention (β = −0.638; $p < 0.001$), supporting *H4a* and *H4b*. Moreover, the results show that attitude toward the website and purchase intention significantly predicted loyalty intention (β = 0.624; $p < 0.001$ for attitude; and β = 0.286; $p <$ 0.001 for purchase intention), supporting *H5a* and *H5b*.

Finally, control variables such as familiarity with online shopping and self-esteem did not significantly influence any focal constructs in the model. The results of our data analysis are presented in Figure 2 and Table 3.

To test the moderation effect of familiarity with online shopping, we calculated an additional structural equation model. The model fit the data well (χ^2/df = 2,299; CFI = 0.928; RMSEA = 0.059; Hair *et al.*, 2014). As expected, the main relationships did not change in significance, but did partially change in terms of standardized coefficients (Table 4). Considering the moderating effect of familiarity with online shopping, our data show that familiarity with online shopping significantly moderates the relationship between scarcity and perceived violation of the quantity maxim (β = −0.211; p = 0.036). However, we did not find a significant moderation effect of familiarity with online shopping for the relationship between scarcity and perceived violation of the relevance maxim (β = −0.186; p = 0.11). Thus, *H2* is only partially supported.

To additionally compare the effects of the four conditions on all dependent variables, we ran an additional analysis of variance (ANOVA). The results revealed that all four groups differ significantly regarding all dependent variables. Means per group and ANOVA results are depicted in Table 5.

Discussion and implications

This paper aims to explain the consequences of dark pattern use by introducing information manipulation theory into marketing research and applying it to an online retail setting. Our findings show that consumers perceive dark patterns as a violation of the communication maxims (Grice, 1989), which in turn leads to perceived customer manipulation. Perceived customer manipulation reduces attitude toward the website, purchase intention and ultimately loyalty intention. However, the results show that not all dark patterns are perceived equally, as scarcity is only partially regarded as a violation of communication maxims, suggesting a habituation effect.

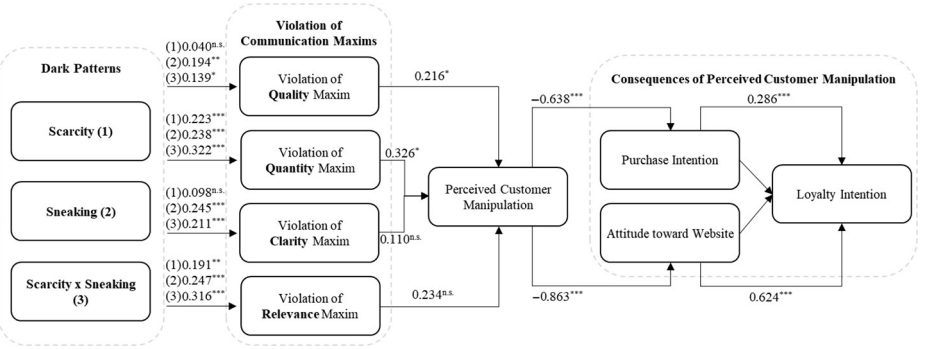

Figure 2. Results of hypothesis testing
Note(s): *$p < 0.05$, **$p < 0.01$ and *** $p < 0.001$; n.s. = not significant
Source: Authors' own work

Table 3. SEM results

Path	Estimate	*p*-value	Conclusion
Hypotheses			
Scarcity → violation of quality maxim	0.040	0.535	Not supported
Scarcity → violation of quantity maxim	0.223	<0.001	Supported
Scarcity → violation of relevance maxim	0.191	0.003	Supported
Scarcity → violation of clarity maxim	0.098	0.120	Not supported
Sneaking → violation of quality maxim	0.194	0.002	Supported
Sneaking → violation of quantity maxim	0.238	<0.001	Supported
Sneaking → violation of relevance maxim	0.247	<0.001	Supported
Sneaking → violation of clarity maxim	0.245	<0.001	Supported
Scarcity × sneaking → violation of quality maxim	0.139	0.027	Supported
Scarcity × sneaking → violation of quantity maxim	0.322	<0.001	Supported
Scarcity × sneaking → violation of relevance maxim	0.316	<0.001	Supported
Scarcity × sneaking → violation of clarity maxim	0.211	<0.001	Supported
Violation of quality maxim → PCM	0.216	0.032	Supported
Violation of quantity maxim → PCM	0.326	0.025	Supported
Violation of relevance maxim → PCM	0.234	0.107	Not supported
Violation of clarity maxim → PCM	0.110	0.275	Not supported
PCM → attitude toward the website	−0.863	<0.001	Supported
PCM → purchase intention	−0.638	<0.001	Supported
Attitude toward the website → loyalty intentions	0.624	<0.001	Supported
Purchase intention → loyalty intentions	0.286	<0.001	Supported
Control variables			
Familiarity with online shopping → PCM	−0.024	0.621	-
Familiarity with online shopping → attitude toward the website	−0.041	0.361	-
Familiarity with online shopping → purchase intention	−0.045	0.356	-
Familiarity with online shopping → loyalty intentions	0.069	0.051	-

Note(s): $\chi^2 = 2{,}231.979$; df = 951; $\chi^2/df = 2{,}347$; CFI = 0.924; and RMSEA = 0.06
Source(s): Authors' own work

Table 4. SEM results of moderation

Path	Estimate	*p*-value
Hypotheses		
Scarcity → violation of quality maxim	0.040	0.536
Scarcity → violation of quantity maxim	0.425	<0.001
Scarcity → violation of relevance maxim	0.369	0.002
Scarcity → violation of clarity maxim	0.098	0.120
Sneaking → violation of quality maxim	0.193	<0.001
Sneaking → violation of quantity maxim	0.238	<0.001
Sneaking → violation of relevance maxim	0.246	<0.001
Sneaking → violation of clarity maxim	0.245	<0.001
Scarcity × sneaking → violation of quality maxim	0.139	0.027
Scarcity × sneaking → violation of quantity maxim	0.315	<0.001
Scarcity × sneaking → violation of relevance maxim	0.307	<0.001
Scarcity × sneaking → violation of clarity maxim	0.211	<0.001
Violation of quality maxim → PCM	0.210	0.036
Violation of quantity maxim → PCM	0.336	0.020
Violation of relevance maxim → PCM	0.232	0.110
Violation of clarity maxim → PCM	0.109	0.281
PCM → attitude toward the website	−0.861	<0.001
PCM → purchase intention	−0.634	<0.001
Attitude toward the website → loyalty intentions	0.628	<0.001
Purchase intention → loyalty intentions	0.283	<0.001
Moderator familiarity with online-shopping (FWO)		
FWO × scarcity → violation of quantity maxim	−0.211	0.036
FWO × scarcity → violation of relevance maxim	−0.186	0.110

Note(s): χ^2 = 2,282.96; df = 993; χ^2/df = 2,299; CFI = 0.928; and RMSEA = 0.059
Source(s): Authors' own work

Table 5. Means per group and ANOVA results

Dependent variable	Control	Scarcity	Mean Sneaking	Scarcity × sneaking	ANOVA *p*-value
Violation of quality maxim	2.88	3.00	3.52	3.30	< 0.01
Violation of quantity maxim	2.42	3.05	3.16	3.42	< 0.01
Violation of relevance maxim	2.43	2.94	3.14	3.31	< 0.01
Violation of clarity maxim	2.55	2.86	3.33	3.23	< 0.01
Perceived customer manipulation	2.41	3.15	3.11	3.49	< 0.01
Attitude toward the website	4.84	4.46	3.60	3.62	< 0.01
Purchase intention	4.46	4.19	2.39	2.39	< 0.01
Loyalty intentions	3.74	3.56	2.48	2.58	< 0.01

Source(s): Authors' own work

In general, we were able to empirically validate information manipulation theory and to predict consequences of the use of dark patterns. Thus, we find evidence that information manipulation theory is suitable to explain consumer reactions to the application of dark patterns. The theory's external validity is demonstrated through our demonstration that, in addition to the context of interpersonal communication, information manipulation theory is

able to explain variance in customer behavior in online retailing settings. However, the use of the dark pattern scarcity is not perceived as a violation of the quality and clarity maxims of information manipulation theory. This might be explained by a habituation effect, which indicates that this theory should be further developed into a dynamic process theory. This assumption is further supported by the found moderation effect, which shows that high familiarity with online shopping buffers the effect of highly prevalent dark patterns (i.e. scarcity) on the perceived violation of specific communication maxims. We show that dark patterns influence customer behavior because their application results in the violation of communication maxims that are crucial for the customer's perception of not being manipulated. Thus, this research explains *why* dark patterns influence customer behavior. Based on the results, marketing managers aiming to avoid negative outcomes of dark pattern usage should seek to minimize the negative impact of these patterns through violation of the four communication maxims (i.e. quantity, quality, clarity and relevance).

Theoretical implications

Our study makes three theoretical contributions. First, we show that information manipulation theory is able to explain the consequences of the application of dark patterns on customer behavior. In particular, by considering the attributes of dark patterns defined by Mathur *et al.* (2019), relevant theoretical and practical implications can be derived with the help of information manipulation theory. This theory enables researchers to differentiate the consequences of various dark patterns in relation to violation of the four communication maxims. The results of our data analysis suggest that covert dark patterns have lower negative consequences compared to non-covert dark patterns. Thus, the introduction of information manipulation theory extends existing research on dark patterns (Mathur *et al.*, 2019; Voigt *et al.*, 2021) by grounding dark patterns in a broader theory of manipulative communication (i.e. information manipulation theory). This enables a more differentiated evaluation of dark patterns. Thus, we show that information manipulation theory can be applied to organizational communication in digital retail contexts. This increases the theory's external validity and scope and opens opportunities for theorization in contexts other than interpersonal communication.

Second, by empirically testing information manipulation theory in the context of dark patterns, we advance knowledge on the consequences of dark patterns and add to existing literature by empirically testing mechanisms underlying consequences of dark patterns. In this regard, we find evidence that the consequences of using dark patterns may depend, on the one hand, on the aggressiveness of the dark patterns (Luguri and Strahilevitz, 2021) and, on the other, on the prevalence or prominence of the dark patterns, which could result in the aforementioned habituation effect. Thus, habituation and aggressiveness might be useful additional constructs for theorizing on dark patterns in marketing research building on information manipulation theory (McCornack, 1992).

Third, the results of this paper contribute to both theory development and improving the theoretical understanding of dark patterns through the identification of a habituation effect, which represents an empirical basis for further developing information manipulation theory from a static structural theory to a dynamic process theory.

Overall, this paper contributes to a differentiated, theory-driven understanding of perceptions of dark patterns and corresponding consequences.

Managerial implications

Our study reveals how using dark patterns can violate the communication maxims introduced by Grice (1989) and the impact this has on relevant marketing constructs. Our

data show that applying sneak-into-basket (alone or in combination with scarcity) negatively impacts all four communication maxims. Interestingly, the use of scarcity only violates the quantity and relevance maxims. This suggests that participants perceive a scarcity claim as a violation of both the quantity and the relevance maxims. This perception arises, potentially, from the belief that messages regarding low stock and high demand provide excessive information. These findings indicate that such messages do not necessarily result in positive outcomes for the organization. However, Barton *et al.*'s (2022) meta-analysis reported primarily positive effects of scarcity claims from the organization's perspective. This discrepancy could be attributed to the limited information provided to participants in our scenario, who lacked details such as delivery time and product care instructions. Consequently, these claims might be perceived as irrelevant, leading to a perceived violation of the relevance maxim. Therefore, if retailers offer limited information, then any details provided should be highly relevant for the customers' decision-making processes, as it is vital to deliver clear information. In contrast, when presenting ample information, less pertinent details like scarcity claims can be included without violating the relevance maxim.

As mentioned above, the quantity maxim refers to the amount of information, which should be adequate for the aim of the communication. To avoid negative outcomes that result from the violation of this maxim, online retailers should communicate scarcity claims as clearly and as accessibly as possible. To avoid violating the relevance maxim, online retailers should seek to ensure that customers perceive the information presented as pertinent. To be able to evaluate what information is relevant to the customer, marketing managers should apply pretests to assess how customers perceive different user interface designs before full implementation. This will also allow marketing managers to refine the clarity of information and, thus, reduce possible violations of both the relevance and clarity communication maxims.

Further, in contrast to our theorizing, scarcity does not violate the quality and clarity maxims. We surmise that this could be because of a "habituation effect": scarcity is highly prevalent as a tactic (Mathur *et al.*, 2019), so online shoppers could be more familiar with this dark pattern and, therefore, do not considering noteworthy. Likewise, the lower use of sneaking (Mathur *et al.*, 2019) could explain why it has a more negative effect on perceived violations of the communication maxims. Moreover, these two dark patterns differ in nature, which could also explain their different effects. As scarcity does not affect the clarity and quality of information, it can be assumed that people appreciate the information under certain circumstances and do not expect any disadvantage from it. This is different for sneaking, because adding a premium shipping charge to the customer's cart, for example, results in direct financial disadvantages. This "aggressiveness" (Luguri and Strahilevitz, 2021) is likely to trigger negative emotions. Therefore, online retail managers should especially evaluate the aggressiveness of dark patterns and their usage frequency when considering using such patterns. In addition, customers' experiences with dark patterns should be considered where data are available.

Moreover, the different effects of scarcity and sneaking on the violation of communication maxims of information manipulation theory might be explained drawing on the attributes introduced by Mathur and colleagues (2019). As argued above, in reality and by nature, scarcity is partially covert while sneaking is not. This implies that in the case of sneaking, customers directly realize the intention underlying the dark pattern's use, which could lead them to perceive violations of all four communication maxims. On the other hand, with scarcity, which is partially covert, customers realize there is, for example, a low-stock message, but in most cases, the intention behind this message is unclear or covert. Therefore, customers might consider the information as irrelevant or excessive, but not necessarily

unclear or of low quality. In the case of sneaking (which is not covert but is obvious), on the other hand, customers would more likely see the information as lacking in terms of quality, quantity, clarity and relevance simultaneously. Additionally, customers that are confronted with dark patterns that are not covert (e.g. sneaking) might be more likely to consider the transaction as unfair and as a threat to their autonomy. These considerations might additionally explain the negative effect of perceived customer manipulation on purchase intention and through purchase intention on loyalty intention. Therefore, online retail managers should carefully evaluate the covert nature of a dark pattern prior to its implementation.

Regarding information manipulation theory, our study reveals significant effects of violating the quality and quantity maxims on perceived customer manipulation, while violating the relevance and clarity maxims, respectively, is not significant. This indicates that especially the violation of quality and quantity exacerbate negative effects of dark patterns. Thus, ensuring quality and quantity of communication in particular seems to be well-received by consumers in the context of e-commerce and should emphasized by online retail managers. It is possible that the clarity maxim is more relevant in dark patterns that obscure information. Hence, it is imperative for online retail managers to prioritize delivering information that is of high quality in adequate quantity. Failing to do so may lead to perceived violations of the quality and quantity maxims, potentially resulting in perceived customer manipulation and, consequently, negative effects on purchase intention, attitude toward the website and, ultimately, loyalty intention.

Further, our study shows that perceived customer manipulation negatively influences attitudes toward the website and purchase intention, which in turn relate to loyalty intention. As expected, perceived customer manipulation drives negative effects on central marketing constructs. Therefore, overall, it is important for online retail managers to rethink whether manipulating (potential) customers is a good strategy, as long-term negative backlash seems likely to threaten the success of relationship marketing. With regard to such rethinking, a differentiated view is necessary. Not all dark patterns have equally negative or positive consequences, as customers might learn to navigate them and may get used to them. How this learning or habituation process takes place, and what determines it, remain open questions and require further research, but our findings indicate that consumers may indeed become used to dark patterns over time. In light of this, it is essential for online retail managers to carefully contemplate the prevalence of specific dark patterns before incorporating them. Considering our findings and the habituation effect, it is reasonable to posit that newly introduced or less familiar dark patterns may carry a heightened risk of provoking adverse reactions. However, at the same time, potential benefits regarding the effectiveness of manipulations might also be reduced if customers ignore familiar dark patterns. As such, caution should be exercised when implementing such design elements. Consequently, it is important for online retail managers to take a more differentiated view of the various dark patterns and potentially to further differentiate their use. It is possible that dark patterns that do not have any direct financial consequences for customers are associated with fewer negative effects, such that they can continue to be used. Furthermore, our study suggests that dark patterns with both high prevalence and covert characteristics tend to incur less potential backlash. Consequently, online retail managers may find it advantageous to prioritize the incorporation of frequently used and covert dark patterns. This strategic approach aims to capitalize on the positive effects while concurrently mitigating the likelihood of negative consequences. However, if a trust-based, long-term customer relationship is the goal, then the use of dark patterns should be implemented with care. To achieve this, marketing managers should focus on delivering value to their customers and

understanding their needs, instead of trying to undermine their decision-making processes. Following, market research and pretesting of different user interface designs should be conducted on a regular basis.

Limitations and future directions

Our study is subject to several limitations that offer opportunities for future research. First, we only focused on two dark patterns. Future research should examine more aggressive dark patterns (Luguri and Strahilevitz, 2021), particularly those that do not have a direct financial impact (e.g. forced action; Mathur *et al.*, 2019), to explain concretely which mechanism is responsible for the different effects. Further, we explained some effects regarding scarcity with the consideration that information on product availability might be informative to customers. Thus, further research should seek to identify dark patterns that are useful to customers (bright patterns; Sandhaus, 2023) versus those that are merely threatening (dark patterns). In addition, studies should include stable factors such as involvement (Gordon *et al.*, 1998) or need for autonomy (Wertenbroch *et al.*, 2020) to holistically understand perceptions and consequences of dark patterns. We found a moderating effect of familiarity with online shopping for the dark pattern scarcity; future research should investigate this effect regarding different dark patterns.

Second, we relied on cross-sectional data; to differentiate between short-, mid- and long-term effects of the use of dark patterns, future research could conduct longitudinal studies. This would be particularly interesting in terms of possible habituation effects. In this vein, future studies should incorporate findings and relevant constructs from habituation research when considering dark patters. For example, habituation research shows that habituation depends on cognitive capacity (Huang *et al.*, 2024), which should be analyzed in the context of dark patterns as well. Studies could also focus on the type of product used in the scenario. For our study, we used a hoodie, which can be considered a hedonic product. To validate our results, we conducted an additional experiment. Compared to the first study, the only difference was that the scenarios involved a utilitarian product – a power bank – rather than a hoodie. While we were able to fully replicate the results of *H4* and *H5*, we found different results for *H1* and *H3*, which could be explained by the type of product used in the experiments, emphasizing the need for further research in this area. Thus, in replicating our study in different contexts, future research should explore the purchase context of more utilitarian products to identify differences depending on product type.

Third, we used survey data and a fictitious brand. Survey data in particular are always at risk of common method bias (Malhotra *et al.*, 2006) and self-generated validity (Feldman and Lynch, 1988). To address these shortcomings and to validate our results, experiments generating behavioral data (e.g. in a field experiment) should be conducted (as also suggested by Runge *et al.*, 2022).

Fourth, we relied on information manipulation theory (McCornack, 1992). As there are several other theories that might be able to explain the consequences of dark patterns, future research might use different approaches, such as the persuasion knowledge model (Friestad and Wright, 1994), to compare both theories.

Finally, based on our findings, future research should analyze the impact of different interventions on the consequences of using dark patterns. Zac *et al.* (2025) showed that when steps are added between the use of dark patterns and the purchase decision, dark pattern effectiveness decreases. Thus, future research should analyze the effectiveness of different interventions to slow down the decision-making process, for instance, by applying so called "remorators" (Kenning, 2011) into the consumers decision making process.

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Data availability
The data that support the findings of this study are available on request from the corresponding author.

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Further reading

Petrescu, M., Mingione, M., Gironda, J. and Brotspies, H. (2019), "Ad scepticism and retouch-free disclaimers: are they worth it?", *Journal of Marketing Communications*, Vol. 25 No. 7, pp. 1-25. doi, doi: 10.1080/13527266.2018.1437552.

Appendix

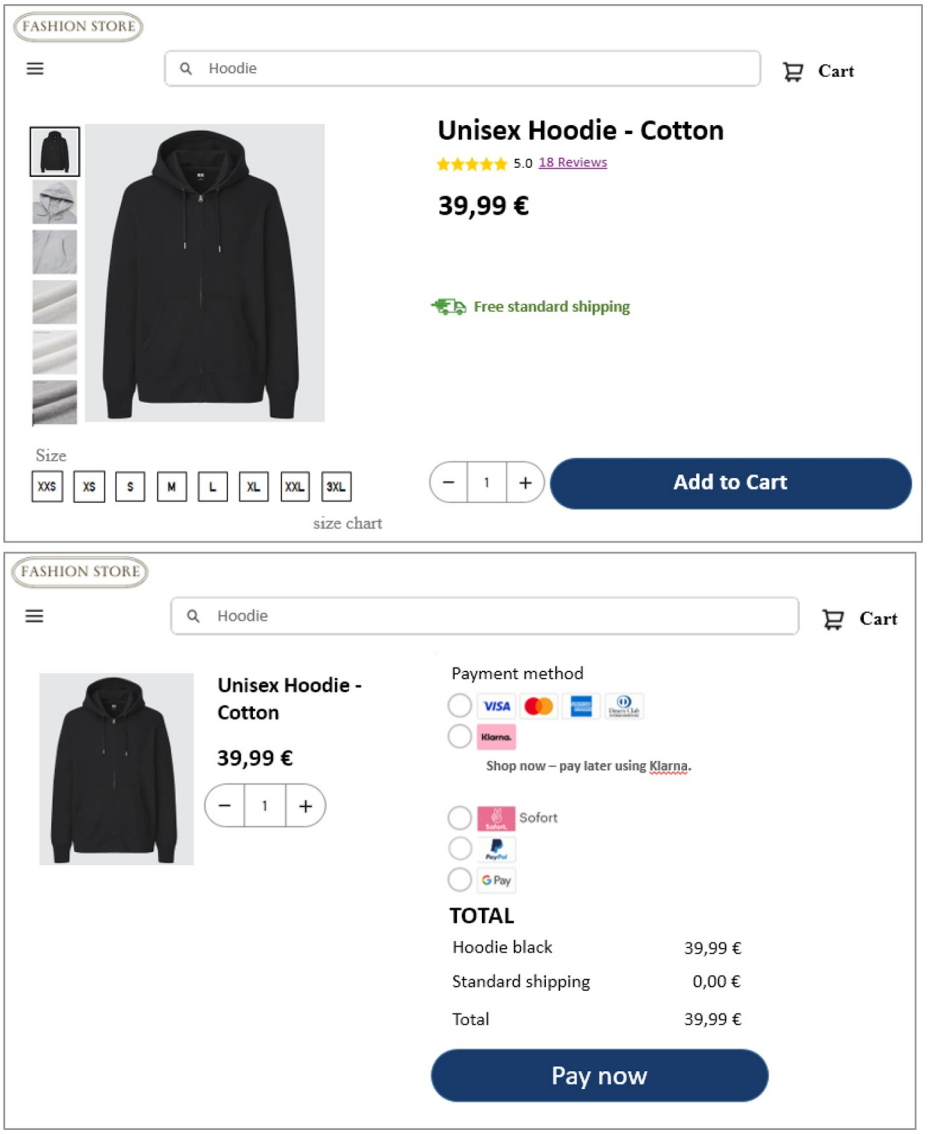

Figure A1. Control condition (no dark pattern)
Source: Authors' own work

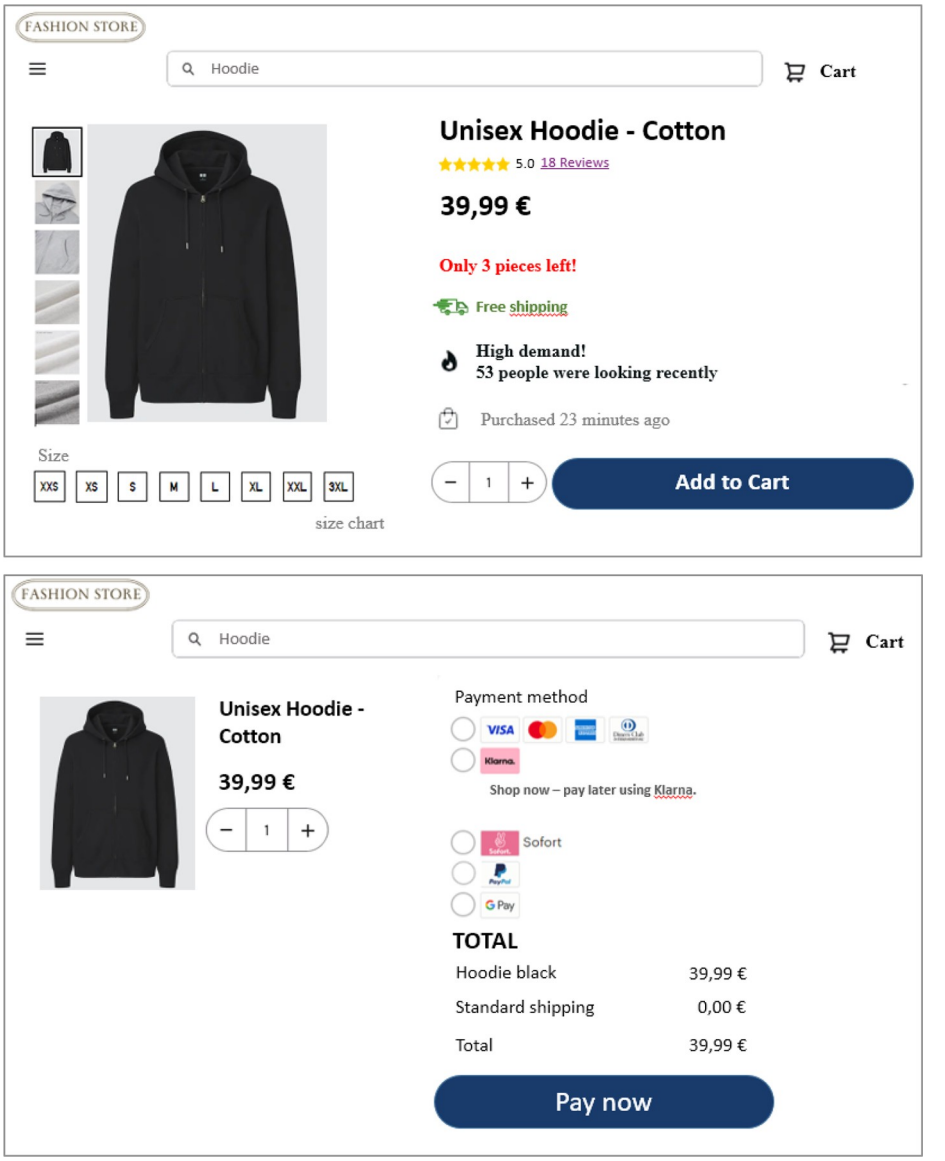

Figure A2. Scarcity condition
Source: Authors' own work

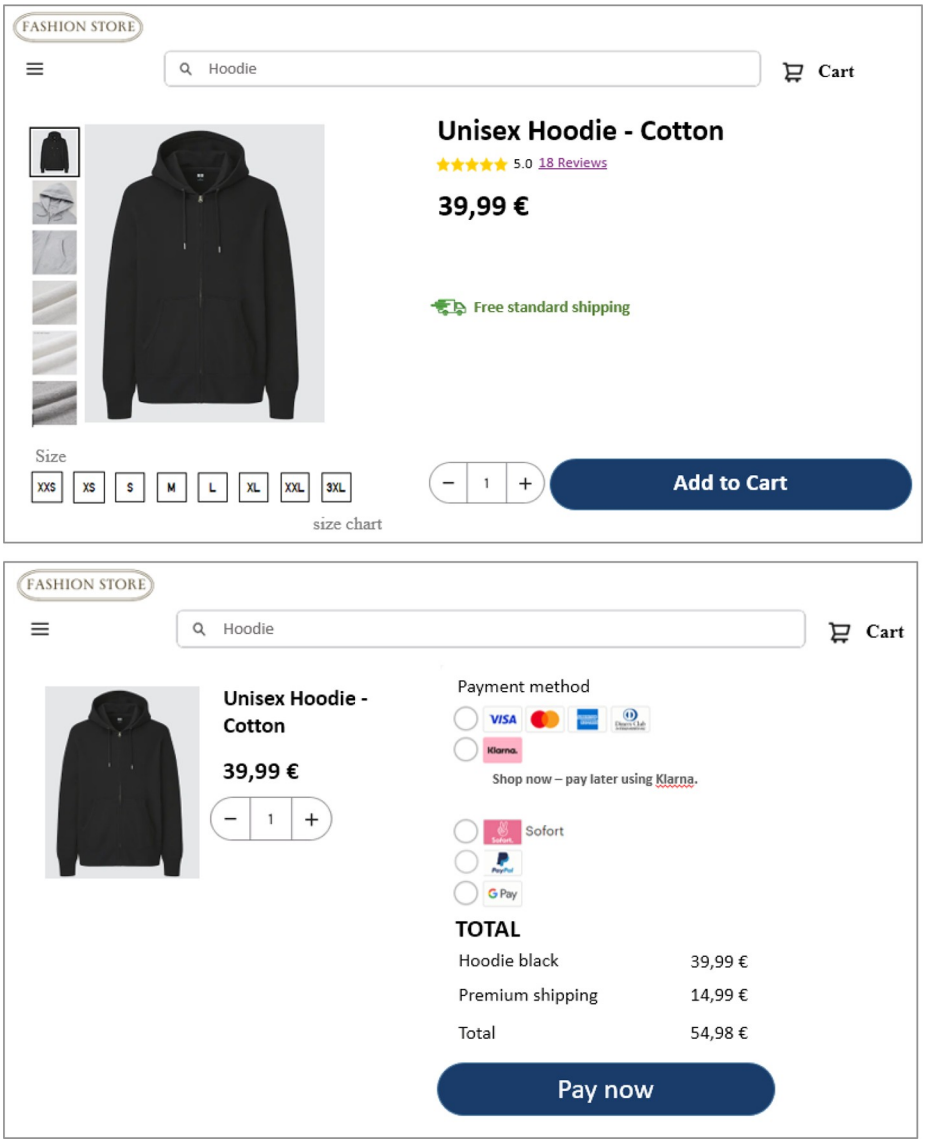

Figure A3. Sneaking condition
Source: Authors' own work

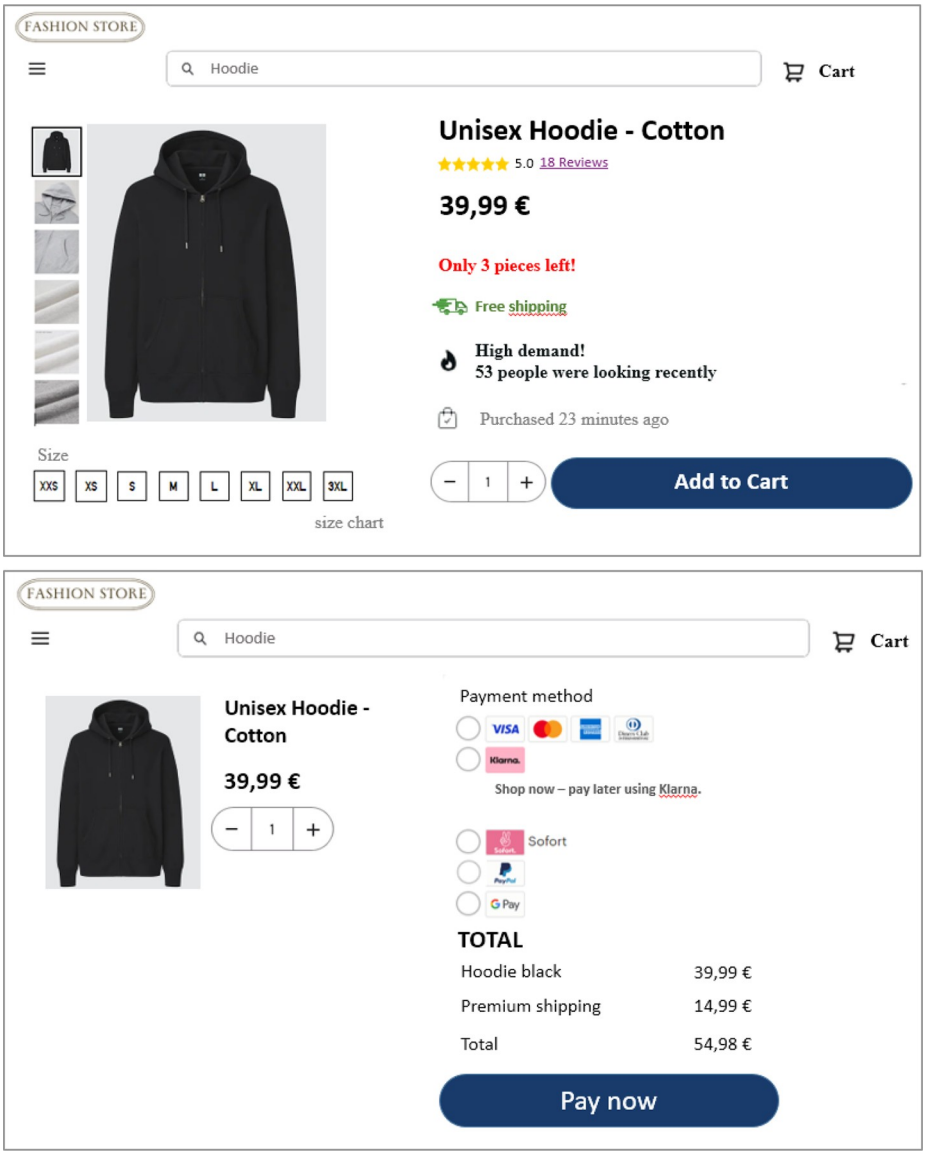

Figure A4. Scarcity and sneaking condition
Source: Authors' own work

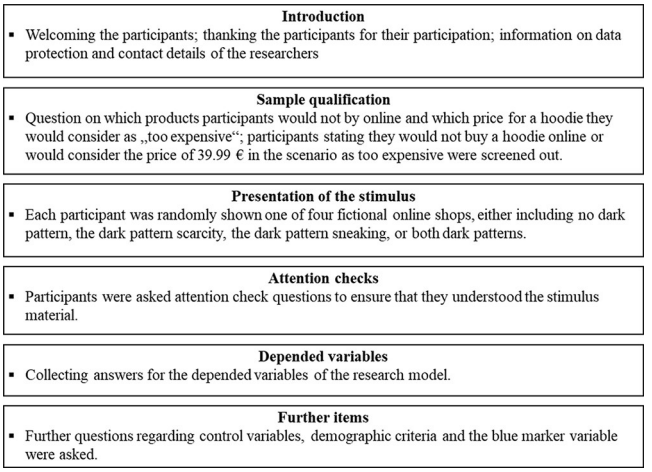

Figure A5. Data collection process
Source: Authors' own work

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