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Scarcity and Social Proof Dark Patterns in Online Travel Accommodation Booking: the Interplay between Perceived Arousal, Meta-motivational States and Urge to Buy Impulsively

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Abstract

Purpose – This paper aims to examine the main effects and interaction effects of scarcity and social proof dark patterns on perceived arousal and urge to buy impulsively in the context of online travel booking. Second, this study assesses the impact of telic/ paratelic meta-motivational state as moderators of perceived arousal and urge to buy impulsively.

Design/methodology/approach – A 2 (scarcity) x 2 (social proof) x 2 (meta-motivational state) mixed design using scenario-based experiment was employed to collect data from 20 participants. One-way repeated measures ANOVA was used to analyze the main and interaction effects of scarcity and social proof dark patterns on perceived arousal. Furthermore, linear mixed effects modelling was used to analyze the direct effects of perceived arousal on urge to buy impulsively and the moderating effects of telic/ paratelic meta-motivational states on this relationship.

Findings – The result indicates that there is a significant interaction effect between scarcity and social proof dark patterns on perceived arousal. In addition, we also found a positive correlation between perceived arousal and urge to buy impulsively. These findings support the S-O-R framework in understanding how external stimuli influences an individual's behavioral response, driven by emotional organism. Telic/paratelic meta-motivational states did not moderate the relationship between perceived arousal and urge to buy impulsively.

Practical implications – The findings highlight the potential for online travel booking platform operators to employ scarcity and social proof claims in fostering impulse buying behavior. Regardless of an individual's impulsive buying tendency or meta-motivational states/shopping motivations, the use of dynamic website elements such as a countdown timer, limited quantity claim, and activity message can heighten arousal level, driving urges to buy impulsively that strongly correlate with actual impulse purchases. However, these persuasive claims must be grounded in factual data to avoid being classified as dark patterns, which hold legal implications in regions like the EU. From a UX practitioner perspective, this study shed lights on the effects of leveraging psychological biases in designing digital interfaces and emphasized the importance of advocating for

ethical design and end user's well-being.

Originality/value – Drawing from the competitive arousal theory, this study examined the less-explored main and interaction effects of scarcity and social proof claims, often manifested as dark patterns, on perceived arousal and their subsequent influences on urge to buy impulsively. Through a scenario-based experiment employing dynamic web stimuli, we found positive correlations between the interaction effects of those claims/dark patterns on perceived arousal and their subsequent influences on urge to buy impulsively, thereby advancing the well-established S-O-R framework for understanding online impulse buying phenomenon. Second, the study examined the role of telic (task-oriented) and paratelic (recreational-oriented) meta-motivational state within the reversal theory. Contrary to expectations, we assert that these meta-motivational states do not moderate the effect of perceived arousal on urge to buy impulsively.

Keywords Scarcity claims; Social proof claims; Dark pattern; Perceived Arousal; Urge to buy impulsively; Telic/ paratelic meta-motivational states; Online travel booking; Competitive arousal theory; S-O-R framework; Reversal theory.

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List of abbreviations

UX: User experience

HCI: Human-computer interaction

S-O-R: Stimulus-Organism-Response

IS: Information system

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1. Introduction

In the age of digital transformation, all travel and tourism services from flights to accommodations to activities can be booked online conveniently, effectively and ahead of time. A survey study about online travel booking among US adults in 2022 revealed that people generally prefer to book their travels on the internet (72 percent) versus via travel agencies (12 percent) (Armstrong, 2023). With such preference towards online transactions, the online travel industry has generated approximately 475 billion US dollars in 2022 and is projected to surpass over one trillion U.S. dollars by 2030 (Statista, 2023). Customers can compare prices and offers from different retailers while businesses can reach a wider audience on a much larger scale than ever. The low barrier yet lucrative digital landscape has intensified the level of competition in the industry (Le, 2023), prompting businesses to adopt digital marketing strategies aimed at driving consumer purchase. Given the inherent limited availability of travel products and services, such as flights or hotel rooms (i.e., a restricted number of seats or rooms for specific dates or date ranges), online travel booking platforms leverage the consumer's awareness of scarcity and time-sensitive nature of these intangible offerings (Chung, Song, Koo, 2015; Gu & Wu, 2019). Employing techniques like *scarcity* and *social proof* claims, they aim to instill a sense of urgency, urging consumers towards purchase behavior (Teubner & Graul, 2020).

Imagine you are browsing through an online travel booking platform to look for your next vacation accommodation. You encounter familiar prompts like: 'Only 2 rooms left at this price,' '15 minutes left to claim this room deal,' or 'Sarah from Houston just purchased this room deal.' These persuasive claims may rely on artificial data and have been a controversial and a much-disputed subject within the HCI field. They are known as 'dark patterns' - digital interface nudges that are designed to mislead or pressure users into taking actions that they did not intend to, often against their best interest (Gray et al., 2018, Mathur et al., 2019). Dark patterns exploit cognitive biases and heuristics to deprive users of sufficient time and opportunity to make an informed choice, often resulting in

immediate decision such as impulse buying (Moser, Schoenebeck, Resnick, 2019; Mathur et al., 2019).

Online impulse buying is a phenomenon where an individual makes a sudden, unplanned purchase after being exposed to online stimuli and experiencing sudden urge to consume a product/service on the spot (Rook, 1987; Parboteeah, Valacich, Wells, 2009). It has been reported that 'over 60 percent of U.S travelers would consider an impulse trip based on a good hotel or flight deal.' (Jaclyn, 2017). Coupled with financial tools such as 'buy now pay later' types of schemes, credit card recording, and convenience features (i.e., 1-click shops, free cancellation policy), the digital landscape instills a 'have it all now mindset' and can easily induce consumers into the trap of impulse buying. A recent survey done by Credit Karma has reported that about half of millennials (51%) and almost half of gen-x (49%) in the US had gone into debt for summer travel, with 56% expressing they would go into debt again (Ward, 2019). With the increasing use of manipulative features, inducing impulse purchase online has never been easier. In sum, impulse purchase appears to be a lucrative revenue stream for businesses operating in the online travel industry.

Investigating the prevalent emergence of dark patterns is a continuing concern within the HCI community and the governments, as illustrated by the recent 2022 sweep on dark patterns coordinated by the European Commission. The sweep screened out 148 out of 399 online shops in various industries, including travel and tourism, were involved in using at least one dark patterns practice (European Commission, 2023). Among those figures, 42 websites were found to use scarcity claims dark patterns such as "fake countdown timers with deadlines to purchase specific products" to manipulate consumers decision making and behavior (European Commission, 2023). A similar incident occurred with Fareportal, an online travel agency based in New York, which settled for a $2.6 million imposed by the State of New York (James, 2022). The online travel agency was charged for employing numerous dark patterns, including as false stock message, countdown timer and activity message, to pressure consumers into purchasing flights and hotels (see Appendix A) (James, 2022).

The research to date has mostly focused on scarcity and social proof claims as legitimate attempts at persuasion rather than illegitimate manipulation techniques. The existing literature has consistently reported their effectiveness on positively influencing consumer behaviors, including booking intentions in the travel and tourism sector (Park et al., 2017; Huang et al., 2020; Teubner & Graul, 2020) and impulse purchases in the ecommerce sector (Jeong & Kwon, 2012; Zheng et al., 2013; Wu et al., 2021). However, the emerging literature in the HCI community offers contradictory findings about the effectiveness of scarcity and social proof claims as manipulative tools. In the context of ecommerce, one study indicated that these types of dark patterns successfully increased purchase impulsivity (Sin et al., 2022). Yet, another study in similar context provided contrasting evidence of the effectiveness of countdown timer as scarcity based dark pattern while revealing significant results on the use of testimonial as social proof based dark pattern (Lugiri & Strahilevitz, 2021).

Moreover, an independent research study in the UK also shed light on consumers' perception towards these dark patters, with only one third (16 percent) believing in the claims (Shaw, 2019). In addition to these research findings, there has been a growing awareness and interest in publicly exposing companies that employ dark pattern practices online. Websites like https://www.deceptive.design aggregate instances of dark patterns reported by regular consumers, identify and criticize companies under the 'Hall of shame', and compile legal cases and academic research (Brignull, Leiser, Santos, Doshi, 2023). Additionally, the subreddit r/darkpattern is a thriving community with over 10k users actively discussing and identifying these practices (Reddit, 2023).

With the growing diverging perspectives between consumers, researchers and businesses on the use of scarcity and social proof claims, it becomes critical to re-evaluate the prevalence of these practices and their impacts on consumer behavior within the context of online travel booking. In this context, this paper focuses on examining (i) the main effects of scarcity and social proof dark patterns in inducing perceived arousal, (ii) the interaction effects of these dark patterns (i.e., scarcity and social proof) on perceived arousal, and (iii) the effect of perceived arousal on urge to buy impulsively, influenced by those dark patterns. Through the S-O-R (stimulus – organism – response)

framework (Mehrabian and Russell, 1974), the dark patterns will be explored as the stimuli, perceived arousal as the organism and urge to buy impulsively as the response. Previous empirical research and meta-analysis (Iyer & Xiao, 2020) have analyzed the influence of digital interface stimuli, including architectural quality of websites and promotion campaigns (Chen & Yao, 2018); interactivity and vividness (Shen & Khalifa, 2012); and review quality, source credibility and observational learning (Xu, Zhang, Zhao, 2020) on online impulse purchase related behavior through emotional response variables, using the S-O-R framework. In fact, one study has found that scarcity claims like countdown timer and limited quantity messages led to an increase in perceived arousal in consumers which in turn led to impulsive purchase decisions (Wu et al., 2021). However, there appears to be a lack of research on the combination effect of both scarcity and social proof claims using the S-O-R framework in the context of online travel booking.

In addition, this study aims to explore whether an individual's meta-motivational state, or in short shopping state, affects the intensity of their emotional response, which, in turn, affects their urge to buy impulsively. According to the reversal theory (Apter, 1989), individuals have an arousal preference system. Under a *telic* state, associated with utilitarian motives, individuals prefer to be in low arousal situations (Apter, 1989). In contrast, individuals under a *paratelic* state, associated with hedonic motives, seek high arousal situations (Apter, 1989). Previous studies have provided significant evidence regarding the relationship between online emotion-eliciting stimuli, emotional responses (pleasure and arousal) as mediator, meta-motivational states as moderators and consumer behavior as the outcome. This includes aspects such as approach/avoidant behavior and shopping intention (Kaltcheva & Weitz, 2006; Deng & Poole, 2010). So far, however, there has been little discussion about the interplay between scarcity and social proof dark patterns, emotional response, urge to buy impulsively and meta motivational states.

With these research goals in mind, this study will address the following research questions:

- RQ1: What are the unique and combined impacts of scarcity and social proof dark patterns on an individual's urge to buy impulsively, through the emotional response mechanism, in the context of online travel booking?
- RQ2: What are the impacts of meta-motivational states as moderators in the relationship between emotional response and urge to buy impulsively, influenced by scarcity and social proof claims, in the context of online travel booking?

The following sections of this paper are as follows. The paper begins with a literature review outlining the theoretical dimensions of the research, drawing from environmental psychology, behavioral economics, and cognitive biases. This is followed by the development of hypotheses and a research model based on the S-O-R framework (Mehrabian and Russel, 1974), competitive arousal theory (Ku, Malhotra, Murnighan, 2005), reversal theory (Apter, 1989), and the notion of dark patterns in IS literature (Mathur et al., 2019). We propose a theoretical model that posits scarcity and social proof dark patterns as the digital interface stimuli that trigger arousal as the emotional organism, leading to an increased urge to buy impulsively as the response. In addition, by incorporating reversal theory, we examine whether the shopping motivational states would affect the relationship between arousal and urge to buy impulsively. Next, the paper presents the research methodology, in which we describe the experimental procedure, sampling and measurement. Data analyses and results will follow. To conclude, we will discuss the findings, their theoretical and managerial contributions, address limitations and suggest directions for future research.

2. Literature Review

2.1 Impulse buying and its manifestation in online environments

Impulse buying has been a focal topic in the field of consumer behavior research since 1950 (Clover, 1950). Early work conceptualised impulse buying as any purchases made by shoppers without advanced planning. Over the years, our understanding of the impulse buying phenomenon has evolved. Hawkins Stern (1962) contributed to this evolution by categorising impulse buying it into 4 types: "a pure impulse buying" is a novel purchase,

stemming from emotional appeal, that breaks a normal buying pattern; a “reminder impulse buying” occurs when individuals are suddenly reminded of the need for the product as they ran out of them or have low stock at home; a “suggestion impulse buying” is sparked when individuals visualise the need for a product, either from an entire rational or emotional appeal, without prior knowledge about its impulse; a “planned impulse buying” which might sound contradictory but occurs when individuals carry an expectation and intention to make unspecific purchases depending on the available promotions. Across these four types, the defining characteristic is the unplanned nature of the purchase. His work helped make the distinction between a true impulse buying behavior among the potential deviations in addition to highlighting factors like the economic status, personality, time, location and cultural factors that play a part in inducing impulse buying behavior.

Another school of thoughts on impulse buying behavior that shares similarities to the “pure impulse purchase” by Stern (1962) was developed by Dennis W. Rook (1987). Rook (1987, p.191) offered an even more nuanced understanding of impulse buying, proposing that it happens: “*When a consumer experiences a sudden, often powerful and persistent urge to buy something immediately. The impulse to buy is hedonically complex and may stimulate emotional conflict. Also, impulse buying is prone to occur with diminished regard for its consequences*.” Thus, both Rook and Stern shared the same emphasis on the unplanned nature and emotional appeal of impulse buying behavior. Overall, this body of work suggests that impulse buying is a multi-faceted phenomenon consisting of many layers: (1) it is often forceful and urgent, (2) it is a fast experience, often involving grabbing a product than choosing one, (3) it is more spontaneous than cautious, (4) it disrupts the consumer’s behavior stream, (5) it is more emotional than rational, (6) it is more likely to be perceived as “bad” than “good”, and (7) it induces consumers to feel out of control (Rook, 1987). With the advent of Internet, online shopping has introduced an array of digital stimuli that encourage impulse buying behavior (Moser et al., 2019). In response to this shift, Madhavaram & Laverie (2004) proposed a new perspective on online impulse buying, stating that “*Impulse buying is a result of a purchaser’s immediate reaction to external stimuli that is often hedonically charged. An impulse buying episode signifies a change in purchaser’s intention to purchase that particular product before and after*

exposure to stimuli. The stimuli are not limited to just the product and change in purchaser's intention does not include a reminder item that is simply out of stock at home." Importantly, this definition broadens the scope of the stimuli to also include information and interactive elements that are present on the digital interface with which individuals interact.

Prior research has shown that website stimuli such as visually appealing website design (Parboteeah et al., 2009), rich product assortments, and user-friendly website navigation (Liu, Li, Hu 2013), encourage impulse buying behaviour and are also integral parts to user experience. A following study (Wells, Parboteeah, Valacich, 2011) found that environmental stimuli (quality of websites) had a greater impact on impulse buying behaviour for consumers with a predisposed tendency for impulsivity. In addition, a study conducted on website stimuli that encouraged impulse buying (Moser et al., 2019) identified 64 impulse buying features on ecommerce sites, notably as interactivity (360-degree spin view, zoom in/out); number of ratings/reviews; product quick view button; quick add-to-cart button; multiple product pictures; limited-time discount; low stock warning.

It is worth noting that most of the impulse buying features examined in these studies were not classify as dark patterns since they were not considered as manipulating user-decision making solely for benefits the retailers. However, our study focuses on the potential manipulation of specific stimuli, particularly quantity-based scarcity claims (i.e., low stock warning) and time-based scarcity claims (i.e., countdown timer for a deal). These practices, as indicated by many HCI academic research and authoritative investigations, can be artificially manipulated to mislead and stimulate consumers into impulse buying.

2.2 The Stimulus-Organism-Response framework

Given the emphasis on the influence of stimuli on an individual's internal state and subsequent behavioral response, the S-O-R (Stimuli – Organism – Response) framework has become the widely adopted theoretical model in the study of the impulse buying phenomenon. Mehrabian and Russel (1974) proposed that environmental stimuli trigger emotional response, which then induces behaviors in individuals. A recent systematic

literature review by Redine, Deshpande, Jebarajakirthy, Surachartkumtonkun (2022) identified 28 qualified studies conducted from 2003 to 2022 that had adopted the S-O-R framework as their primary theoretical foundation. Another literature analysis by Chan, Cheung, & Lee (2017) used the S-O-R framework to classify external stimuli (e.g., website stimulus like persuasive claims or media format, marketing stimulus like discount and product type) and internal stimuli (e.g., impulse buying tendency, hedonic shopping motivation) as predecessors; cognitive reactions (e.g., normative evaluations, perceived control) and affective reactions (e.g., pleasure, arousal) as mediators; and urge to buy impulsively, purchase intention, and impulse buying as responses.

Online impulse buying research drawing from the S-O-R framework has examined various external stimuli. For instance, studies have examined scarcity claims like limited quantity and limited time in the context of e-commerce (Wu et al., 2021), parasocial interaction features like similarity, expertise, and likability in the context of social commerce (Xiang et al., 2016), and architectural website features such as ubiquity, ease of use, information exchange, as well as promotion campaign elements like discounted prices and scarcity in the mobile commerce context (Chen & Yao, 2018)

In the following subsections, we propose that scarcity and social proof dark patterns act as the external online impulse buying stimuli (S) triggering arousal as the online impulse buying organism (O). Simultaneously, telic and paratelic meta-motivational states serve as the internal stimuli (S), moderating the relationship between arousal and urge to buying impulsively, thus influencing the online buying impulse response (R).

2.2 Dark patterns: Scarcity and Social Proof Claims as External Stimuli

Scarcity claims

According to the researchers in the HCI community, scarcity claims often appear as written statements and/or visual icons such as (i) low stock message that indicates a limited quantity of deals; (ii) countdown timer indicating to users that a deal or discount will expire in limited time, to increase its desirability to users (Jeong & Kwon, 2012; Mathur et al, 2019). Scarcity claims leverage the scarcity bias which refers to the “tendency of individuals to place higher value on things that are scarce, of limited nature” (Mathur et

al., 2019). In their meta-analysis on scarcity effects, Lynn (1991) observed that scarcity claims often take the form of phrases such as “limited release," "only while supplies last," "limited time only," and "limit of one per customer". Commenting on the psychological effects of scarcity, Brock (1986) argued that “any commodity will be valued to the extent that it is unavailable”, signifies that the scarcer a product or a service is, the more likely it will be desired by the consumers. Similarly, in his book ‘Influence: Psychology of Persuasion’, Cialdini (2009) posited that scarcity claims are effective because they frame goods and services as more valuable when their availability is limited. The European Commission (2022) acknowledged the potential effects of scarcity claims, such as countdown timers, on “manipulating the consumer’s perceived need of the product”.

Social proof claims

Social proof claims typically manifest as written statements and/or visual icons that inform the user about the activity on the digital platforms (e.g., purchases, views, visits), leveraging the tendency of individuals to value something more because others seem to value it (Jeong & Kwon, 2012; Mathur et al., 2019). Cialdini (2009) defined social proof principle as “the tendency to see an action as more appropriate when others are doing it". In the same vein, economist Leibenstein (1950) referred to the effect of social proof claims as the “bandwagon effect”, in which demand for a product increase because others also consume the same product. Similar to scarcity claims, the European Commission (2022) acknowledged the potential effects of social proof claims on consumer behavior, stating that these practices shape behaviors by instilling a perception of high quality since others have already chosen the product.

The effects of scarcity and social proof claims

In the context of the online travel industry, the effects of scarcity and social proof claims on consumer behavior have been widely investigated. For instance, Jeong & Kwon (2012) found that social proof claims (e.g., “94% of consumers bought this product after viewing this site”) enhanced quality perception and thus purchase intention, but the effect was not observed for low stock scarcity stimuli (e.g., “only 3 items left”). In another study by Park

et al. (2017), the authors obtained evidence of the significant impact of social proof claims on booking intentions, suggesting that consumers tend to follow other's people choice, especially when the product is intangible much like travel products. On the other hand, Teubner & Graul (2020) found significant impact for both the low stock scarcity claims (e.g., "Only x rooms left on our site!") and activity social proof claims (e.g., "Booked x times in the last 24") for inducing a sense of urgency, scarcity and value, which led to an increase in booking intention across a sample of 250 participants.

Scarcity and social proof claims manifested as dark patterns

In terms of the nature of these practices, Cialdini (2009) went on to explain how scarcity claims and social proof claims can be fabricated, which aligns with the notion of dark patterns that HCI researchers propose (Mathur et al., 2019; European Commission, 2022; Competition and Markets Authority, 2022). In both cases, where scarcity claims are based on real data or entirely fabricated, the intention is to "convince customers of an item's scarcity and thereby increase its immediate value in their eyes" (Cialdini, 2009). Similarly, the Unfair Commission Practice Directive (UCPD), a part of the EU consumer law, emphasizes the fact that the presence of intention from the practitioners/designers of the scarcity claims are not necessary to qualify them as unfair commercial practices (European Commission, 2022). Mathur et al. (2019) conducted a large-scale study crawling over 11k ecommerce websites and found 183 websites employed dark pattern practices for over 1.8k instances. Among those, the authors discovered 632 instances of low stock message scarcity dark patterns in which 17 were deceptive across 17 websites (i.e., using plug-ins to generate random stock value in statements like "Only 'X' left"). In addition, they found 393 instances of countdown timer scarcity dark patterns in which 157 were deceptive across 140 websites (i.e., the timer restarted after the indicated limited timer). Other findings were 383 instances of activity message social proof dark patterns (i.e., using a random number generator to indicate the number of users who are "currently viewing" a product) in which 29 were deceptive across 20 websites.

Therefore, this study will examine scarcity and social proof claims as illegitimate manipulation practices. Leiser & Yang (2022) have refined the taxonomy of scarcity and

social proof dark patters, categorizing them under the broad category called “information asymmetry”. This concept denotes a power imbalance between vendors and consumers, due to vendors deploying “active misleading actions” that provide “false, confounding, deceiving, or exaggerated information actively to mislead consumers”. Adding to this understanding, the Competition and Markets Authority (CMA), a UK regulatory body, categorizes dark patterns such as scarcity and social proof claims as part of the “online choice architecture” (OCA). This concept encompasses the presentation, placement and choices of digital interface designs that exert influence and shape consumer’s decisions (Competition and Markets Authority, 2022).

For instance, a limited time discount can be designed with a false countdown clock, intensifies the sense of urgency, even when the offer remains available after the countdown. Similarly, websites could display misleading low stock warning to amplify the perception of scarcity. Moreover, the use of activity notification, such as showing the number, name of customers interested, watching, or buying a product, capitalize on the social proof principle, even when the data could be fabricated using third party add-ons (Mathur et al, 2019). All these scarcity and social proof dark patterns pressure consumers to rely on fast and automatic System 1 thinking and act more intuitively, bypassing more deliberate and thoughtful System 2 thinking process (Competition and Markets Authority, 2022; Kahneman, 2011).

3. Hypothesis Development

3.1 Arousal as emotional reaction Organism

The S-O-R framework and perceived arousal

In accordance with the S-O-R framework, any interaction between an individual and the online environment can evoke an emotional reaction, including pleasure, arousal and dominance (Mehrabian & Russel, 1974). However, when investigating impulse buying phenomenon, Verplanken & Herabadi (2001) proposed that pleasure and arousal are the main emotions that drive impulse buying behavior. Pleasure is an emotional state in which an individual experiences the feelings of happiness, contentment, and relaxation (Mehrabian & Russel, 1974). On the other hand, arousal is the state of feelings associated

with being stimulated, excited, and alert (Mehrabian & Russel, 1974). The authors also developed a semantic differential scale to measure emotions, which can be self-reported by study participants. Therefore, in this study, we will address arousal as perceived emotional reaction.

Perceived arousal and the Competitive Arousal Theory

Drawing from the phenomenon of “auction fever”, competitive arousal theory posits that numerous factors such as “*rivalry, time pressure, social facilitation, and the first-mover advantage can increase arousal and that arousal can impair calm, careful decision-making*" (Ku et al., 2005). In the context of this study, scarcity dark patterns like countdown timer restricting time and low stock restricting quantity instill a sense of rivalry and urgency, accompanied by social proof dark patterns like activity message that indicate popularity of the product/service that further fuel the sense of rivalry, leading to an arousal reactance when being exposed to such stimuli. Furthermore, the aspect of deliberate and careful decision-thinking being disrupted is very similar to the mechanism of impulse buying. As mentioned previously, impulse buying is characterized as fast and furious, without much consideration and is emotionally charged (Rook, 1987). Previous studies examining the effects of website stimuli like website order and complexity (Deng & Poole, 2010); digital format like text, image, video (Adelaar, 2003); scarcity cues like limited quantity and limited time (Wu et al., 2021); all found significant correlations with perceived arousal, and subsequent approach behavior (Deng & Poole, 2010) or urge to buy (Adelaar, 2003) or impulse purchase behavior (Wu et al., 2021). Therefore, we posit that:

- H1: The presence of scarcity claims leads to higher perceived arousal.
- H2: The presence of social proof claims leads to higher perceived arousal.
- H3: The presence of both scarcity claims, and social proof claims leads to higher perceived arousal.

3.2 Urge to buy impulsively as Response and impulse buying tendency as control variable

Urge to buy impulsively as proxy for impulse buying

As far as impulse buying is concerned, an important aspect of this behavior is the buying impulses or urge to buy impulsively that precedes the actual action. Beatty & Ferrell (1998) defined the urge to buy impulsively a "*a state of desire that is experienced upon encountering an object in the environment. It clearly precedes the actual impulse action. It is spontaneous and sudden. As more urges are experienced, the likelihood of engaging in an impulse purchase increase*". Rook and Fisher (1995) pointed out that not all urges to buy impulsively are acted upon, as there are various factors such as "consumer's economic position, time pressure, social visibility, and perhaps even the buying impulse itself" that could interfere with the process of being exposed to impulsive inducing stimuli and highly arousing state that would lead to actual impulse purchase. In addition, impulse buying behavior is also often regarded as worse than good (Rook, 1987). These uncontrollable factors make capturing actual impulse purchase tricky, especially in self-report survey where social desirability bias may exist or controlled experiments where individualities may prevent people from impulsively purchase the same product at the same time (Parboteeah et al., 2009). In a similar vein, Lo, Lin & Hsu (2016) identified promotional stimuli like scarcity and social proof claims as "Pre-purchase evaluation of alternatives", implying that consumers are unlikely to act on their buying impulse immediately and complete the transaction. Thus, this study will employ the urge to buy impulsively construct as a proxy for actual impulse buying response.

Perceived arousal and urge to buy impulsively

Previous studies have provided empirical evidence for the relationship between perceived arousal and urge to buy impulsively. For instance, Shen & Khalifa (2012) found that emotional states such as pleasure and arousal enhanced the buying impulse/urge to buy impulsively after exposure to system stimuli in a controlled experiment. Adelaar (2003) found that arousal was the only significant emotion predicting the relationship between

digital media formats and impulse buying intent/ urge to buy impulsively. Analyzing through the lens of competitive arousal theory, perceived arousal is posited to drive the effects of scarcity and social proof dark patterns on urge to buy impulsively. Therefore, we hypothesize that:

H4: Perceived arousal positively impacts urge to buy impulsively.

Impulse buying tendency as control variable

Impulse buying tendency is an individual's propensity to engage in spontaneous and sudden purchases without much reflection and is often emotionally driven (Rook and Fisher, 1995). Beatty & Ferrell (1998) found that impulsive individuals are prone to experience a more frequent and stronger urge to buy impulsively than their non-impulsive counterparts. Wells et al. (2011) examined the roles of impulse buying tendency, website quality and their interaction as stimuli affecting and resulting in online urge to buy impulsively. Their research also drew from previous works that found a positive relationship between consumer's impulse buying tendency and the intention to shop online by Zhang et al. (2006). Another literature analysis also indicated that impulse buying tendency was the most widely investigated independent variable to impulse buying behavior (Redine et al., 2022). Although, a few studies have found insignificant correlation between impulsive buying tendency and urge to buy impulsively (Chen & Yao, 2018) or actual impulse purchase (Wu et al., 2021), we still acknowledge its potential influence on urge to buy impulsively by treating it as a control variable. That way, we can delve more deeply into our focal variables of interest, such as scarcity and social proof dark patterns as our external stimuli, meta-motivational state as our internal stimuli and perceived arousal as our emotional organism construct.

3.3 Meta-motivational states as Internal Stimuli

Telic / Paratelic Meta-motivational states

Apter (1989) developed the reversal theory, positing that individuals can experience two contrasting states of mind, namely telic meta-motivational state and paratelic meta-

motivational state, when engaging in a situation or being exposed to a stimulus. In the telic meta-motivational state, individuals are typically more goal-oriented and more serious, concerned about the future rather than the present, viewing activities as a means to reach the goal. In contrast, in the paratelic meta-motivational state, individuals adopt a more activity-oriented and playful approach, focusing more on the presence, emphasizing the enjoyment deriding from the activities, with the goal taking a secondary role. Applied to the context of shopping, a telic meta-motivational state matches a utilitarian shopping motivation while a paratelic meta-motivational state is aligned with a more hedonic shopping motivation (Kaltcheva & Weitz, 2006). For example, consider someone engaging in online clothes shopping. In one scenario, this person might be looking for formal work attire, where the goal is to obtain appropriate clothing to wear at work, representing a serious, goal-oriented aspect of the telic meta-motivational state. In another situation, the shopper might explore online clothes shopping to discover trendy pieces; here the shopping activity itself would be likely to take precedence over a specific goal, representing the leisure recreational aspect of paratelic meta-motivational state.

Telic / Paratelic Meta-motivational states as moderators

Apter (1989) went onto stating that individuals in the telic state prefer low arousal environment that facilitate efficiency in reaching their goals. In contrast, those in the paratelic state gravitate towards high arousal environment where they seek stimulation and spontaneity. This aspect of the paratelic meta-motivational state aligns closely with the defining characteristics of impulse buying/ urge to buy impulsively behavior.

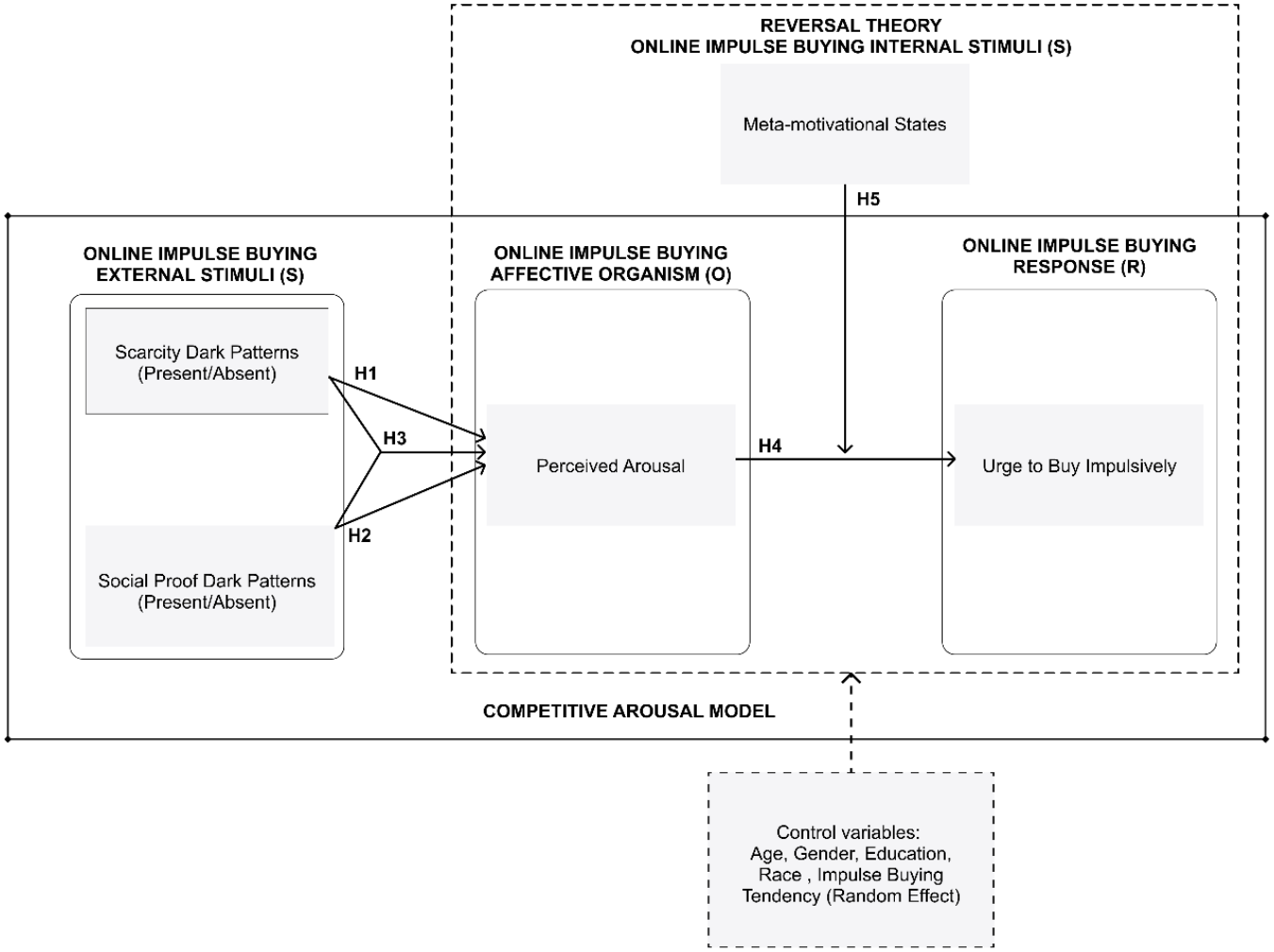
Chan et al. (2017) proposed, in their S-O-R framework, that internal stimuli like shopping motivation like hedonic/ utilitarian could also impact the chain of process in studying online impulse buying. Lo et al. (2016) identified motivational factors such as scarcity-based limited time and limited quantity providing high hedonic and utilitarian benefits, thus encouraging online impulse buying. Given the link between S-O-R framework and arousal with everything discussed so far regarding the reversal theory, by incorporating the telic/ paratelic meta-motivational states, we can introduce a layer of nuance in better understanding how individuals interact and react with arousal-inducing online stimuli like

scarcity and social proof dark patterns and the subsequent effects on urge to buy impulsively.

In previous studies, Deng & Poole (2010) found significant evidence for the effects of arousal-inducing website stimuli such as webpage order and webpage complexity on perceived arousal, and in turn, in telic condition, such arousal was perceived negatively, leading to avoidance tendency (i.e., leaving the website); whereas in paratelic condition, the arousal led to approach tendency (i.e., staying in the website and explore further). In the context of this study, we propose that the presence of stimuli like scarcity and social proof dark patterns in an online travel booking website would trigger higher level of felt/perceived arousal. The arousal preference for each meta-motivational state should moderate the relationship between perceived arousal and the ultimate behavioral response which is the urge to buy impulsively. Our hypotheses are as follows:

- H5: A web user's meta motivational states moderate the effect of arousal on the user's urge to buy impulsively.
- H5a: The level of arousal negatively influences the user's urge to buy impulsively when the user is in telic state.
- H5b: The level of arousal positively influences the user's urge to buy impulsively when the user is in paratelic state.

Figure 1: Theoretical research model



4. Research Method

4.1 Experimental Design and Procedure

In line with previous research assessing the effects of website stimuli on behavioral response (Parboteeah et al., 2009; Deng & Poole, 2010), we tested our research model using a scenario-based experiment, a common research method in studies on impulse buying (Redine et al., 2022).

The experiment employed a 2 (scarcity) x 2 (social proof) x 2 (meta-motivational state) mixed design, in which the between-subject factor was the meta-motivational state

(telic/paratelic state), and the within-subject factor was the scarcity and social proof dark patterns. This research design yielded a total of two between-subject treatments to which participants were randomly assigned.

Table 1: Experimental Design

Mixed experimental design with two factors (n=20)		**Factor #2: Dark patterns** Within-subject			
		Control group	Scarcity only	Social proof only	Both scarcity and social proof
Factor #1: Meta - motivational states Between-subject	Telic (task-focused)	10 participants			
	Paratelic (recreational focused)	10 participants			

4.2 Sample and background analyses

A total of 31 participants were recruited from the author's university research recruitment panel, of which 11 participated in the pilot study. This research was approved by the author's university research ethics committee (Certificate #2023-5327). The participants were compensated for CA$25 via Interac payment. 10 participants were randomly assigned to telic state treatment and the other 10 participants were assigned to the paratelic treatment. All 20 participants were exposed to all four dark patterns experimental stimuli.

The sample consisted of 11 females (55 percent) and 9 males (45 percent). Most of the subjects were between 21 and 39 years old (85 percent); 30 percent of the subjects have received a bachelor's degree (6) and 50 percent of the subjects have received a graduate degree (10).

4.3 Webpage Stimuli

The design of the experimental website sought to recreate an industry-standard accommodation booking website, modeled after the user interface and layout of Sonder.com (Appendix B). The no-code web application builder 'Bubble'[1] was used to design, develop, and launch the fully functional experimental website. The rationale behind this choice was to provide a familiar and credible online environment that would closely mimic real-world user experience, thereby enhancing the ecological validity of the study. All of the experimental versions of the website are presented in Appendix C.

The overall architecture of the website was intentionally kept minimal to focus the participants' attention on the elements most relevant to the study. Upon landing on the homepage, participants were presented with the search bar to input the travel details that were laid out in the instruction task sheet, which then led them to the next page that presented two accommodation choices for their preferred city. This design decision was made to avoid overwhelming the participants with too many options and to sidestep the "paralysis of choice" as the primary interest of this study was to examine the effects of dark patterns on the add-on services page.

Across all eight experimental conditions, the only elements that varied were the description paragraphs for each city and the photos of the accommodations. The core structure of the webpage remained constant, ensuring that any differences in user behavior could be attributed to the manipulated variables (i.e., the scarcity and social proof dark patterns).

Once the primary accommodation selection was made, participants were directed to a page featuring optional add-on services, such as buffet breakfasts, corner room upgrades, and airport shuttles. This page was the focal point of the study. The add-on services were presented with a 15% discount, a common marketing practice to entice customers into making additional purchases.

The scarcity and social proof dark patterns were strategically placed on this add-on services page to induce impulsive buying behaviors. The limited-quantity message, the

[1] https://bubble.io/

limited-time message and the social proof all appeared under the discounted price of each add-on service to maximize visibility and association with the 15% discount. The decision for the design and the placement of the scarcity and social proof dark patterns mimics that of ecommerce marketplace Amazon during their 'lightning deals' promotion (Helium 10, 2020) (Appendix D). Furthermore, both dark patterns were designed to appear only after participants had made their primary accommodation selections, which was their primary shopping goal, targeting impulsive buying specifically.

Pilot testing confirmed that the placement of the dark patterns and the 15-minute countdown timer were both effective and appropriate. The sample consisted of 7 female and 4 male participants, with the majority falling within in the age group of 21-29 (73 percent). Among that, 55 percent had obtained a high school degree or above and 45 percent had obtained a bachelor's degree or above. Feedback from the pilot participants was integrated to finalize the placement and the quantity of the message of these elements, balancing both visibility and subtlety to ensure that they would be noticed but not overly intrusive.

4.4 Meta-motivational State Manipulation

We crafted two hypothetical scenarios to capture the experimental nuances of both telic and paratelic motivational states (Appendix E). Each scenario portrays a fictional individual navigating an accommodation-booking website, Heritage Stay, for distinct purposes: either a business trip, representing the telic state, or a leisure trip, representing the paratelic state. In both narratives, the individual is tasked with booking accommodations in multiple cities, thereby incorporating various dark pattern manipulations into the experiment.

To ensure a robust experimental design, we implemented several measures for randomization and counterbalancing. The individual cities in the scenarios—Las Vegas, San Francisco, San Diego, and Los Angeles—served as different webpages that embodied the various dark pattern stimuli of the study. Participants, however, were not informed beforehand about which city represented which experimental condition.

The order in which these cities (and thus the corresponding dark pattern stimuli) appeared was randomized using a Balanced Latin Square counterbalancing approach, given the even number of conditions (four in total). For verification purposes, we utilized a Latin Square Generator (Masson, 2023), yielding the sequences ABDC, BCAD, CDBA, and DACB. In these sequences, 'A' represents Las Vegas (where both scarcity and social proof dark patterns were present), 'B' denotes San Francisco (social proof only), 'D' indicates San Diego (control group with no dark patterns), and 'C' signifies Los Angeles (scarcity only).

Randomization in participant assignment was further ensured by alternating the order of the Balanced Latin Square sequences among participants. For example, the first and second participants assigned to the “telic” condition experienced the ABDC sequence, while the third and fourth participants underwent the BCAD sequence. This procedure was repeated to maintain an even distribution of participants across both telic and paratelic states, as well as across the different sequences of city-based manipulations.

4.5 Experimental Procedure

Each participant was guided to a designated study room within the school’s facility to begin the experiment. Initially, the researcher was present to explain the consent form and outline the study procedure. After the briefing, the researcher left the room to minimize any potential social influence on the participant. To ensure a consistent experience, every participant used a laptop with a standardized screen size for website browsing and shopping tasks. In addition, an iPad was provided for viewing instructions and completing surveys.

Participants first viewed their study instructions on the iPad, which outlined a specific shopping scenario. These scenarios were either recreational-oriented (i.e., paratelic meta-motivational state) or task-oriented (i.e., telic meta-motivational state) inducing, such as booking accommodations for a leisure trip or for a business trip. The task sheet also specified browsing activities, like entering date ranges or reading descriptions, to ensure uniform actions across different conditions of the experiment.

Next, participants switched to the laptop to perform their designated shopping tasks on the website stimuli for a duration of 15 minutes. During this phase, they were exposed to one of the four experimental conditions: the presence of scarcity dark patterns, social proof dark patterns, both, or neither. These dark patterns were strategically displayed on the page featuring optional add-on services - such as buffet breakfast, corner room upgrades, or airport shuttle - only after participants had made their primary accommodation selections. This design choice aimed to specifically capture impulsive buying urges, as these additional services were not part of the participants' main shopping goal. After completing each task on the laptop, participants returned to the iPad to fill out an online questionnaire hosted on Qualtrics (Appendix F). This survey included questions for dark pattern manipulation checks, as well as measures of perceived arousal, impulsive buying urges, and buying alternatives. Subsequently, participants repeated the same shopping task and survey questions four times, each time being exposed to a different one of the four experimental conditions.

To conclude the experiment, participants used the iPad once more to respond to questions designed to assess meta-motivational state manipulation checks, impulse buying tendencies, and demographic data. Finally, they were debriefed and received compensation for their time and participation.

4.6 Measurement and manipulation checks

Our measurement instruments were adapted from a variety of existing scales that have been validated for reliability and validity. To assess the effectiveness of our dark pattern stimuli, we adapted the measure of scarcity manipulation originally developed by Wu et al. (2021). Specifically, for limited-time and limited-quantity scarcity, we used statements such as "I felt that I had little time to take advantage of the 15% discount promotion on the extras," and "I felt that the 15% discount promotion on the extras was going to sell out soon." To gauge the effectiveness of the social proof manipulation, we used the statement, "I felt that the 15% discount promotion on the extras was in high demand."

To measure the efficacy of our hypothetical scenarios in inducing meta-motivational states, we tailored the motivational orientation manipulation checks from Kaltcheva &

Weitz's (2006) study. We adopted Verplanken & Herabadi's (2001) 20-item scale for assessing impulse buying tendencies. To measure perceived arousal, we employed four dichotomous pair items, adapted from Deng & Poole's (2010) study. Lastly, the metric for evaluating the subject's urge to make impulsive purchases was contextualized from the research of Parboteeah & Wells (2009).

A comprehensive list of all scales used in this study is provided in Table 2.

Table 2: Measurement Items

Construct	Measures (seven-point agreement scales were used unless otherwise specified)	Source
Urge to Buy Impulsively (UBI, 2 items)	UBI_2: Browsing this website, I had the desire to take advantage of the 15% discount promotion on the extras besides booking an accommodation for my San Francisco spring break trip. UBI_3: While browsing this website, I had the inclination to add the discounted extras along with booking an accommodation for my San Francisco spring break trip	Adapted from Parboteeah & Wells (2009)
Impulse Buying Tendency (IBT, 20 items)	IBT_1: I usually think carefully before I buy something. IBT_2: I usually only buy things that I intended to buy. IBT_3: If I buy something, I usually do that spontaneously. IBT_4: Most of my purchases are planned in advance. IBT_5: I only buy things that I really need. IBT_6: It is not my style to just buy things IBT_7: I like to compare different brands before I buy one. IBT_8: Before I buy something I always carefully consider whether I need it. IBT_9: I am used to buying things 'on the spot'.	Verplanken & Herabadi's (2001)

	IBT_10: I often buy things without thinking. IBT_11: It is a struggle to leave nice things I see in a shop. IBT_12: I sometimes cannot suppress the feeling of wanting to buy something. IBT_13: I sometimes feel guilty after having bought something. IBT_14: I'm not the kind of person who 'falls in love at first sight' with things I see in shops. IBT_15: I can become very excited if I see something I would like to buy. IBT_16: I always see something nice whenever I pass by shops. IBT_17: I find it difficult to pass up a bargain. IBT_18: If I see something new, I want to buy it. IBT_19: I am a bit reckless in buying things. IBT_20: I sometimes buy things because I like buying things, rather than because I need them. *Items 1, 2, 4±8, and 14 should be reverse coded.	
Telic/Paratelic Manipulation Checks (MC_TP, 6 items)	MC_TP1: <Paratelic state> I went shopping without an established goal. MC_TP2: <Paratelic state> I went shopping to look for entertainment. MC_TP3: <Paratelic state> I went shopping to feel good. MC_TP4: <Telic state> I went shopping looking for efficiency. MC_TP5: <Telic state> I went shopping to do my task. MC_TP6: <Telic state> I went shopping with an established goal.	Kaltcheva & Weitz's (2006)
Perceived Arousal[a] (SD_A, 4 items)	SD_SR: Stimulated- Relaxed SD_FS: Frenzied- Sluggish SD_JD: Jittery-Dull SD_WS: Wide-awake-Sleepy	Deng & Poole (2010)

Note: [a]A seven-point semantic differential scale was used for this construct		

5. Data analyses and results

5.1 Manipulation checks validity

Dark Pattern Manipulation

We conducted a two-way repeated measure ANOVA to test the effectiveness of arousal manipulation of the dark patterns for each experimental condition. The one-item scale manipulation check per dark patterns was the dependent variable.

1. Limited Time Scarcity

As expected, **the time scarcity manipulation had a significant main effect on the time scarcity manipulation check** ($F (1, 19) = 18.771$, $p < .001$). Pairwise comparisons with Bonferroni adjustments further substantiated these findings as participants in the scarcity conditions (scarcity only: M=4.75; and scarcity combined with social proof: M=4.80) reported significantly higher score on the time scarcity manipulation check in comparison to those in the non-scarcity conditions (control group: M=2.75; and social proof only: M=3.35). These results were robust, with no significant interaction effects between scarcity and social proof ($F (1, 19) = 0.477$, $p = .498$).

2. Limited Quantity Scarcity

As expected, **the quantity scarcity manipulation had a significant main effect on the quantity scarcity manipulation check** ($F (1, 19) = 17.412$, $p < .001$). Pairwise comparisons with Bonferroni adjustments further substantiated these findings as participants in the scarcity conditions (scarcity only: M=4.90; and scarcity combined with social proof: M=4.70) reported significantly higher score on the time scarcity manipulation check in comparison to those in the non-scarcity conditions (control group: M=2.90; and social proof only: M=3.60). These results were robust, with no significant interaction effects between scarcity and social proof ($F (1, 19) = 2.302$, $p = .146$).

3. Social proof

Scarcity manipulation had a significant main effect on perceptions of social proof (F (1, 19) = 13.268, p = .002). However, **the social proof manipulation did not show a significant main effect (**F (1, 19) = 2.579, p = .125). In particular, the social proof-only group (M = 4.35) did not show a statistically significant difference from the control group (M = 3.15). Interestingly, however, we found a significant interaction effect between scarcity and social proof (F (1, 19) = 5.278, p = .033). Pairwise comparisons with Bonferroni adjustments revealed that participants in the combined scarcity and social proof condition (M = 5.10) reported higher perceptions of social proof compared to those in the scarcity-only (M = 4.90) and social proof-only (M = 4.35) conditions. These results suggest that while the social proof manipulation alone was not effective, its effects were significant when combined with scarcity manipulation.

Given these results, we concluded that the social proof experimental condition did not pass the manipulation check. Consequently, further analysis involving only the social proof group as a distinct experimental factor will not be considered.

Meta-motivational States Manipulation

We conducted a Mann-Whitney U test to assess the effectiveness of the manipulations designed to induce different meta-motivational states, namely telic and paratelic, which were presented in two experimental scenarios. To measure these states, we used 6-item scales, consisting of 3 items for each of the telic and paratelic states.

Participants in the telic meta-motivational state experimental condition reported significantly higher scores on the telic manipulation check items (Mean Rank: 14.25, Mann-Whitney U = 12.500, p = .004) compared to those in the paratelic experimental condition (Mean Rank: 6.75). Conversely, participants in the paratelic meta-motivational state reported significantly higher scores on the paratelic manipulation check items (Mean Rank: 13.30, Mann-Whitney U = 22.000, p = .033) compared to those in the telic state (Mean Rank: 7.70).

These results demonstrate that **our manipulations were effective in inducing the intended meta-motivational states**.

5.2 Reliability Analysis

We removed 1 item from the Urge to buy impulsively scale and 2 items from the perceived arousal scales after finding out those items have poor loading value. In summary, the Composite Reliability (CR) and Cronbach's Alpha (CA) values were mostly above the recommended thresholds of 0.70, except for the CR of 'Impulse Buying Tendency,' which was slightly below at 0.67. Average Variance Extracted (AVE) values were also generally above the recommended 0.50, except for 'Impulse Buying Tendency' at 0.2 and 'Telic Manipulation Checks' at 0.45. Factor loadings for most items exceeded the recommended 0.70 minimum, supporting convergent validity. Moreover, most items demonstrated higher loadings on their respective constructs than on others, reinforcing discriminant validity. However, some constructs, particularly 'Impulse Buying Tendency,' require further refinement to fully meet validity criteria.

Table 3: Measurement validity of the perceptual constructs

Construct	No. Of items	CR (>0.70)	CA (>0.70)	AVE (>0.50)	[1]	[2]	[3]	[4]	[5]
Urge to Buy Impulsively (1)	2	0.80	0.712	0.66	0.81				
Impulse Buying Tendency (2)	20	0.67	0.812	0.20	-0.065	0.45			
Paratelic Manipulation Checks (3)	3	0.80	0.712	0.60	0.042	0.412**	0.77		
Telic Manipulation Checks (4)	3	0.71	0.922	0.45	0.215	-0.499**	-0.476**	0.67	
Perceived Arousal (5)	4	0.81	0.763	0.54	0.309**	-0.034	0.210	0.185	0.73

Notes: CR: composite reliability; CA: Cronbach's alpha; AVE: average variance extracted. Diagonal elements (in bold) are the square root of the shared variance between the constructs and their measures (i.e., square root of the AVE); off-diagonal elements are correlations between constructs. **Correlation is significant at the 0.01 level (2-tailed).

Table 4: Constructs loadings and cross loadings

	Urge to Buy Impulsively	Impulse Buying Tendency	Paratelic Manipulation Checks	Telic Manipulation Checks	Perceived Arousal
UBI2	0.792	-0.007	-0.066	0.025	0.199
UBI3	0.833	-0.1	0.117	0.147	0.075
SD_SR	0.187	0.028	0.093	0.156	0.764
SD_FS	0.085	0.032	0.094	-0.121	0.888
SD_JD	0.043	-0.189	0.016	0.243	0.779
SD_WS	0.289	-0.295	0.178	0.391	0.408
IBT_1	-0.023	0.747	0.219	-0.386	0.058
IBT_2	0.04	0.318	-0.099	-0.181	0.068
IBT_3	0.002	0.118	0.172	-0.24	0.017
IBT_4	-0.014	0.722	0.076	-0.236	-0.14
IBT_5	-0.202	0.286	0.046	-0.168	-0.131
IBT_6	-0.205	0.032	0.124	0.04	0.019
IBT_7	0.028	0.169	-0.249	-0.115	-0.059
IBT_8	-0.068	0.675	0.099	0.03	-0.167
IBT_9	0.218	0.688	0.153	-0.154	-0.227
IBT_10	-0.197	0.821	0.143	-0.109	0.074
IBT_11	0.182	0.028	0.168	0.069	0.135
IBT_12	0.14	0.186	0.366	-0.196	-0.181
IBT_13	0	0.332	-0.121	-0.093	0.038
IBT_14	0.049	-0.048	-0.129	-0.414	-0.066
IBT_15	0.193	-0.037	0.081	0.836	0.234
IBT_16	0.221	0.125	0.143	0.431	-0.192
IBT_17	0.285	-0.168	-0.002	0.133	0.229
IBT_18	-0.133	-0.175	0.092	0.124	0.373
IBT_19	-0.053	0.624	0.46	0	-0.083
IBT_20	-0.153	0.504	0.457	-0.049	-0.015
MC_TP1	0.028	0.147	0.371	-0.323	0.169
MC_TP2	0	0.142	0.911	-0.1	0.168
MC_TP3	0.088	0.196	0.905	0.031	0.053
MC_TP4	-0.081	-0.386	-0.09	0.803	0.171
MC_TP5	0.104	-0.271	-0.403	0.667	-0.091
MC_TP6	0.131	-0.244	-0.445	0.522	-0.006

Table 5: Reliability statistics

Construct (no. of items)		α (>0.70)

Urge to Buy Impulsively (2)		
	Condition 1 (control group)	0.59
	Control 2 (social proof only group)	0.80
	Control 3 (scarcity only group)	0.75
	Control 4 (scarcity + social proof group)	0.70
Semantic Differential Scale Measuring Perceived Arousal (4)		
	Condition 1 (control group)	0.78
	Control 2 (social proof only group)	0.82
	Control 3 (scarcity only group)	0.79
	Control 4 (scarcity + social proof group)	0.69
Impulse Buying Tendency (20)		0.81
Telic Manipulation Checks (3)		0.92
Paratelic Manipulation Checks (3)		0.71

5.3 Hypothesis Testing: effects of scarcity and social proof dark patterns on perceived arousal (H1-H3)

We initially aimed to analyze the main effects and the interaction effects of scarcity and social proof manipulations. Ideally, we would employ a two-way repeated measures ANOVA to analyze such effects, as it would allow us to examine the main effects of each factor (scarcity and social proof) as well as the interactions between them (combined effect of scarcity and social proof).

However, the manipulation check analysis revealed that the social proof only condition did not successfully induce the intended effect. Therefore, we opted to analyze the data using a one-way repeated measure ANOVA, comparing the effects of the scarcity only condition as well as the combined scarcity and social proof condition against the control group. This method allowed us to avoid making any assumptions about the ineffective social proof only manipulation, instead focusing on the comparative effects of the dark patterns across three distinct groups: control, low impact (scarcity only), and high impact (both scarcity and social proof).

5.3.1 Effect of scarcity dark patterns on perceived arousal (H1)

The mean value for perceived arousal was higher in the scarcity group (u=4.638) compared to the control group (m=4.20). Pairwise comparison tests using Bonferroni adjustment revealed that this difference was not statistically significant (p>0.05). Thus, **the hypothesis that scarcity – based dark patterns would induce emotional arousal in online shoppers (H1) was not supported by the data**.

5.3.2. Effect of social proof dark pattern on perceived arousal (H2)

The mean value for perceived arousal was slightly higher in the social proof group (m=4.45) compared to the control group (m=4.20). Pairwise comparison tests using Bonferroni adjustment revealed that this difference was not statistically significant (p>0.05). This reaffirms our previous manipulation check's findings: **the hypothesis that social proof-based dark patterns would induce emotional arousal in online shoppers (H2) was not supported by the data**.

5.3.3. Scarcity and social proof dark patterns on perceived arousal (H3)

The mean value for perceived arousal was higher in the combined scarcity and social proof group (m=4.625) compared to the control group (m=4.20). Pairwise comparison tests using Bonferroni adjustment revealed that this difference was statistically significant with a p-value of 0.042. Thus, the **hypothesis that both scarcity and social proof – based dark patterns would induce emotional arousal in online shoppers (H3) was supported by the data.**

Table 6: Mean Values of Perceived Arousal Among Experimental Conditions

	Social proof: Present	Social proof: Absent	
Scarcity: Present	4.625 (N=20)	4.638 (N=20)	4.632 (N=40)
Scarcity: Absent	4.45 (N=20)	4.20 (N=20)	4.325 (N=40)
	4.538 (N=40)	4.419 (N=40)	(N=80)

*Number of n equivalates to data points across 20 participants

5.4 Hypothesis Testing: effects of perceived arousal, meta-motivational state moderation on urge to buy impulsively while accounting for Individual's impulse buying tendency (H4-H5)

Perceived arousal on urge to buy impulsively (H4)

We tested this hypothesis using linear mixed effect modelling due to observations being non-independent. As reported in Table 6, the beta coefficient representing the fixed effect of perceived arousal on urge to buy impulsively was 0.378 in with control variables, and this effect was statistically significant with a p-value of 0.013. In other words, for every 1-unit increase in perceived arousal, our participants' urge to buy impulsively increased by approximately 0.378 units. Thus, **the hypothesis that perceived arousal would induce urge to buy impulsively in online shoppers (H4) was supported by the data**

Meta-motivational states as moderators, accounting for individual variability of impulse buying tendency (H5)

The interaction between meta-motivational states and perceived arousal did not significantly influence the urge to impulsively buy with a p-value 0.767. Neither being in a telic nor a paratelic state seems to significantly change how perceived arousal influences urge to buy impulsively, even when accounting for individual variability in impulse buying tendency. Thus, **we did not find support for H5.**

Table 7: Testing Results on Urge to Buy Impulsively

Variables	Model
Gender	0.005 (0.426)
Age	0.091 (0.302)
Education	-0.042 (0.277)
Race	0.081

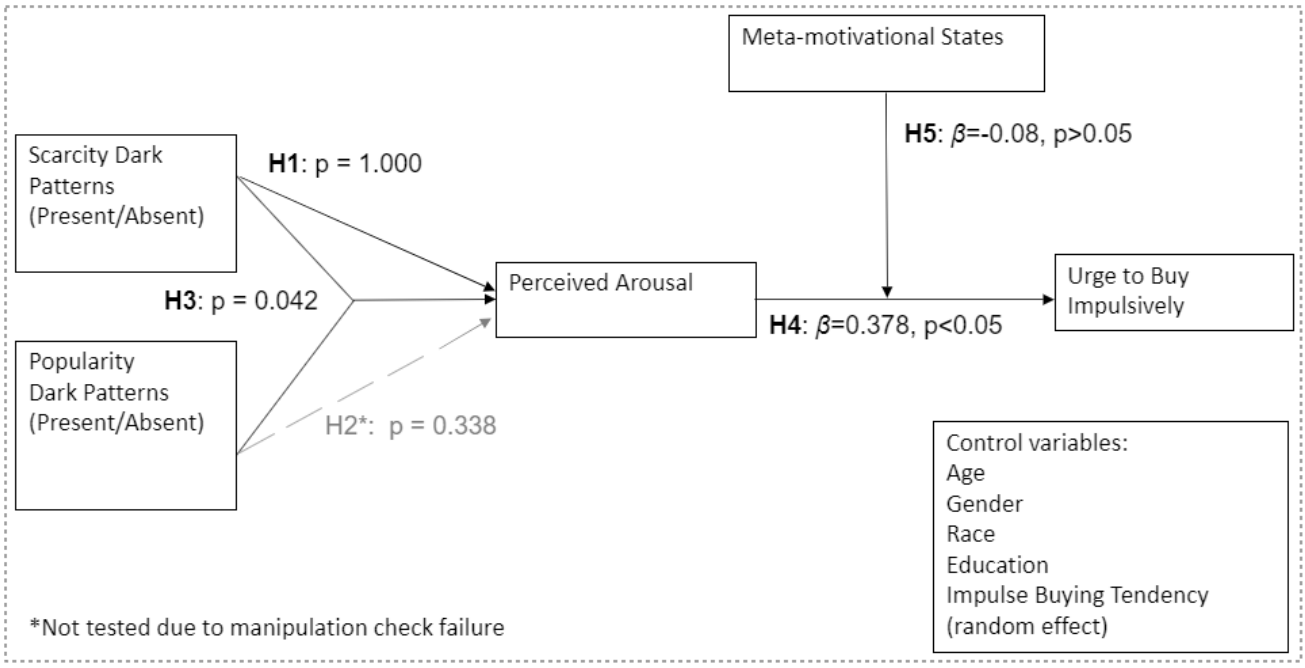
	(0.101)
Impulse Buying Tendency	-0.182 (0.368)
Perceived Arousal	0.378* (0.140)
Meta-motivational States	0.828 (1.319)
Perceived Arousal* Meta-motivational States	-0.083 (0.277)
Observations	20

Notes: Standard errors are in parentheses. * $p<0.05$

Table 8: Summary of Results

Hypotheses	Test	Results
H1: Scarcity (+) -> Perceived Arousal	One-way repeated measures ANOVA	Rejected
H2: Social proof (+) -> Perceived Arousal	One-way Repeated measures ANOVA	Rejected – not tested (due to manipulation check failure)
H3: Scarcity & Social proof (+) -> Perceived Arousal	One-way Repeated measures ANOVA	Supported
H4: Perceived Arousal (+) -> Urge to Buy Impulsively	Linear mixed effects modeling	Supported
H5a: Telic condition: Perceived Arousal (-) -> Urge to Buy Impulsively	Linear mixed effects modeling	Rejected
H5b: Paratelic condition: Perceived Arousal (+) -> Urge to Buy Impulsively	Linear mixed effects modeling	Rejected

Figure 2: Model testing results



6. Discussion and Conclusion

6.1 Main findings

This study examines the effects of scarcity dark patterns (i.e., fake countdown timer and falsified limited quantity statement) and social proof dark patterns (i.e., falsified activity message) on perceived arousal and subsequent urge to buy impulsively, while considering the potential moderating role of telic/ paratelic meta-motivational state, in the context of online travel booking. Drawing from the S-O-R framework, the study established dark patterns as the external stimuli, telic/ paratelic meta-motivational states as internal stimuli, perceived arousal as the emotional organism, and urge to buy impulsively as the behavioral response.

We failed to provide enough evidence to support H1 and H2, which proposed the main effects of scarcity or social proof dark pattern on perceived arousal. This could be attributed to several factors. First, social proof dark patterns failed their manipulation check, making the interpretation of H2 unreliable; thus, we were not confident in including the results of H2 into our overall analysis. We observed in our manipulation check that the current design of the activity message, highlighting individuals claiming discounts or

deals on extra services, seems to trigger a perception of scarcity (i.e., limited quantity/ sell out soon) more than social proof/ social proof (i.e., in high demand). Second, individual's susceptibility to and the perception of scarcity dark patterns could contribute to the non-significant result. While our study focuses on the perceived arousal as the response to scarcity dark patterns stimuli, we find supporting evidence from other studies. For instance, Park et al. (2017), observed that scarcity claims did not significantly influence the participant's travel booking intention, which is a closely linked behavioral response to urge to buy impulsively in the context of online travel booking. In addition, Luguri & Strahilevitz (2021)'s study 2 also investigated the individual effects of scarcity dark patterns on user's acceptance rate of data protection services and did not find significant impact.

The statistical findings provide support for H3, indicating that there is a significant correlation between the interaction effects of both scarcity and social proof dark patterns on inducing individual's felt arousal. This result aligns with Teubner & Graul (2020)'s study in which they found significant interaction effects between scarcity and social proof claims in triggering perceived scarcity, which led to perceived value and urgency and subsequently intention to book. In comparison to the insignificant main effects of scarcity (H1) and social proof (H2) dark patterns, we tentatively suggest that the combined effects of both dark patterns generated a stronger emotional response in participants. This finding aligns with Luguri & Strahilevitz (2021)'s study 1, in which they also observed the effects of different magnitude of dark patterns. The authors investigated the effects of control vs mild (i.e., two types of dark patterns: confirm-shaming and false hierarchy) vs aggressive dark patterns (i.e., four additional types: countdown timer, toying with emotions, trick question, and roach motel) on user's acceptance rate of a data protection service. Their findings shown that in the mild condition, user's acceptance rate was doubled compared to the control group, whereas it quadrupled in the aggressive condition. While we draw parallels with their study, we do recognize the differences in the types of dark patterns we investigated and the dependent variables. Having said that, this still provides additional insights into the cumulative power of dark patterns on people, specifically in the context of online travel booking.

Moreover, we found sufficient evidence to support H4 where perceived arousal is positively correlated with urge to buy impulsively, further strengthening the findings of previous literature that perceived arousal is a strong predictor of such behavioral response. We did not, however, find enough evidence to support H5, which proposed that being in telic/ paratelic meta-motivational state would strengthen/ weaken the relationship between perceived arousal and urge to buy impulsively. As Apter (1989) recognized, individuals possess a tendency towards either telic or paratelic, and that the factors that induce telic/paratelic state must be stronger than the inherent dominated tendency to bring forth the reversal in an individual. Despite the manipulation check that demonstrated the effectiveness of the scenarios in inducing the intended meta-motivational states, participants were exposed to the dark pattern stimuli and task four times. This repeated exposure might have induced task fatigue or habituation, impacting the intensity of felt arousal and urge to buy impulsively overtime and hindered the sustaining effects of the induced telic/ paratelic states.

6.2 Theoretical contributions

This study contributed to the existing knowledge on dark patterns, online impulse buying phenomenon and reversal theory. First, we created a dynamic experiential web stimuli instead of static web stimuli, allowing participants to browse the webpages and performing the shopping tasks that replicate their natural browsing environment. In line with the research suggestion from Wu et al. (2021), the scarcity and social proof dark patterns stimuli were designed to incorporate modern user interface elements such as colorful progress bar, pop-up and a live countdown timer, mirroring the typical look-and-feel of online travel booking websites.

Furthermore, our study extends the understanding of online impulse buying behavior using the S-O-R framework. Our result highlights that the interaction effects between the scarcity and social proof dark patterns, as opposed to their main effects, triggered more emotional response in the form of perceived arousal among our participants. This finding aligns with the study of online travel booking conducted by Teubner & Graul (2020), who also found significant interaction effects between scarcity and social proof claims in

triggering perceived scarcity, leading to heightened perceptions of value and urgency, ultimately influencing the intention to book. Drawing parallels from Luguri & Strahilevitz (2021)'s study on the varying magnitude of dark patterns, our study reinforces the notion that cumulative power of these misleading and manipulative practices effectively shapes consumer responses. While our investigation took place in the context of online travel booking, the observed cumulative impacts of scarcity and social proof dark patterns provides broader insights into the (mis)use of online persuasive claims to influence consumer behavior.

In addition, our results confirm that emotional responses, like perceived arousal, play a crucial role in driving the effects of external online stimuli and individual's behavioral response. Built upon previous research on online impulse buying behavior (Adelaar, 2003; Wu et al., 2021), we confirm that perceived arousal serves as a significant emotional driver of the urge to buy impulsively. Our finding suggests a direct correlation: the higher the arousal experienced by participants, the stronger their felt urge to buy impulsively. This result emphasizes the importance of understanding how businesses design arousal-stimulating digital interface to shape online consumer behavior, for the better or worse.

While the statistical findings of our study aligned with the competitive arousal theory by confirming the significant interaction effects between scarcity and social proof dark patterns on perceived arousal, our qualitative findings gathered a mixed response among participants when being asked how they felt after being revealed the scarcity and social proof claims in the study might be dark patterns. From more trusting and positive sentiment like "Usually when I see something like this, I tend to trust the websites. I feel like they cannot put up something that is untrue." to more neutral and indifferent sentiment like "In Amazon or other shopping websites, it's quite normal to use these tactics so I don't care that much those marketing information are just there to trigger further actions. I don't know whether it's true or not so most of the time I'm not that influenced by them. If the product is something needed or wanted urgently, that information is powerful, otherwise I know they will restock if it's a popular product." to more strongly opinionated sentiment like "I saw these tactics on Booking.com before. I felt annoyed when I saw

these things. I know it might be just a marketing thing to make me buy it, first feeling seeing a deal is it true or not risk. If I like something I would buy it without the pressure, don't annoy me." These varied responses highlight the intricacies of consumer behavior in the face of manipulative design tactics and called for further exploration in the ethical implications and long-term consequences of such practices.

6.3 Practical contributions

From a managerial perspective, online travel booking platforms can indeed leverage the notion of scarcity and social proof claims to drive online impulse buying behavior. Our findings illustrate that, regardless of an individual's impulsive buying tendency and shopping motivation (telic/ paratelic meta-motivational state), dynamic website stimuli like countdown timer, limited quantity claim and activity message, when utilized simultaneously, heighten one's arousal level and trigger urge to buy impulsively, which in turn is likely to lead to actual impulse purchase. However, these claims must be based on factual data, otherwise they would be deemed as dark patterns, which are unethical and illegal in regions like the EU. For example, the Netherlands Authority for Consumers & Markets (ACM, 2020) clearly outlined that limited quantity claim, such as "only 3 rooms left", need to be framed as "only 3 rooms left on this site". This is due to the fact that the availability of a hotel listing on one accommodation comparison website (e.g., Booking.com, Expedia) does not necessarily reflect the true availability of the listing on other similar websites. In addition, deriving from our qualitative insights, some consumers nowadays might develop some form of skepticism and aversion towards these scarcity and social proof practices. Therefore, we advise businesses to consider the long-term implications on the reputation and brand image of employing these practices, even when they are based on factual data.

From a UX practitioner perspective, this study highlights the efficacy of scarcity and social proof claims in leveraging psychological biases to influence impulse purchasing. From a business standpoint, the UX practitioner could leverage this knowledge to build an arousing digital environment that supposedly fosters purchase decision making. However, from an ethical standpoint, it is also the responsibility of the UX practitioner to

advocate for the well-being of the consumers, especially vulnerable groups like seniors and children, by making sure that the digital environment is designed to assist consumers in making the most well-informed decisions possible, starting with making sure data are not falsified and following the guideline outlined by legislative bodies.

6.4 Limitation and future research

While this study contributed valuable insights, we acknowledge the limitations regarding the research design and method. First, the social proof experimental condition did not pass the manipulation test, restricting us from confidently interpreting the isolated or main effect of this type of dark pattern on perceived arousal. Given that perceived arousal has been established in our study and previous literature as a significant driver of urge to buy impulsively, our focal behavioral response. We propose exploring different types of activity message as a form social proof dark pattern, as there exist many variations of such practices promoted by third party adds on for ecommerce. For example, researchers could consider shifting from individual activity narrative (e.g., John from Boston just claimed this 15% deal on buffet breakfast 30 minutes ago) to group-based activity (e.g., '15 travelers claimed this 15% deal on buffet breakfast in the last 24 hours' or '15 travelers are looking at this deal right now') to see which one generates the most pronounced social proof effect.

Second, we opted for mixed factor design, incorporating the within-subject factor for the experimental conditions. While randomization was implemented to minimize the risk of learning effects in this repeated measure design, participants may still become more accustomed to the experimental procedure or the content of the scenarios, affecting their responses over time. Furthermore, while perceived arousal, or self-reported arousal, is a common metric for capturing an individual's arousal level, supplementing the findings with more objective physiological measurements such as electrodermal activity (EDA) and heart rate could provide a more comprehensive understanding of the outcomes.

Lastly, given the widespread social media platforms such as TikTok and Instagram, consumers are constantly exposed to emerging trends in products and services under social influence. It is likely that consumers, influenced by social media content (e.g.,

influencer's travel activities), experience the urge to explore travel products/services. They may proceed to travel booking websites to check for deals and exposing themselves to dark pattern practices. This suggests that the funnel leading to impulse purchase starts well before landing on a travel website or mobile app. Therefore, investigating this complex customer journey could provide an intriguing and comprehensive avenue for understanding the cumulative impacts of dark patterns alongside with other digitally native stimuli.

In conclusion, this study explores the influence of scarcity and social proof dark patterns on perceived arousal and the urge to buy impulsively in online travel booking. To address research question 1, we found that while the main effects of the dark patterns were not confirmed, significant interaction effects were identified, aligning with previous research on the cumulative effect of such practices. Using the S-O-R framework to position our research model, our findings reinforce the positive correlation between perceived arousal and the urge to buy impulsively, ultimately indicating actual impulse buying behavior. We also examined the potential moderating power of telic/paratelic meta-motivational states in shaping the relationship between perceived arousal and the urge to buy impulsively. To answer research question 2, although we did not establish a significant correlation, we propose that, regardless of shopping motivation, a highly arousal-inducing digital environment would likely induce the urge to buy impulsively. From a managerial standpoint, leveraging scarcity and social proof claims requires ethical and legal consideration, as claims must be based on factual data to avoid being deemed as dark patterns. From a UX practitioner standpoint, designing persuasive digital environments not only requires an understanding of psychological impacts but also ethical responsibility towards end users. We acknowledge the limitations and propose that future research considers objective physiological measurement and explores diverse framings of scarcity and social proof claims to better understand the evolving dynamics of human-computer interaction.

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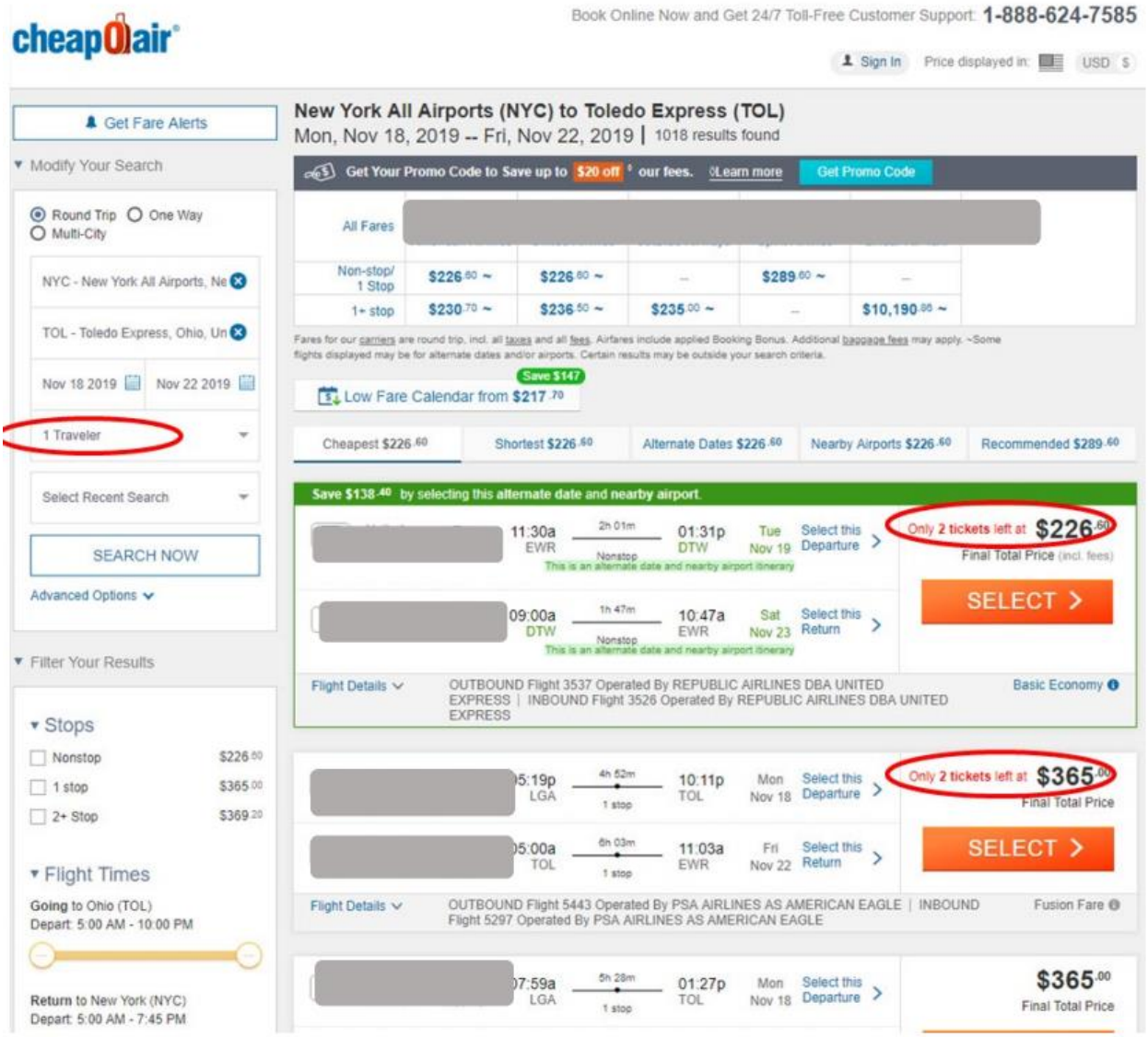
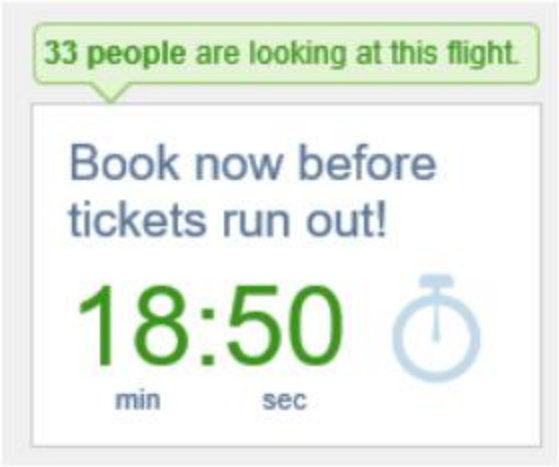
Appendices

Appendix A: Fareportal's dark patterns employment



Falsified limited stock messages that automatically added one unit to the plane ticket for every 'X' number of travelers.



Fabricated activity message using a random number generator between 28 and 45. False countdown timer that did not reserve the tickets for the consumers. Also, consumers could still buy the tickets if they are still available, even after the timer expired.

Appendix B: Sonder.com's accommodation booking page.

Availability and rates

Wed, Nov 1 → Wed, Nov 8 | Guests — 4 + | Price

Book with peace of mind Cancel your reservation up to 3 days before check-in for a full refund

Please note: The layout, furniture, and decor of your space may vary from what's shown here.

Superior One-Bedroom Apartment

1 Bedroom | 4 Guests | 1 Bathroom | 632 Sq ft

Features

- Queen bed
- Sofa bed
- Air conditioning
- Stocked kitchen
- In unit laundry
- Dishwasher
- Microwave
- Television
- Streaming device

US$3,661
Includes taxes and fees
US$449 / night
~~US$599~~

Only 1 left

Book

One-Bedroom Apartment w/ Peloton

1 Bedroom | 4 Guests | 1 Bathroom | 632 Sq ft

Features

- Queen bed
- Sofa bed
- Air conditioning
- Stocked kitchen
- In unit laundry
- Dishwasher
- Microwave
- Television
- Streaming device

US$3,751
Includes taxes and fees
US$460 / night
~~US$614~~

Only 1 left

Book

Two-Bedroom Apartment

2 Bedrooms | 6 Guests | 1 Bathroom | 780 Sq ft

Features

- 2 Queen beds
- Sofa bed
- Air conditioning
- Stocked kitchen
- In unit laundry
- Dishwasher
- Microwave
- Television
- Streaming device

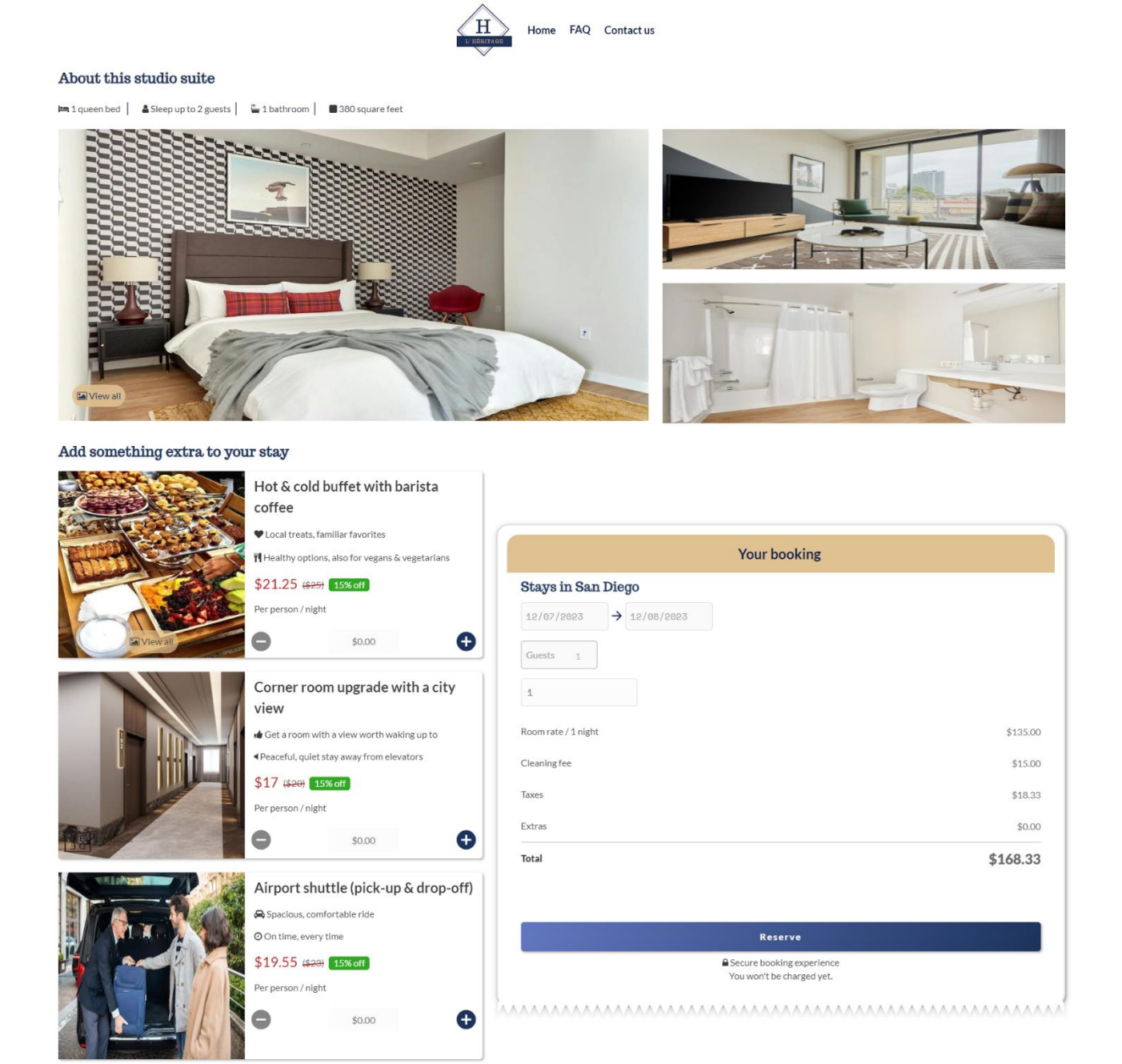
US$7,412
Includes taxes and fees
US$915 / night
~~US$1,219~~

Only 2 left

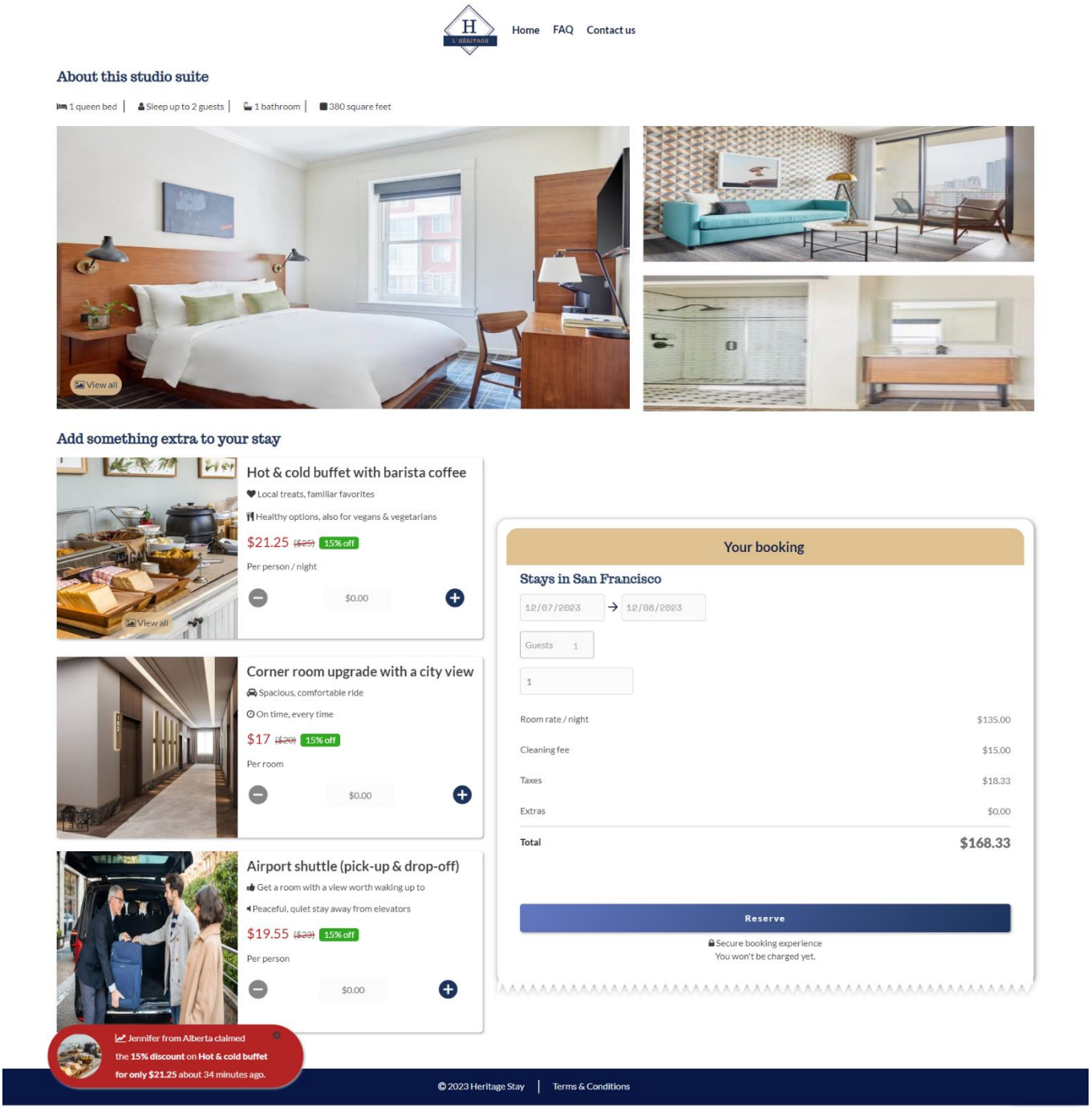
Book

Appendix C: Website stimuli

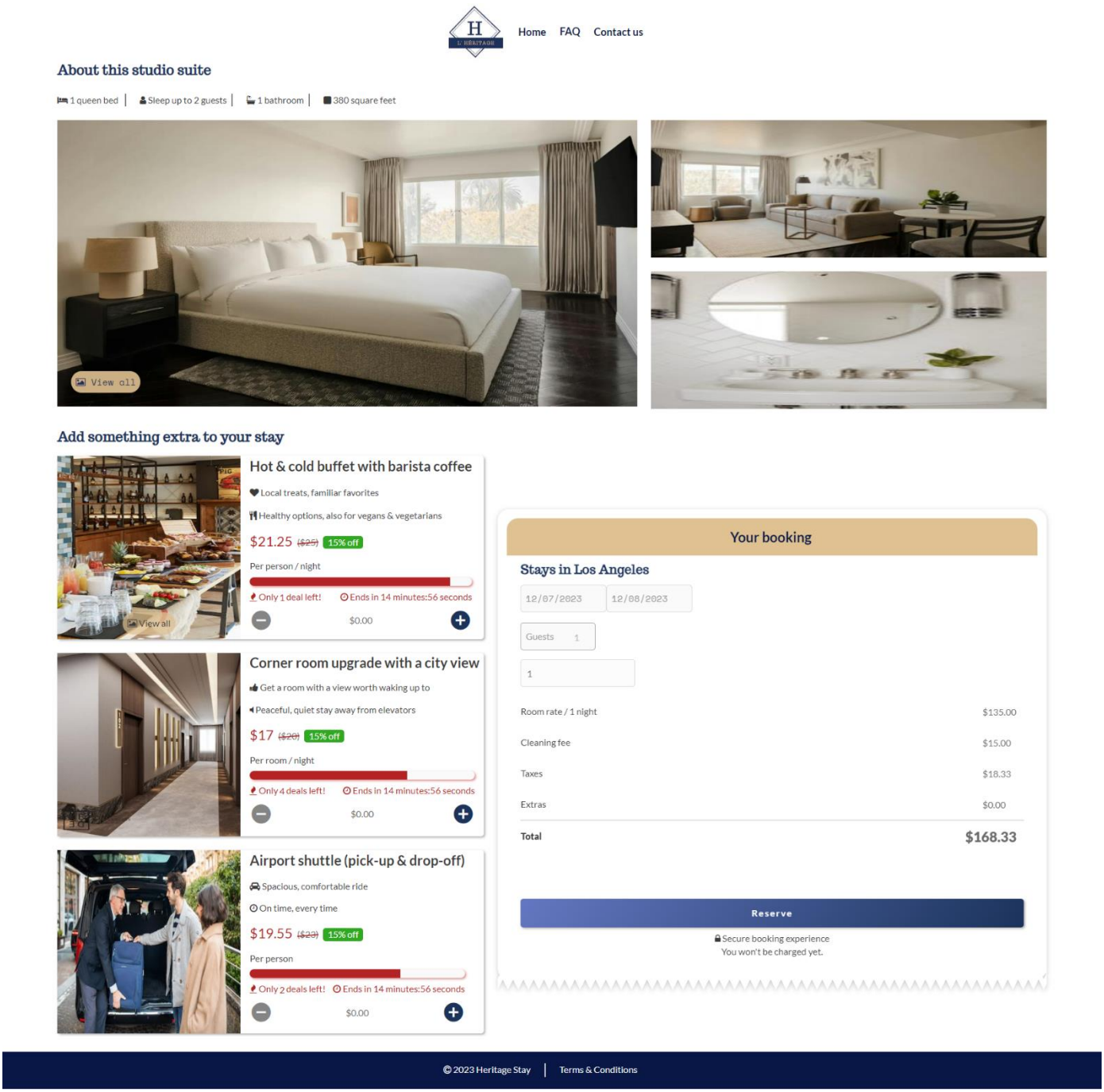
Stimuli 1: Control group



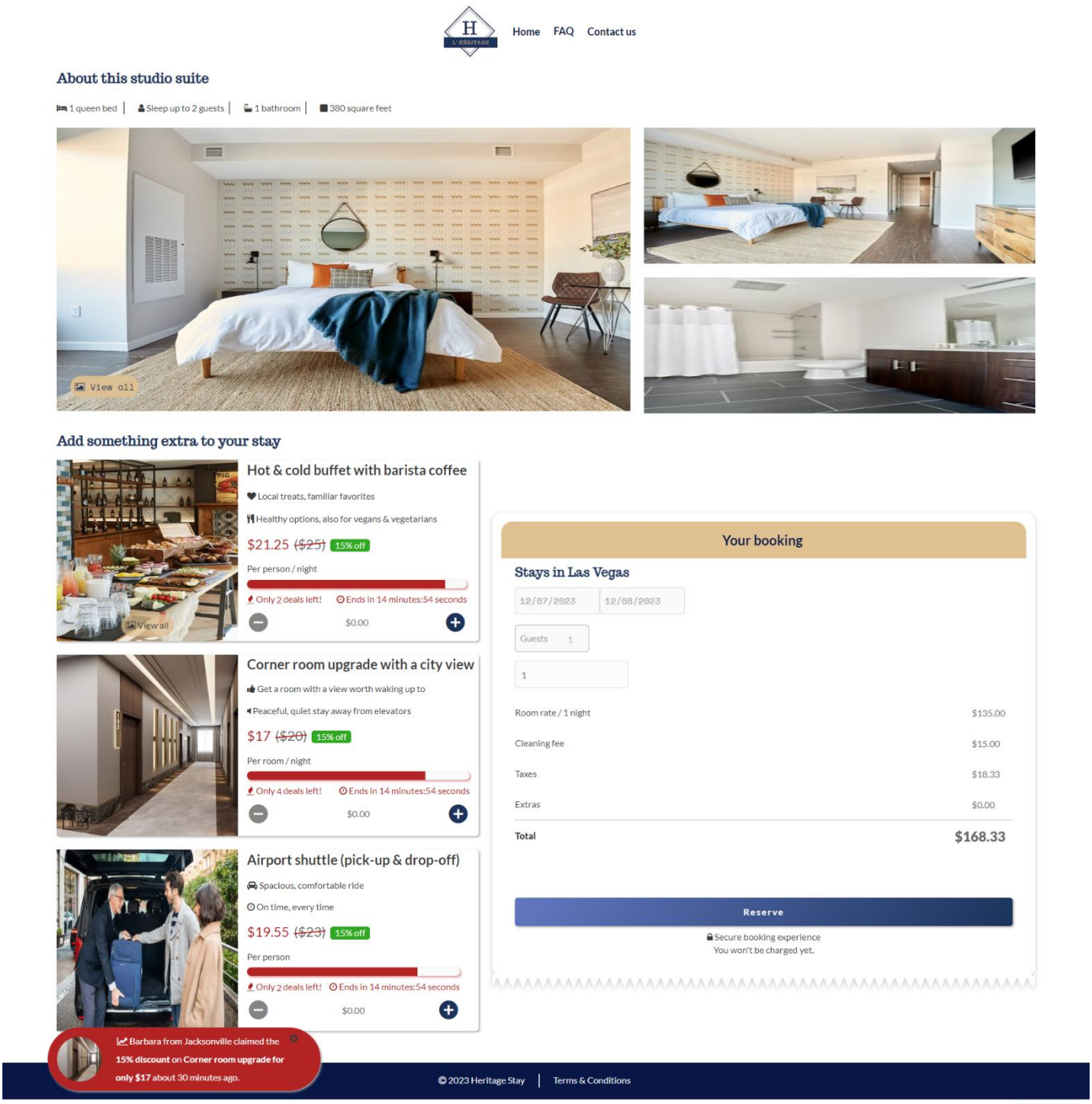
Stimuli 2: Social Proof only group



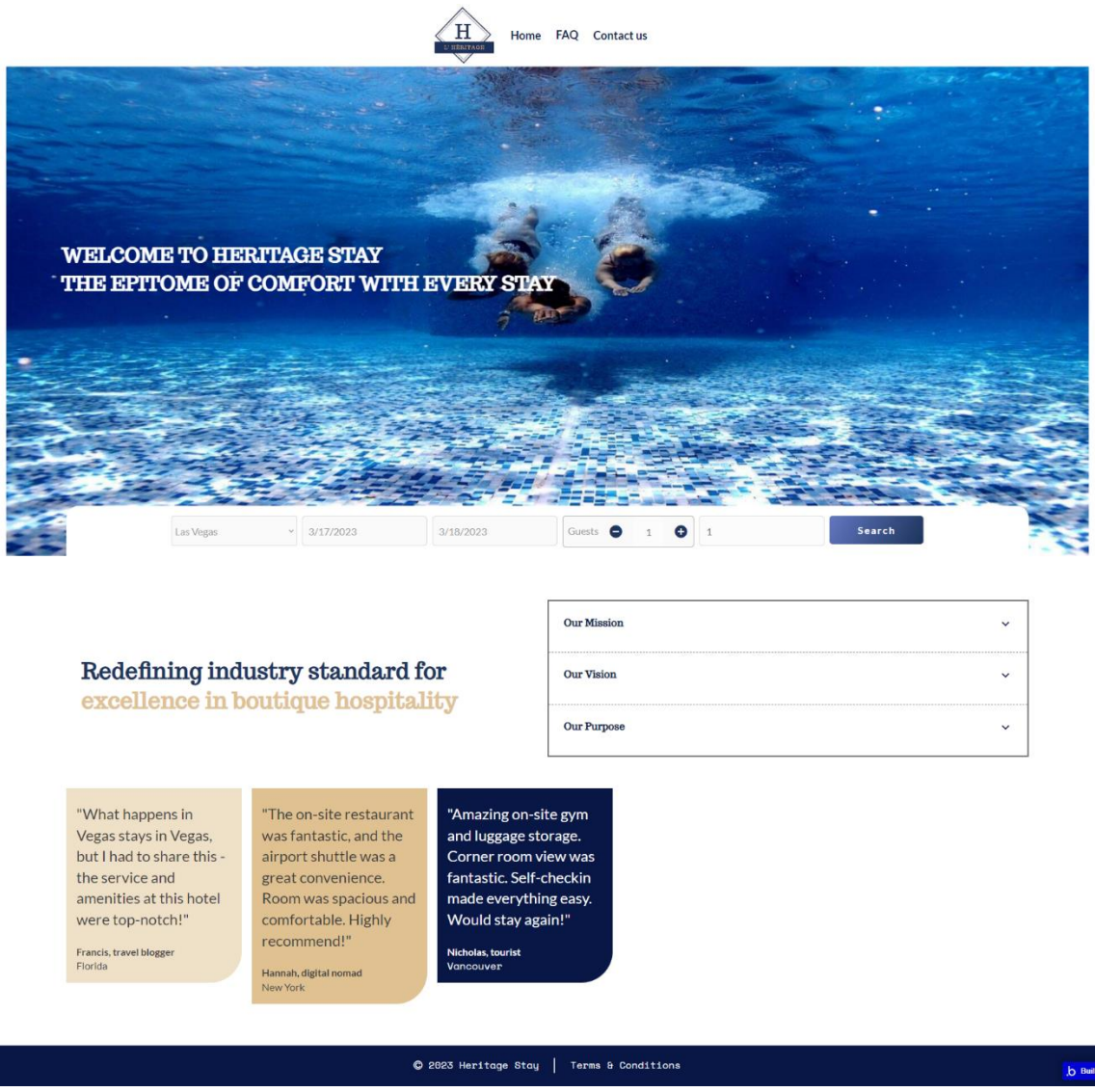
Stimuli 3: Scarcity only group

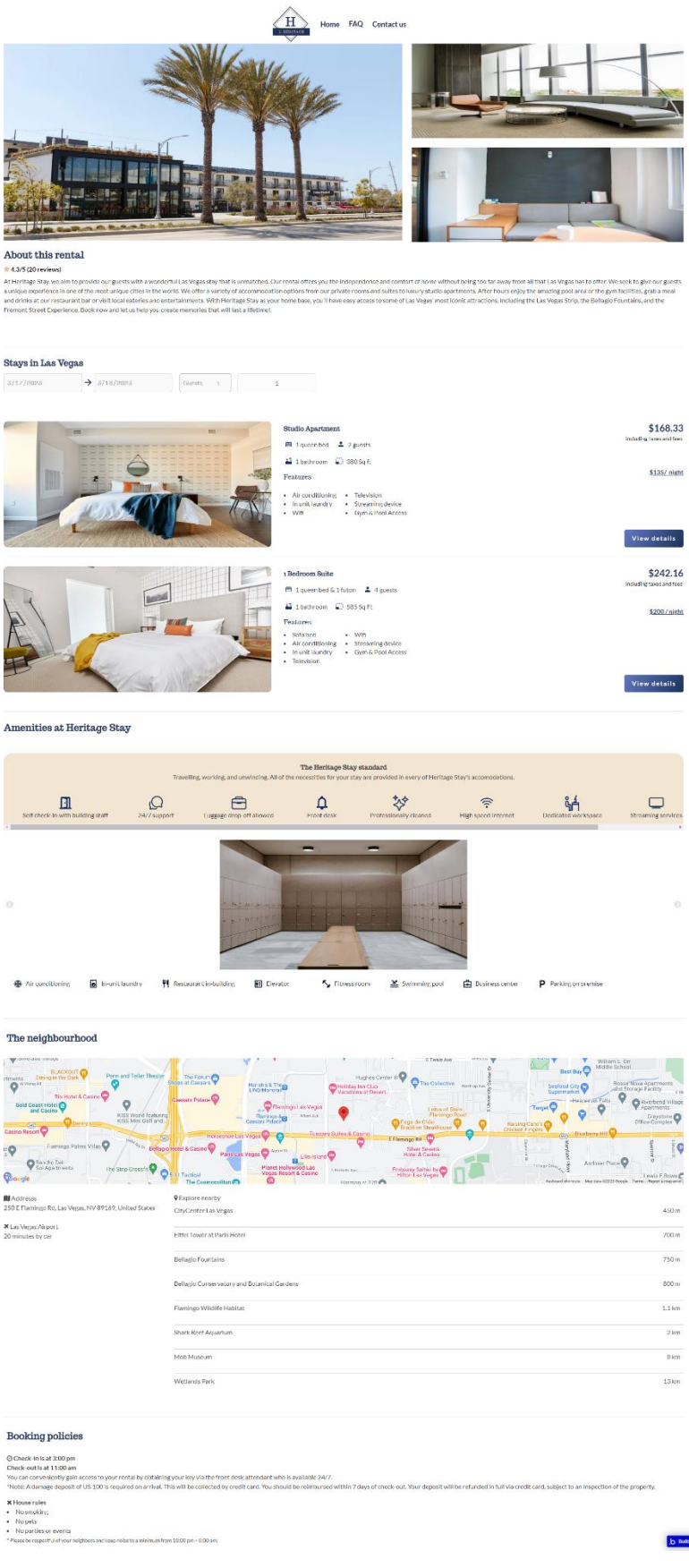


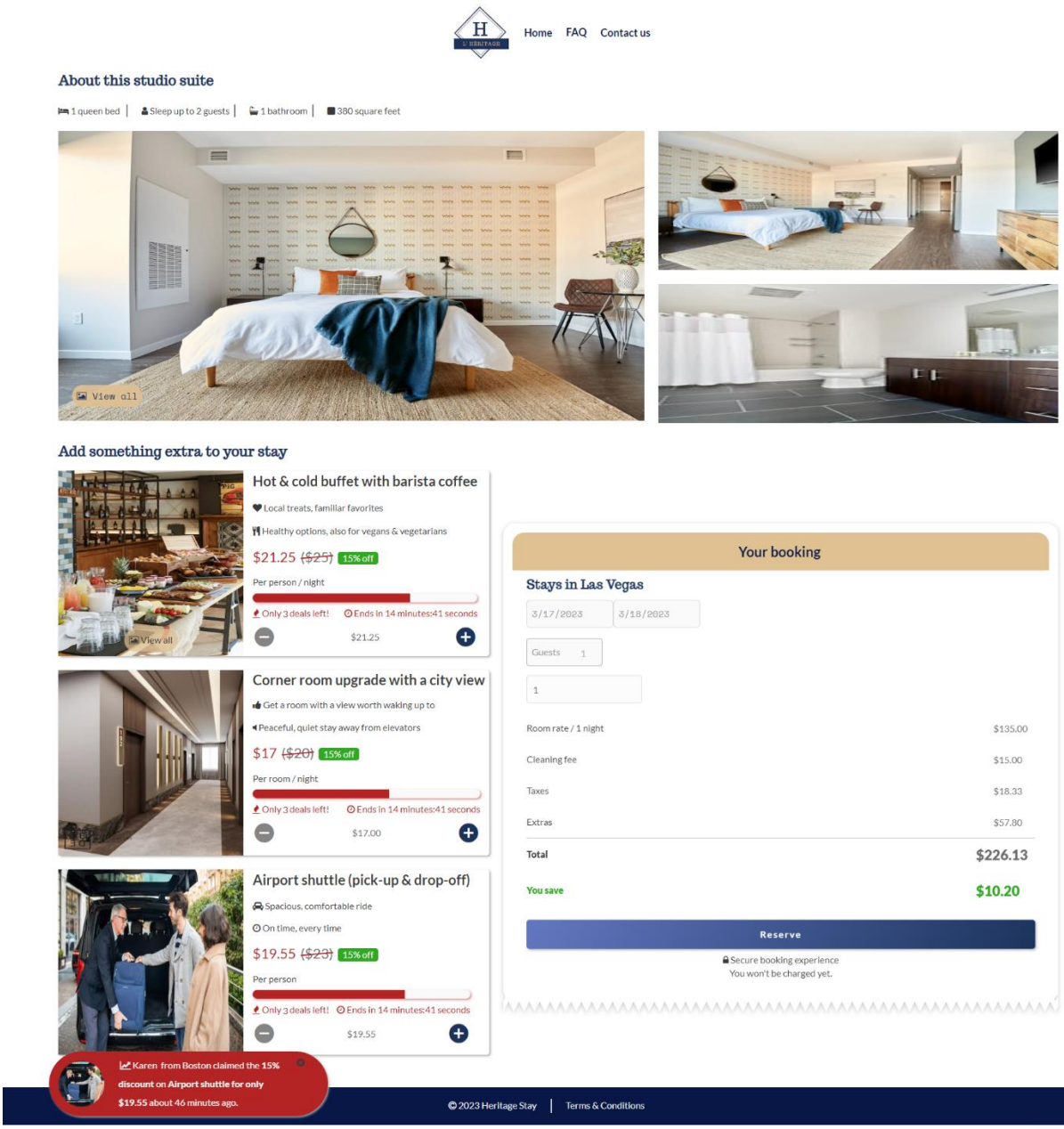
Stimuli 4: Both Scarcity and Social Proof group



Website flow: Homepage → Room option page → Extra services page → Confirmation page


Home
FAQ
Contact us
WELCOME TO HERITAGE STAY
THE EPITOME OF COMFORT WITH EVERY STAY
Las Vegas
3/17/2023
3/18/2023
Guests
1
1
Search
Redefining industry standard for
excellence in boutique hospitality
Our Mission
Our Vision
Our Purpose
"What happens in Vegas stays in Vegas, but I had to share this - the service and amenities at this hotel were top-notch!"
Francis, travel blogger
Florida
"The on-site restaurant was fantastic, and the airport shuttle was a great convenience. Room was spacious and comfortable. Highly recommend!"
Hannah, digital nomad
New York
"Amazing on-site gym and luggage storage. Corner room view was fantastic. Self-checkin made everything easy. Would stay again!"
Nicholas, tourist
Vancouver
© 2023 Heritage Stay | Terms & Conditions
Built on Bubble


Home
FAQ
Contact us
About this rental
4.3/5 (20 reviews)
At Heritage Stay, we aim to provide our guests with a wonderful Las Vegas stay that is unmatched. Our rental offers you the independence and comfort of home without being too far away from all that Las Vegas has to offer. We seek to give our guests a unique experience in one of the most unique cities in the world. We offer a variety of accommodation options from our private rooms and suites to luxury studio apartments. After hours enjoy the amazing pool area or the gym facilities, grab a meal and drinks at our restaurant bar or visit local eateries and entertainments. With Heritage Stay as your home base, you'll have easy access to some of Las Vegas' most iconic attractions, including the Las Vegas Strip, the Bellagio Fountains, and the Fremont Street Experience. Book now and let us help you create memories that will last a lifetime!
Stays in Las Vegas
Studio Apartment
1 queen bed
2 guests
1 bathroom
380 Sq ft
Features
Air conditioning
In-unit laundry
Wifi
Television
Streaming device
Gym & Pool Access
$168.33
Including taxes and fees
$135/ night
View details
1 Bedroom Suite
1 queen bed & 1 futon
4 guests
1 bathroom
585 Sq Ft
Features
Sofa bed
Air conditioning
In-unit laundry
Television
Wifi
Streaming device
Gym & Pool Access
$242.16
Including taxes and fees
$200 / night
View details
Amenities at Heritage Stay
The Heritage Stay standard
Travelling, working, and unwinding. All of the necessities for your stay are provided in every of Heritage Stay's accomodations.
Self check-in with building staff
24/7 support
Luggage drop off allowed
Front desk
Professionally cleaned
High speed internet
Dedicated workspace
Streaming services
Air conditioning
In-unit laundry
Restaurant in-building
Elevator
Fitness room
Swimming pool
Business center
Parking on premise
The neighbourhood
Address
250 E Flamingo Rd, Las Vegas, NV 89169, United States
Las Vegas Airport
20 minutes by car
Explore nearby
CityCenter Las Vegas 4.50 m
Eiffel Tower at Paris Hotel 7.00 m
Bellagio Fountains 7.50 m
Bellagio Conservatory and Botanical Gardens 8.00 m
Flamingo Wildlife Habitat 1.1 km
Shark Reef Aquarium 2 km
Mob Museum 8 km
Wetlands Park 13 km
Booking policies
Check-in is at 3:00 pm
Check-out is at 11:00 am
You can conveniently gain access to your rental by obtaining your key via the front desk attendant who is available 24/7.
*Note: A damage deposit of US 100 is required on arrival. This will be collected by credit card. You should be reimbursed within 7 days of check-out. Your deposit will be refunded in full via credit card, subject to an inspection of the property.
House rules
No smoking
No pets
No parties or events
* Please be respectful of your neighbors and keep noise to a minimum from 10:00 pm - 8:00 am.
Built on Rubble


Home
FAQ
Contact us
About this studio suite
1 queen bed | Sleep up to 2 guests | 1 bathroom | 380 square feet
View all
Add something extra to your stay
Hot & cold buffet with barista coffee
Local treats, familiar favorites
Healthy options, also for vegans & vegetarians
$21.25 ($25) 15% off
Per person / night
Only 3 deals left! Ends in 14 minutes:41 seconds
$21.25
View all
Corner room upgrade with a city view
Get a room with a view worth waking up to
Peaceful, quiet stay away from elevators
$17 ($20) 15% off
Per room / night
Only 3 deals left! Ends in 14 minutes:41 seconds
$17.00
Airport shuttle (pick-up & drop-off)
Spacious, comfortable ride
On time, every time
$19.55 ($23) 15% off
Per person
Only 3 deals left! Ends in 14 minutes:41 seconds
$19.55
Your booking
Stays in Las Vegas
3/17/2023
3/18/2023
Guests 1
1
Room rate / 1 night $135.00
Cleaning fee $15.00
Taxes $18.33
Extras $57.80
Total $226.13
You save $10.20
Reserve
Secure booking experience
You won't be charged yet.
Karen from Boston claimed the 15% discount on Airport shuttle for only $19.55 about 46 minutes ago.
© 2023 Heritage Stay
Terms & Conditions

Home FAQ Contact us

Thank you for completing your booking from Mar 17, 2023 12:00 am to Mar 18, 2023 12:00 am in Las Vegas. Please refer to the booking details below to answer the questionnaire. The questionnaire is on the iPad.

Booking details

Studio Apartment

Las Vegas

Mar 17, 2023 12:00 am - Mar 18, 2023 12:00 am

Guests: 1

Participant ID:1

Extras

Breakfast	$21.25
Corner room	$17
Airport shuttle	$19.55

Total booking fees: $226.133

Once you finish answering the questionnaire, return to Home to carry on the next task.

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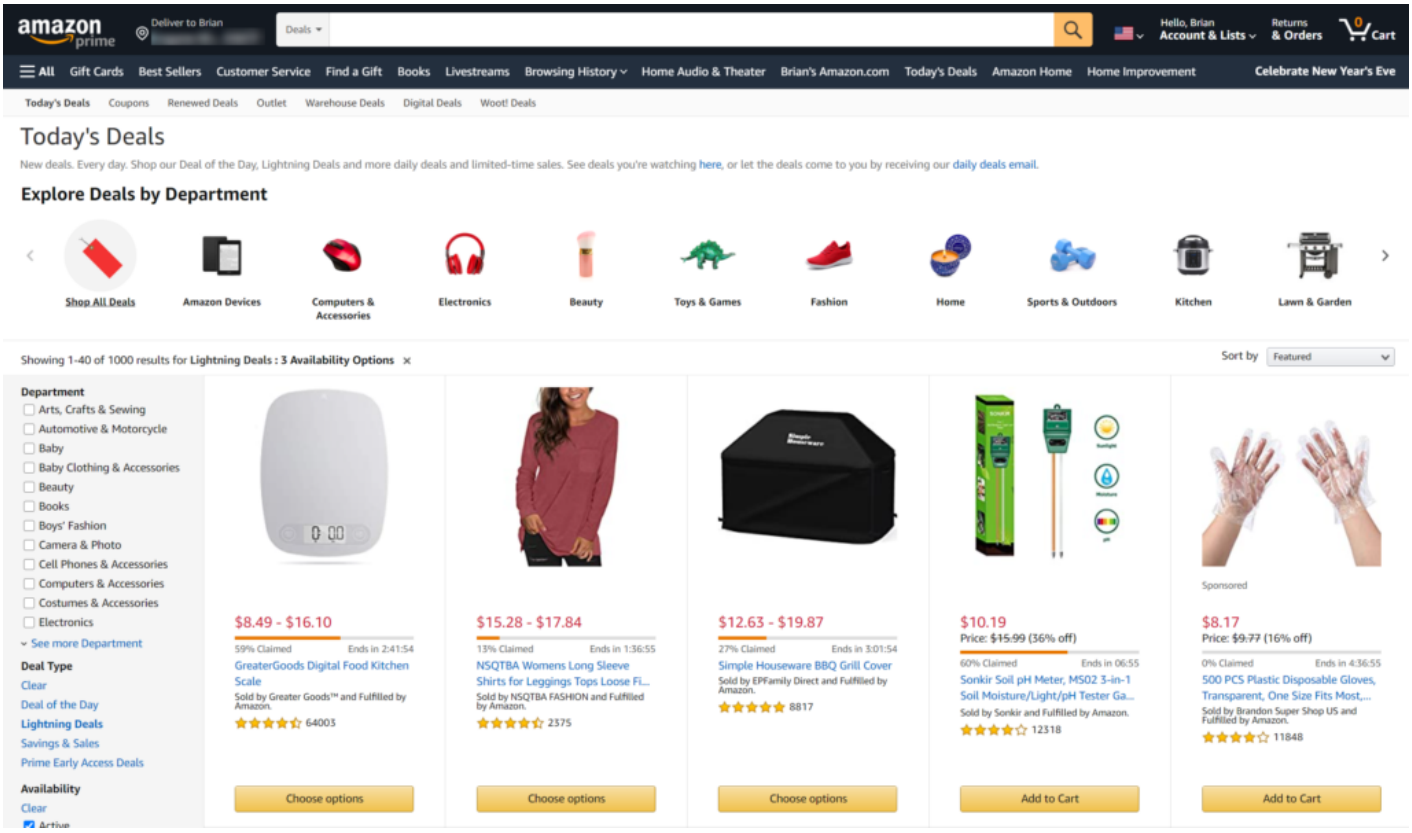
Built on Bubble

Appendix D: Amazon's limited time and limited quantity messages during 'lightning deals' promotion



Appendix E: Meta-motivational states inducing hypothetical scenarios

Scenario for Telic motivational state

It's Monday morning, and you are a driven business professional preparing for a crucial one-week business trip to attend trade shows across 4 cities on the West Coast. Your flights are set, but your accommodation remains un-booked. With a tight schedule and the need to prepare for the trade shows and pack your belongings, you prioritize efficiency and timesaving.

You come across Heritage Stay, a hospitality start-up that leases and manages several rentals across the West Coast with a recently revamped online booking application. You are eager to try the application, knowing that it could simplify your search for the perfect place to stay.

Your itinerary is as follows:

- The first night (March 18 - March 19) you will stay at Las Vegas
- The second night (March 19 – March 20) you will stay at San Francisco
- The third night (March 20 – March 21) you will stay at San Diego
- The fourth/last night (March 21 – March 22) you will stay at Los Angeles

After inputting your itinerary, including the cities and dates of your stay, the number of guests (1), you carefully review each listing, considering the amenities and location of each property. You want to ensure that each choice meets your needs. In addition, Heritage Stay is running a 15% discount promotion on extra services that you could book along with your accommodation, you are welcome to consider the extra services.

You are ready to book your first night's stay, clicking the 'Reserve' button with confidence and a sense of satisfaction knowing you have made a step towards a successful business trip. By the end of the day, you have booked all four of your accommodations, and you are ready to focus on other crucial preparations for your business trip.

Scenario for Paratelic motivational state

It's a Friday evening and you've just finished a long workweek. You and your friends want to relieve the boredom by thinking about what to do for a fun and relaxing spring break, but don't have any concrete plans yet. You all gather around your computer and start browsing travel websites, looking for inspiration.

As you search, you come across Heritage Stay, a hospitality start-up that leases and manages short-term rentals across the West Coast. You feel a rush of excitement as you load the website and start browsing through the listings.

You simply start exploring the options for a potential 4-night trip after browsing an itinerary on a travel blog:

- The first night (March 18 - March 19) you might stay in Las Vegas, known for its famous casinos and shows.
- The second night (March 19 – March 20) you might stay in San Francisco, known for its iconic landmarks and diverse cultures.
- The third night (March 20 – March 21) you might stay in San Diego, known for its stunning beaches and vibrant nightlife.
- The fourth/last night (March 21 – March 22) you might stay in Los Angeles, known for its renowned entertainment scene.

You're not in a rush. You're feeling lighthearted and carefree. There's no pressure to book anything, you're just having a good time exploring the options. You input your travel dates, and the number of guests (1), and hit search. Eventually, you pick out a listing in each of the 4 cities that appeal to you, and you proceed through the booking process for the first night by clicking the ‘Reserve’ button. In addition, Heritage Stay is running a 15% discount promotion on extra services that you could book along with your accommodation, you are welcome to consider the extras.

Appendix F: Survey Instrument

Study Instruction

HEC MONTRÉAL

Instructions:

- Firstly, you will be presented with a shopping scenario where you will be asked to browse an online accommodation booking website.
- Then you will be asked to complete a post-task questionnaire of 3 pages of questions.
- After that, you will repeat this process of doing another shopping task and answering the post-task questionnaire 3 more times.
- At the end of the study, you will be asked to fill out 3 additional pages of the questionnaire about the study and demographic information.
- The entire study is estimated to take up to 1 hour to complete.

Please read the scenario below carefully before starting your study:

It's a Friday evening and you've just finished a long workweek. You and your friends want to *relieve the boredom* by thinking about what to do for a fun and relaxing spring break, but don't have any concrete plans yet. You all gather around your computer and start browsing travel websites, looking for inspiration.

As you search, you come across Heritage Stay, a hospitality start-up that leases and manages short-term rentals across the West Coast. You feel a *rush of excitement* as you load the website and start browsing through the listings.

You simply start *exploring the options for a potential* 4-night trip after browsing an itinerary on a travel blog:

1. **The first night (March 18 - March 19) you might stay in San Diego, known for its stunning beaches and vibrant nightlife.**
2. The second night (March 19 - March 20) you might stay in Las Vegas, known for its famous casinos and shows.
3. The third night (March 20 - March 21) you might stay in Los Angeles, known for its renowned entertainment scene.
4. The fourth and final night (March 21 - March 22) you might stay in San Francisco, known for its iconic landmarks and diverse cultures.

You're *not in a rush*. You're feeling *lighthearted and carefree*. There's *no pressure to book anything*, you're just *having a good time* exploring the options. You input your travel dates, and the number of guests (1), and hit search. Eventually, you pick out a listing in each of the 4 cities that appeal to you, and you proceed through the booking process for the first night by clicking the 'Reserve' button. In addition, Heritage Stay is running a 15% discount promotion on extra services that you could book along with your accommodation, you are welcome to consider the extras.

***You must keep this window open while browsing the website.**

Survey Completion
0% 100%

→

Powered by Qualtrics

HEC MONTRÉAL

Which dates did you book for?

- ○ March 18 - March 19
- ○ March 19 - March 20
- ○ March 20 - March 21
- ○ March 21 - March 22

Which city did you book for?

- ○ Las Vegas
- ○ Los Angeles
- ○ San Francisco
- ○ San Diego

Please refer to the confirmation page of your booking and select the following extras:

	Yes	No	Not an option
Extra breakfast	○	○	○
Extra corner room	○	○	○
Extra airport shuttle	○	○	○

Overall, while searching for an accommodation for your San Diego spring break trip, please rate your experience with the following statements:

As I browsed this website, I had the urge to claim the 15% discount promotion on the extras in addition to booking an accommodation for my San Diego spring break trip.

Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

Browsing this website, I had the desire to take advantage of the 15% discount promotion on the extras besides booking an accommodation for my San Diego spring break trip.

Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

While browsing this website, I had the inclination to add the discounted extras along with booking an accommodation for my San Diego spring break trip

Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

After searching for an accommodation for your San Diego spring break trip, please select one of the following statements that most accurately describes your experience:

- ○ Booking the accommodation only
- ○ Booking the accommodation only (although I kind of wanted to claim the 15% discount promotion on SOME of the extras)
- ○ Booking the accommodation only (although I kind of wanted to claim the 15% discount promotion on ALL the extras)
- ○ Booking the accommodation AND SOME of the extras
- ○ Booking the accommodation AND ALL of the extras

Please click on the Next button to proceed to the next question.

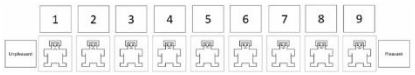
Survey Completion
0% 100%

→

HEC MONTRÉAL

Thinking about the image below, please select the figure that most accurately shows **how you feel** while searching for an accommodation for your San Diego spring break trip.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9



Thinking about the image below, please select the figure that most accurately shows the **intensity of your feelings** while searching for an accommodation for your San Diego spring break trip:

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9

Please slide the button on the scale below to indicate **how you feel** while searching for an accommodation for your San Diego spring break trip.

Pleasure level

Please slide the button on the scale below to indicate the **intensity of your feelings** while searching for an accommodation for your San Diego spring break trip.

Arousal level

While searching for an accommodation for my San Diego spring break trip, I felt:

	Significantly	Quite	Slightly	Neither	Slightly	Quite	Significantly	
Stimulated	○	○	○	○	○	○	○	Relaxed
Calm	○	○	○	○	○	○	○	Excited
Frenzied	○	○	○	○	○	○	○	Sluggish
Unaroused	○	○	○	○	○	○	○	Aroused
Jittery	○	○	○	○	○	○	○	Dull
Wide awake	○	○	○	○	○	○	○	Sleepy
Happy	○	○	○	○	○	○	○	Unhappy
Annoyed	○	○	○	○	○	○	○	Pleased
Satisfied	○	○	○	○	○	○	○	Unsatisfied
Melancholic	○	○	○	○	○	○	○	Contented
Hopeful	○	○	○	○	○	○	○	Despairing
Uncomfortable	○	○	○	○	○	○	○	Comfortable

Please click on the Next button to proceed to the next question.

→

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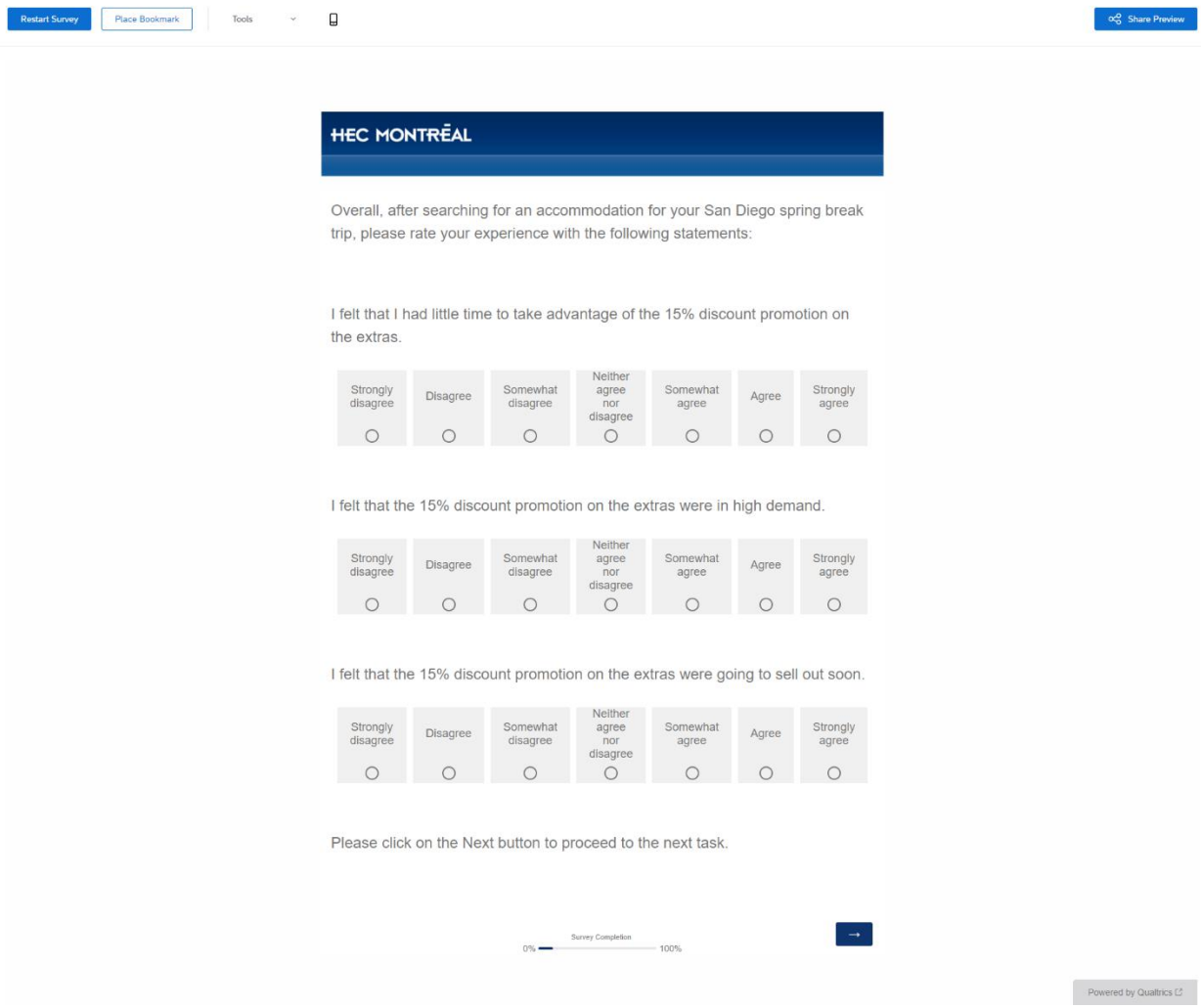
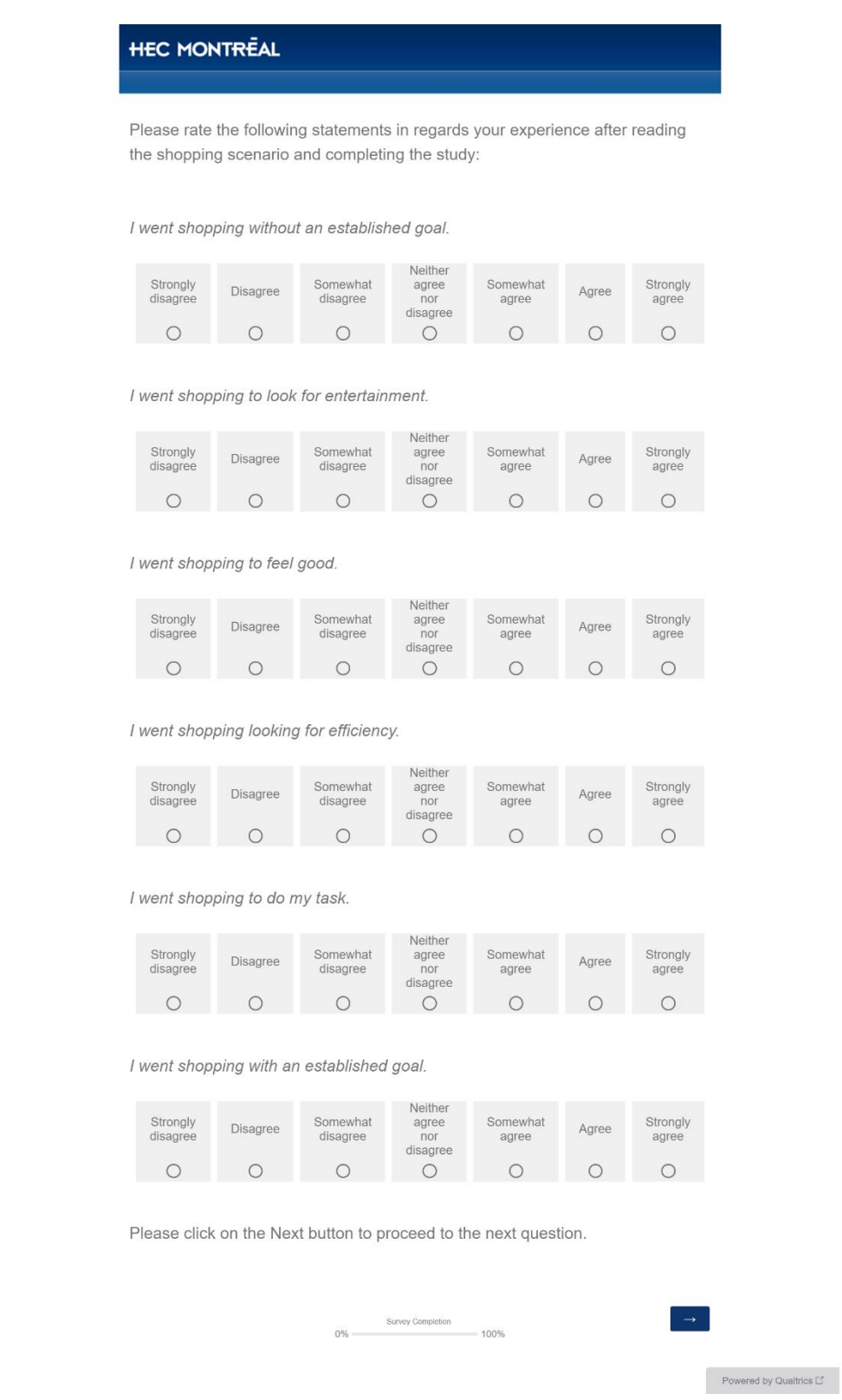

Restart Survey
Place Bookmark
Tools
Share Preview
HEC MONTRÉAL
Overall, after searching for an accommodation for your San Diego spring break trip, please rate your experience with the following statements:
I felt that I had little time to take advantage of the 15% discount promotion on the extras.
Strongly disagree
Disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Agree
Strongly agree
I felt that the 15% discount promotion on the extras were in high demand.
Strongly disagree
Disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Agree
Strongly agree
I felt that the 15% discount promotion on the extras were going to sell out soon.
Strongly disagree
Disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Agree
Strongly agree
Please click on the Next button to proceed to the next task.
Survey Completion
0%
100%
Powered by Qualtrics

Post study questionnaire



HEC MONTRÉAL

Please indicate your level of agreement with the following statements:

I usually think carefully before I buy something.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I usually only buy things that I intended to buy.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

If I buy something, I usually do that spontaneously.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

Most of my purchase are planned in advance.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I only buy things that I really need.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

It is not my style to just buy things

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I like to compare different brands before I buy one.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

Before I buy something I always carefully consider whether I need it.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I am used to buying things 'on the spot'.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I often buy things without thinking.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

It is a struggle to leave nice things I see in a shop.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I sometimes cannot suppress the feeling of wanting to buy something.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I sometimes feel guilty after having bought something.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I'm not the kind of person who 'falls in love at first sight' with things I see in shops.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I can become very excited if I see something I would like to buy.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I always see something nice whenever I pass by shops.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I find it difficult to pass up a bargain.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

If I see something new, I want to buy it.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I am a bit reckless in buying things.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

I sometimes buy things because I like buying things, rather than because I need them.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

Please click on the Next button to proceed to the next question.

HEC MONTRÉAL

Which race do you identify with?

- ◯ White
- ◯ Black or African American
- ◯ American Indian or Alaska Native
- ◯ Asian
- ◯ Native Hawaiian or Pacific Islander
- ◯ Preferred not to say
- ◯ Other

Which category below includes your age?

- ◯ 18-20
- ◯ 21-29
- ◯ 30-39
- ◯ 40-49
- ◯ 50-59
- ◯ 60+

What is your gender identity?

- ◯ Male
- ◯ Female
- ◯ Non-binary / third gender
- ◯ Prefer not to say
- ◯ Others

What is the highest level of school you have completed or the highest degree you have received?

- ◯ Less than high school degree
- ◯ High school degree or equivalent (e.g., GED)
- ◯ Cegep/Associate degree
- ◯ Bachelor degree
- ◯ Graduate degree

Which program are you in?

Please enter your participant ID

Please click Next to submit the survey and end the study.

→

Survey Completion
0% 100%

Appendix G: Ethics forms

HEC MONTRÉAL

Comité d'éthique de la recherche

December 07, 2022

To the attention of:
Nhu Ngo

Re: Ethics approval of your research project

Project No.: 2023-5327

Title of research project: Research on the use of dark patterns in online booking context and the implication on impulse buying intention

---

Your research project has been evaluated in accordance with ethical conduct for research involving human subjects by the Research Ethics Board (REB) of HEC Montréal.

A Certificate of Ethics Approval attesting that your research complies with HEC Montréal's *Policy on Ethical Conduct for Research Involving Humans* has been issued, effective December 07, 2022. This certificate is **valid until December 01, 2023.**

In the current context of the COVID-19 pandemic, you must ensure that you comply with the directives issued by the Government of Quebec, the Government of Canada and those of HEC Montréal in effect during the state of health emergency.

Please note that you are nonetheless required to renew your ethics approval before your certificate expires using Form *F7 – Annual Renewal*. You will receive an automatic reminder by email a few weeks before your certificate expires.

When your project is completed, you must complete Form *F9 – Termination of Project*. (or *F9a – Termination of Student Project if certification is under the supervisor's name).* **All students must complete an F9 form to obtain the "Attestation d'approbation complétée" that is required to submit their thesis/master's thesis/supervised project.**

If any major changes are made to your project before the certificate expires, you must complete Form *F8 – Project Modification.*

Under the *Policy on Ethical Conduct for Research Involving Humans*, researchers are responsible for ensuring that their research projects maintain ethics approval for the entire duration of the research work, and for informing the REB of its completion. In addition, any significant changes to the project must be submitted to the REB for approval before they are implemented.

You may now begin the data collection for which you obtained this certificate.

We wish you every success in your research work.

REB of HEC Montréal

HEC MONTRÉAL

Comité d'éthique de la recherche

CERTIFICAT D'APPROBATION ÉTHIQUE

La présente atteste que le projet de recherche décrit ci-dessous a fait l'objet d'une évaluation en matière d'éthique de la recherche avec des êtres humains et qu'il satisfait aux exigences de notre politique en cette matière.

Projet # : 2023-5327

Titre du projet de recherche : Research on the use of dark patterns in online booking context and the implication on impulse buying intention

Chercheur principal :
Nhu Ngo,

Directeur/codirecteurs :
Camille Grange
Professeur - HEC Montréal

Date d'approbation du projet : December 07, 2022

Date d'entrée en vigueur du certificat : December 07, 2022

Date d'échéance du certificat : December 01, 2023

Maurice Lemelin
Président
CER de HEC Montréal

Signé le 2022-12-07 à 15:13

HEC MONTRÉAL

Comité d'éthique de la recherche

October 26, 2023

To the attention of : Nhu Ngo

Project No. 2023-5327

Title:Research on the use of dark patterns in online booking context and the implication on impulse buying intention

Funding source : Subvention HEC - Chaire Institutionelle (32 153 200 22 G772)

Title of the grant : Chaire commerce électronique RBC

Dear Nhu Ngo**,**

Further to your request for renewal, the Ethics Approval Certificate for the above project has been renewed as at December 01, 2023. **This certificate is valid until December 01, 2024.**

You must therefore request renewal of your ethics approval before that date using Form *F7 – Annual Renewal*. You will receive an automatic reminder by email a few weeks before your certificate expires.

If any major changes are made to your project before the certificate expires, you must complete Form *F8 – Project Modification*.

Please note also that any new member of your research team must sign the Confidentiality Agreement, which must be sent to us prior to your request for renewal.

When your project is completed, you must complete Form *F9 – Termination of Project*. (or *F9a – Termination of Student Project if certification is under the supervisor's name).* **All students must complete an F9 form to obtain the "Attestation d'approbation complétée" that is required to submit their thesis/master's thesis/supervised project.**

We wish you every success in your research work.

Yours very truly,

REB of HEC Montréal

HEC MONTRÉAL

Comité d'éthique de la recherche

RENOUVELLEMENT DE L'APPROBATION ÉTHIQUE

La présente atteste que le projet de recherche décrit ci-dessous a fait l'objet d'une évaluation en matière d'éthique de la recherche avec des êtres humains et qu'il satisfait aux exigences de notre politique en cette matière.

Projet # : 2023-5327

Titre du projet de recherche : Research on the use of dark patterns in online booking context and the implication on impulse buying intention

Chercheur principal : Nhu Ngo

Directeur/codirecteurs : Camille Grange, Professeur - HEC Montréal

Date d'approbation du projet : December 07, 2022

Date d'entrée en vigueur du certificat : December 01, 2023

Date d'échéance du certificat : December 01, 2024

Maurice Lemelin
Président
CER de HEC Montréal

Signé le 2023-10-26 à 14:53

HEC MONTRÉAL

Comité d'éthique de la recherche

ATTESTATION D'APPROBATION ÉTHIQUE COMPLÉTÉE

La présente atteste que le projet de recherche décrit ci-dessous a fait l'objet des approbations en matière d'éthique de la recherche avec des êtres humains nécessaires selon les exigences de HEC Montréal.

La période de validité du certificat d'approbation éthique émis pour ce projet est maintenant terminée. Si vous devez reprendre contact avec les participants ou reprendre une collecte de données pour ce projet, la certification éthique doit être réactivée préalablement. Vous devez alors prendre contact avec le secrétariat du CER de HEC Montréal.

Projet # : 2023-5327 - Heritage Stay

Titre du projet de recherche : Scarcity and Social Proof Dark Patterns in Online Travel Accommodation Booking: the Interplay between Perceived Arousal, Meta-motivational States and Urge to Buy Impulsively

Chercheur principal : Nhu Ngo

Directeur/codirecteurs : Camille Grange

Date d'approbation initiale du projet : December 07, 2022

Date de fermeture de l'approbation éthique : November 29, 2023

Maurice Lemelin
Président
CER de HEC Montréal

Signé le 2023-11-29 à 15:35