

Impulse Buying: Design Practices and Consumer Needs

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ABSTRACT

E-commerce sites have an incentive to encourage impulse buying, even when not in the consumer's best interest. This study investigates what features e-commerce sites use to encourage impulse buying and what tools consumers desire to curb their online spending. We present two studies: (1) a systematic content analysis of 200 top e-commerce websites in the U.S. and (2) a survey of online impulse buyers (N=151). From Study 1, we find that e-commerce sites contain multiple features that encourage impulsive buying, including those that lower perceived risks, leverage social influence, and enhance perceived proximity to the product. Conversely, from Study 2 we find that online impulse buyers want tools that (a) encourage deliberation and avoidance, (b) enforce spending limits and postponement, (c) increase checkout effort, (d) make costs more salient, and (e) reduce product desire. These findings inform the design of "friction" technologies that help users make more deliberative consumer choices.

CCS CONCEPTS

• **Human-centered computing** → **User studies; Interaction design.**

KEYWORDS

E-commerce; Dark Patterns; Self-control; Behavior Change

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1 INTRODUCTION

Impulse buying, or making unplanned purchases with little deliberation [46, 69], is commonplace in the United States; roughly 84-86% of Americans report making impulsive purchases in stores and online [47, 55]. Unfortunately, impulse buying can lead to a host of negative outcomes, including financial strain [69], feelings of guilt, shame, and regret [55, 89], and strain on personal relationships [55]. Even when used strategically to cope with negative emotions, impulse buying can backfire and lead to a greater number of ruminating and negative thoughts [26]. While consumers have reported a desire to curb their impulse buying [87], retailers have little incentive to support this goal and are often criticized for promotional and design strategies that seem to aggressively encourage impulse buying [33, 84].

Behavior change research in HCI has explored ways to support financial health, with tools that track personal finances [43] and UI design features that encourage saving for retirement [31]. More recent work on "dark patterns" has highlighted the use of intentionally deceptive functionality designed to persuade, or even manipulate, users into signing up for or purchasing things that may not be in the user's best interest [30]. The current research bridges themes from HCI and consumer behavior by prioritizing the needs of the user/consumer in designing new self-control technologies. To do so, we capture current design practices found on e-commerce sites (Study 1) and then investigate the needs and preferences of online impulse buyers (Study 2).

Results from Study 1 show that the top 200 e-commerce sites in the U.S. use multiple features that encourage impulse buying; common features include those that: (a) lower the perceived risk of transacting online, (b) leverage social influence, (c) enhance perceived proximity to the product, and (d) enhance perceived temporal proximity to the product. For example, Booking.com utilizes a variety of social influence features such as "11 people are looking right now" and "In high demand!" (Figure 1). In contrast, Study 2 reveals a range of web tools that online impulse buyers want to

discourage their impulse buying, including those that leverage deliberation, avoidance, spending limits, postponement, increased checkout effort, more salient costs, and reduced product desire. Social accountability tools were less popular.

This work is driven by a consumer advocate perspective that prioritizes ethical design practices and consumer well-being. We (a) demonstrate that the use of impulse buying features is common and does not vary significantly by a site's product focus, (b) highlight which e-commerce sites may be especially encouraging of impulse buying, and (c) catalog commonly used features that can encourage impulse buying. For researchers and designers interested in designing tools to support this population of consumers, we provide insights into the types of tools users hope to use in the future to control their impulse spending. We synthesize findings from our content analysis and user survey to emphasize transparency opportunities for e-commerce companies and to propose potential technological interventions that can help consumers exert greater self-control with e-commerce.

2 CONTENT ANALYSIS (STUDY 1)

Online impulse buying is a regular topic in the popular press, which reports on the thousands of dollars consumers “waste” annually [83] and prescribes tips on how to avoid impulsive spending [16, 72, 76]. Yet little research has investigated the types of features that e-commerce sites utilize to encourage this behavior. Early research on “unregulated buying on the Internet” analyzed eight e-commerce sites and found more features that disrupt self-regulation than encourage it [48]. More recent work has highlighted the use of “dark patterns”—design features intended to trick and trap users [30]. Analysis of dark pattern exemplars revealed features that utilize nagging, obstruction, sneaking, interference, and forced action. Dark patterns related to e-commerce included, for example, sneaking products into shopping carts and obstructing price comparison tools [30]. The goal of this research is to more systematically investigate which features are being utilized by current e-commerce sites that can encourage impulse buying. Therefore, this study asks (RQ1): Do current e-commerce sites include features that can encourage impulse buying? And if so, (RQ2) What types of features do e-commerce sites currently use that can encourage impulse buying?

Encouraging Impulse Buying

While many factors can encourage impulse buying (e.g., individual differences [12, 70] and current mood [26]), this research focuses on factors related to the product or shopping environment. Hoch and Loewenstein theorized that enhancing perceived physical proximity to a product creates feelings of partial ownership and potential loss if the product is not ultimately purchased [36]. Accordingly, a shopper who tries on a new winter coat is more likely to purchase

“their” coat than a shopper who only sees that coat in a store display. Enhancing the vividness and interactivity of online product presentations can help the consumer feel physically closer to the product [80]. In the case of a sunglass e-store, having 360-spin view options or a web-cam mirror to “try on” sunglasses predicted feelings of wanting to impulsively purchase [80]. Shopping through Facebook live video helped consumers feel as though they were shopping in a physical store, increasing impulse buying behavior [49]. Perceived temporal proximity, or how quickly a consumer believes they can acquire a product, can also encourage impulse buying. Immediate rewards are often favored over delayed rewards, even when delayed rewards are larger [36]. The availability of next- or same-day shipping and easy credit (i.e., not having to wait and “save-up” for a purchase) provides the promise of near-instant gratification for online consumers [69, 90].

Lowering the perceived risks of shopping can also encourage impulsive purchasing. Impulse buyers often rely on generous return/refund policies—especially when impulsively buying apparel [41]. Products promoted as “on sale” [40] or that are perceived as a “good deal” can trigger an impulse buy [26, 90]. Similarly, being offered unexpected or surprise coupons at the beginning of a shopping trip can result in a greater number of, and greater amount spent on, unplanned purchases [35].

Social influence, or cues that “leverage the behavior of other users” [15], can also encourage impulsive purchases. Impulse buys can be brought on by social comparison, when, for example, consumers see their peers purchasing a particular product [36]. Friend posts on social network sites about products or local establishments (e.g., restaurants) predict similar online purchases and visits to similar establishments [91]. On social media marketplaces, the more “likes” that a product receives [17, 49] and the larger the live video audience [49], the more likely a consumer is to experience an impulsive urge to buy. E-commerce sites have also found success increasing revenue through the use of social proof cues, such as highlighting “popular” products [15].

Field experiments have shown that more time spent browsing in-store leads to more impulse purchases [12, 63]. Similarly, time spent browsing an online store positively affects a consumer's felt urge to buy impulsively [79, 92]. The effect may be explained by greater exposure to novel products and marketing stimuli. Consumers assigned to shop in an unfamiliar grocery store contended with unfamiliar store layouts, increasing their exposure to in-store marketing stimuli, leading to increased impulse buying [63]. Similarly, exposure to online product recommender systems can increase a consumer's number of unplanned purchases [38].

Add-on benefits describe when a purchase is made more attractive by bundling it with add-ons, such as free gifts.

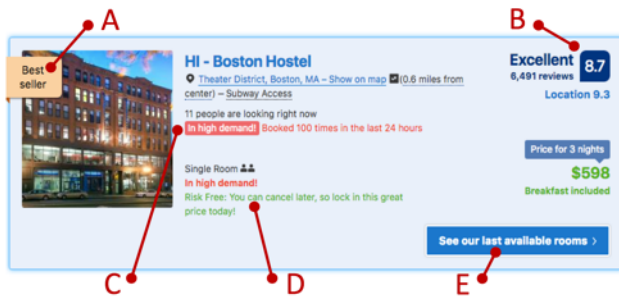


Figure 1: Screenshot from Booking.com illustrating features (A) bestseller tag, (B) ratings and number of ratings, (C) number of customers interested and selling fast tag, (D) free cancellation, and (E) low stock warning.

Consumers have reported that entry into a sweepstakes or the promise of a “free gift with purchase” have triggered an impulse purchase [44, 90]. The shopping momentum effect describes how making an initial purchase creates a “psychological impulse” to make additional purchases [21]. Recent work has shown that making an unplanned purchase increases the probability of making subsequent unplanned purchases, especially for those with medium (versus small) sized budgets [27]. Perceived product scarcity is the “perception of a product shortage” conveyed to consumers through “limited-quantity” messaging [3]. One way that e-commerce sites enhance perceived product scarcity is through “stock pointers” (e.g., only 1 left in stock) [15]. When consumers perceive that a product of interest is almost out of stock, they experience an urge to purchase that product immediately [32]. Urgency, in contrast, is based on limited-time availability messaging that, for example, urges a consumer to take action before a deadline, sometimes implemented on e-commerce sites with a countdown clock [15]. Research has shown that limited-time offers are one of the most commonly self-reported triggers of online impulse buying [52].

The presence of product advertising has long been associated with impulse buying behavior and can include stimuli such as mass advertising [74] and in-store marketing materials [63]. Other miscellaneous factors that have been shown to encourage impulse buying include visually appealing website design [62], diverse product assortments [51], appetitive stimuli (e.g., “mouthwatering photography”) [88], and user-friendly website navigation [62].

Method

Content analysis is a well-established “observational” research method used to systematically evaluate the content of different types of communication [45]. We conducted a content analysis of 200 e-commerce sites to systematically assess the presence of features related to impulse buying.

Sample Selection. The U.S. Census Bureau segments the “Electronic Economy” into 4 sectors: Manufacturing, Retail, Services, and Wholesale [2]. This work focuses on Retail primarily, as well as the travel services segment of Services, both of which cater to consumers. We analyzed the top 200 retail websites from Internet Retailer’s 2017 Top 500 Report, an annual industry report of the top internet retailers in the United States by online revenue [67]. We chose the top 200 sites to capture a range of websites but without having to code all 500. We excluded purely informational corporate websites and non-functional websites (i.e., out of business). We added eBay, a large online auction site, and the top earning U.S. based travel websites, which were not included in Internet Retailer’s report, to our sample. The final sample includes 186 retail sites (e.g., Amazon.com, OfficeDepot.com, PetCo.com) and 14 travel sites (e.g., Expedia.com, Booking.com, Airbnb.com).

Website Archiving. All websites were archived in PDF format in April 2018, over the course of seven days. A research assistant visited all websites using a Chrome browser on an HP desktop computer. Because some e-commerce sites track user behavior in order to personalize content [1], sites were visited in “incognito” mode to prevent our sample from reflecting the personalized content of one person. The research assistant used each website’s navigation bar to drill down to a specific product type. When possible, products were selected from a list of product types that are more likely to be purchased on impulse (i.e., lower-cost items such as books, toys, small electronics, makeup, clothing, accessories, and home décor [24, 40]). For specialty websites that specialized in a particular product type (e.g., 1800Flowers.com), that product was selected. The average price of the product captured was \$29.22 ($SD=\67.14, $min=\$0.69$, $max=\$599$).

A full-page screen capture was taken of (a) the home page, (b) all pop-up windows and special interactivity, such as quick-view buttons, (c) a fully expanded homepage navigation bar, (d) any “sale” or “deal” pages, (e) a product listing page (e.g., all winter scarves), (f) a product details page (e.g., for one particular scarf), (g) any product interactivity such as video, zoom, spin, or virtual dressing rooms, (h) the shopping cart, and (i) the first checkout screen. The full checkout process was not captured because that would have required making a purchase. No paid membership accounts (e.g., Amazon Prime) were used. The average number of pages captured per website was 9.26 ($SD=1.98$, $min=4$, $max=14$).

Coding Procedure. We developed a codebook based on themes identified from our review of prior work in impulse buying. Keeping these themes in mind, the lead author visited several e-commerce sites (independent from the study’s sample) and generated an initial list of features that can encourage impulse buying. For example, the literature suggests that

social influence can encourage impulse buying [17, 49, 91] and therefore features such as product recommendations based on what “other customers” purchased were added to the codebook under the social influence theme. The list was expanded to also include features that can encourage deliberative decision-making (e.g., product comparison tools). The research team then reviewed, discussed, and revised the initial list of features. The list was then reviewed and expanded by an independent group of six doctoral students. The list of features was then reviewed one last time and finalized by the research team.

The codebook excluded features that were not conducive to a binary (present/not present) measurement (e.g., visually appealing). The final codebook included 12 themes: physical proximity, temporal proximity, lower risk, social influence, browsing, add-on benefit, perceived scarcity, urgency, shopping momentum, advertising, investment, and deliberation. We added the “investment” theme for a small number of features that did not map to any themes identified in prior work. Investment features require an investment from the consumer (usually time or effort) in exchange for information or functionality that can encourage impulse buying in the future (e.g., completing a personalization quiz). Themes were represented by a total of 71 parent codes (i.e., features) and two child codes. Websites were coded using Atlas.ti for whether a feature was or was not present on a website.

Inter-Rater Reliability and Analysis. Inter-rater reliability (IRR) was established and measured following Lombard et al. [53]. The lead author first trained a research assistant on a small sample of websites independent from the study’s main sample (N=3, representing 1.5% of full sample size). The two researchers then completed independent pilot coding of two new websites (also not part of the study’s main sample), compared coding, discussed points of disagreement, and refined the codebook. The two researchers then conducted independent coding of 20 websites (10% of the full corpus [20, 53]) randomly selected from the study’s sample of 200 websites. IRR for the two coders was Cohen’s Kappa of .83, demonstrating sufficient agreement between coders [53]. One coder completed the remaining 180 websites in a random order. We conducted all statistical analyses (frequency counts and comparison of means) using SPSS.

Results

Websites Use Impulse Buying Features. Research question 1 asked whether current e-commerce sites include features that can encourage impulse buying—our results show that they do and that the use of those features was common among the websites sampled. Among all websites sampled (N=200), an average of 19.36 features ($SD=5.64$, $min=4$, $max=34$, $median=19$) were present out of a possible 64 features. 75%

(N=150) of websites had at least 16 features that can encourage impulse buying. 100% (N=200) of websites included at least 4 features that can encourage impulse buying. Websites also included deliberation features ($M=1.97$, $SD=1.48$, $min=0$, $max=6$, $median=2$, out of a possible 7 features). 75% (N=150) of websites included at least 1 deliberation feature. 16% (N=32) of websites included no deliberation features.

Most and Least Common Features. Research question 2 asked what types of features do e-commerce sites currently use that can encourage impulse buying. The most common impulse buying features, found in 75% of websites, included member/rewards program discounts, discounted prices, product ratings/reviews, sale pages, product interactivity (e.g., photo zoom/spin), and returns/refunds. The least common features included entry into a sweepstakes with a purchase, displaying a countdown clock for limited-time product availability, quick check-out buttons, a discount for the first purchase made on the site, virtual dressing rooms, and showing that social media friends have purchased the product. Fewer than 3% of websites included any one of these features. See Table 1 for a report on all features.

Most and Least Common Themes. When features were analyzed at the theme level, we found that features that lower the perceived risk of transacting on an e-commerce site (e.g., discounts, returns/refunds, and third-party seals such as Verisign™) were the most common theme—100% (N=200) of websites sampled included features in this category. Another common theme of feature included those that rely on social influence, such as product ratings/reviews, sharing carts/products, bestseller tags, and product recommendations based on what “other” people bought—96% (N=192) of websites sampled included features in this category. Features that enhance a user’s perceived physical proximity to a product were also common, such as product interactivity (zoom/spin of product photos), multiple product photos, previews of product specs such as different colors, and product videos or animation—91% (N=182) of websites included features in this theme. Features that enhance the perceived temporal proximity to a product (e.g., same day delivery, store pick-up, quick add-to-cart buttons, quick check-out pop-ups) were also common—more than 90% (N=181) of websites included this theme.

Other common themes included those that try to generate shopping momentum (e.g., add-on product recommendations) and that encourage browsing (e.g., curated product collections). These two themes were each present in at least 82% of websites sampled. Features that encourage more deliberative decision making, rather than impulsive purchasing, were also a common theme, with 84% (N=168) of websites including at least one feature that encourages deliberation.

Theme	Feature	Count	Theme	Feature	Count
Lower risk	member/rewards program discounts	183	Perceived scarcity	exclusive product	46
Lower risk	discounted price	167	Deliberation	rating distribution	42
Social influence	product ratings/reviews	164	Social influence	others bought recommendations	42
Lower risk	sale page/list	163	Social influence	positive review highlighted	41
Physical proximity	interactivity	160	Social influence	show real customers using product	41
Lower risk	returns/refunds	151	Browsing	others viewed recommendations	39
Social influence	number of ratings/reviews	145	Physical proximity	video/animation of product	39
Social influence	share cart or product (no counter)	128	Perceived scarcity	limited-quantity for sale (not low-stock)	36
Deliberation	wishlist	126	Browsing	personalized recommendations	34
Temporal proximity	quick add-to-cart button	125	Perceived scarcity	exclusive price	34
Browsing	product collection(s) for browsing	119	Perceived scarcity	low stock warning	34
Social influence	bestseller tag	118	Temporal proximity	easy credit/payment terms	34
Advertising	internal ads	117	Investment	requires account to buy	29
Urgency	limited-time discount (no countdown clock)	116	Perceived scarcity	sold out/back-ordered tag	29
Physical proximity	multiple product pictures	113	Urgency	order deadline for shipping	28
Lower risk	third-party seal	108	Urgency	limited-time discount (with countdown clock)	27
Browsing	similar products recommendations	103	Urgency	lock in discount now feature	26
Temporal proximity	expedited shipping (all)	103	Lower risk	price match guarantee	25
	expedited shipping (next day) (count=52)	~	Investment	sign up for price alerts	15
	expedited shipping (same day) (count=9)	~	Social influence	referral discount	15
Shopping momentum	discounted shipping with minimum spent	96	Perceived scarcity	selling fast tag	14
Physical proximity	preview products specs	88	Shopping momentum	discount for auto-reorder	14
Shopping momentum	add-on product recommendations	87	Social influence	share cart/product (with counter)	14
Browsing	product quickview button	76	Add-on benefit	donation with purchase	13
Shopping momentum	discount for add-on products	72	Social influence	number sold/number of customers	13
Lower risk	discount for providing email address	67	Urgency	limited-time product availability (no clock)	12
Temporal proximity	store pick-up	67	Lower risk	trial period	11
Add-on benefit	free gift with purchase	65	Social influence	number customers interested/watching	11
Lower risk	discount/promo code (not for shipping)	58	Deliberation	negative review highlighted	10
Browsing	general product recommendations	57	Investment	personalization quiz	10
Deliberation	product comparison tool	57	Lower risk	free reservation cancelation	7
Deliberation	helpful review voting	56	Social influence	shows social media friends have purchased	5
Deliberation	product Q&A section	56	Physical proximity	virtual dressing room	3
Advertising	external ads / sponsored products	55	Shopping momentum	first purchase discount	3
Temporal proximity	checkout popup	51	Temporal proximity	quick checkout button	2
Deliberation	save-for-later list	47	Urgency	limited-time product availability (with clock)	2
			Add-on benefit	sweepstakes with purchase	1

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Table 1: Frequency count of websites (max=200) that included at least one instance of each impulse buying feature (code).

Such features included wish lists, save-for-later lists, product comparison tools, and product Q&A sections. Less common themes included features that enhance a user’s sense of urgency (N=138, 69.0%) (e.g., limited-time discounts with countdown clocks), relied on advertising (N=135, 67.5%) (e.g., sponsored products), or enhanced the perceived scarcity of a product (N=124, 62%) (e.g., low stock warnings, exclusive product offerings). The least common themes of impulse buying features included those that provided an add-on benefit for purchasing (e.g., free gift with purchase) and those that relied on the user to make a time investment (e.g., signing-up for price alerts)—fewer than 40% of websites included features in either of these two themes.

Top Websites. Table 2 lists the top 18 websites (roughly top 10%) based on number of impulse buying features. The top 18 websites all included at least 27 features ($M=29.33$, $SD=2.47$) that can encourage impulse buying. Macys.com, OpticsPlanet.com, Amazon.com, Newegg.com, and Target.com topped the list, each including more than 30 impulse buying features

on their sites. The top 18 websites also included on average 2.78 features ($SD=1.26$, $min=1$, $max=6$, $median=3$) that can encourage deliberation.

Number of Features by Product Type. Product type was pulled from Internet Retailer’s Top 500 Report [67], which classified websites into one of 15 categories: Apparel/Accessories (N=61); Automotive (N=8); Books/Music/Video (N=5); Computers/Electronics (N=10); Flowers/Gifts (N=5); Food/Drug (N=9); Hardware (N=10); Health/Beauty (N=15); Housewares (N=13); Jewelry (N=6); Mass Merchant (N=18); Office Supplies (N=4); Specialty (N=9); Sporting Goods (N=10); Toys/Hobbies (N=3). We added a final category, Travel (N=14), for a total of 16 product categories. Because the assumption of homogeneous variances was violated (Levene’s, $p=.02$), a Welch ANOVA was used to assess differences between product types. There were no statistically significant differences in the number of impulse buying features between websites with different product types, Welch’s $F(15, 35.62)=1.66$, $p=.11$.

Website	Product Type	Deliberation Features (count)	Impulse Features (count)
macys.com	Apparel/Accessories	3	34
opticsplanet.com	Sporting Goods	4	34
amazon.com	Mass Merchant	6	33
newegg.com	Computers/Electronics	3	32
target.com	Mass Merchant	3	31
officedepot.com	Office Supplies	2	30
jcpenny.com	Apparel/Accessories	3	30
ebay.com	Mass Merchant	2	29
bedbathandbeyond.com	Housewares	3	28
travelocity.com	Travel	2	28
midwayusa.com	Sporting Goods	1	28
bestbuy.com	Computers/Electronics	4	28
ae.com	Apparel/Accessories	1	28
staples.com	Office Supplies	4	27
build.com	Hardware	3	27
williams-sonoma.com	Housewares	2	27
ebags.com	Apparel/Accessories	1	27
nyandcompany.com	Apparel/Accessories	3	27

Table 2: Top websites by number of impulse buying features.

3 SURVEY OF ONLINE IMPULSE BUYERS (STUDY 2)

Consumers report that regret is one of the most common outcomes of impulse buying [55]. The goal of this exploratory survey is to understand the preferences of consumers who engage in online impulse buying but who wish to curb that behavior. To that end, we ask (RQ3) what types of tools do consumers wish they had available to them to help curb their online impulse buying and (RQ4) what self-control strategies have consumers successfully and unsuccessfully used in the past to control their online impulse buying? The survey is inspired by a user-centered design approach [81], reaching out to consumers to inform the development of technology interventions that support them.

Self-control Strategies

We present prior work on self-control and self-regulation strategies, specifically for impulse buying when available and more generally for saving and eating behavior when not available.

Goals, Rules, and Monitoring. Exerting self-control is often motivated by a personal goal to change unwanted behavior. Goal setting involves identifying and setting a goal (e.g., I want a healthier body weight) and then forming goal intentions (e.g., I intend to exercise every day) [8, 29]. Rules, in contrast, establish a hard restriction on one’s behavior and can take the form “I do not do X” or “I always Y.” For example, households with the rule that one spouse’s income is always set aside for savings have been shown to spend less money than households without savings rules [68]. Implementation plans, a type of rule, specify what actions to

take under certain conditions (e.g., “If I’m offered dessert, I’ll always ask for coffee instead”). Meta-analysis data show that implementation plans are effective, with a medium-to-large effect size on goal attainment [29].

Goal priming helps keep goals top of mind in the face of temptations. Lab experiments have shown that participants unconsciously primed with the word “save” (versus “table” in the control condition) reported lower willingness to make unplanned purchases in a shopping scenario [82]. Other research has shown that participants who were primed to take a promotion-focus (i.e., focus on what they wanted) were less likely to yield to a tempting dessert than participants primed with a prevention-focus (i.e., focus on what they wanted to avoid). This suggests that for impulse buyers, focusing on what they hope to achieve (e.g., saving for a vacation) may be a better self-control tactic than focusing on what they hope to avoid (e.g., going further into debt). Finally, monitoring one’s behavior against goals or standards is considered a key criteria for successful self-regulation [11]. Monitoring provides the signal that a behavior shift may be needed to remain in-line with goals or standards. Further, the effort of monitoring can be perceived as a tax on that behavior, creating additional incentives to not engage in it [77].

Commitment Devices. Commitment devices are self-imposed arrangements, typically designed to eliminate future, goal-inconsistent choices [7]. For example, commitment contracts promise a reward or a punishment, contingent on performing or avoiding some behavior (e.g., If I surpass my monthly shopping budget, I am not allowed to watch TV for a month). Commitment contracts can be created with yourself on an “honor” system [7], can be refereed by someone else, or can be structured as a competition among a group of people (i.e., commitment pools). For example, a randomized field experiment in Chile demonstrated that participants who reported their progress toward savings goals at weekly group meetings were able to save more money over time than participants who did not attend [42]. Other commitment devices restrict access to goal-inconsistent options. Examples include cutting up your credit cards to make spending more difficult and putting a lock on the refrigerator to restrict snacking. Consumers sometimes purchase smaller-sized (yet more expensive per-unit) product packaging to slow their consumption of vice products, such as cigarettes [85]. Bank customers enrolled in a savings account that restricted access to funds until a certain date or until their savings goal was met increased their savings by 81 percentage points [6].

Deliberation. Models of self-control describe two systems: the reflective/planner/cool system and the impulsive/doing/hot system [57, 75, 77]. Deliberation strategies work to engage the reflective system to make more considered, less impulsive choices. One such strategy is to conduct a cost assessment,

or a systematic consideration of the economic and psychological costs associated with, for example, an impulse buy [36]. A type of cost assessment is to bundle costs, meaning to consider a product's cumulative price instead of prices presented in smaller, more palatable chunks (e.g., "only 5 installments of \$9.99") [36]. Emotional forecasting is a cost assessment that involves thinking about the emotions you will feel if you, for example, prevail against or yield to a temptation. Lab experiments have shown that participants who thought about the pride they would feel for passing on a piece of cheesecake ate significantly less cake than those who thought about the shame they would feel for yielding to the temptation [64].

Other deliberation strategies include priming elaboration of non-obvious costs [65] or of potential outcomes. Participants who scored low on the tendency to elaborate allocated more money to a retirement fund when they were told to think about the potential positives and negatives of investing [61]. Cognitive reappraisal research has shown that the way you think about a temptation can affect your desire for it. When presented with tempting junk food, participants who were prompted to imagine that something bad had happened to the food, such as someone coughing on it, reported lower levels of desire for the temptation [28].

Avoidance, Postponement, and Substitution. Avoidance involves preventing exposure to factors that can induce an unwanted impulse [36]. Impulsive buyers may try to avoid shopping malls to avoid feeling an impulse to spend. A related strategy, selective attention, involves strategically focusing attention to lessen the pull of a temptation. In Mischel et al.'s classic delay-of-gratification studies, the amount of attention paid to a short-term reward (e.g., a marshmallow) predicted whether a child was able to wait for larger rewards [59]. Children waited longer periods of time when the temptation was not visible and when they focused on the "abstract" qualities (e.g., shape) versus the "arousing" qualities (e.g., taste) of the treat.

Postponement involves "putting off consumption without external reward for incurring the delay" (c.f., delay-of-gratification) [56]. Research in time-inconsistent preferences has shown that adding even a small delay to an immediate reward can shift preferences to larger, long-term rewards [73]. This strategy is made available to consumers who purchase cars or products from persuasive door-to-door sales professionals through "cooling off period" laws [54]. Research has shown that a postponement strategy can be more effective than a total prohibition strategy [56]. Related is the substitution strategy, giving oneself a small immediate reward instead of the larger temptation. The substitution may satisfy the individual enough to reduce the desirability of the larger temptation [36].

Method

We conducted an exploratory, anonymous, online survey of online impulse buyers who wished to curb their online impulse buying. The goal of the survey was to understand what tools consumers want to help them exert greater self-control with e-commerce. The survey also asked about any strategies, successful and unsuccessful, that consumers have used in the past. The 21-item survey was administered through the web platform Qualtrics and ran for 5 days in September 2017. This study was deemed exempt by the research team's Institutional Review Board.

Procedure and Measures. Participants were recruited on shopping groups and self-improvement threads on Facebook, Reddit, and Craigslist. We selected these channels in order to reach frequent online shoppers who also wanted to cut back on their online spending. With permission from group moderators, we posted ads that invited individuals to participate in an online survey for a one-in-ten chance to win a \$15 e-gift card. Recruitment ads linked to a brief questionnaire that screened for (a) living in the United States, (b) age, (c) frequency of online purchases, (d) frequency of making unplanned, impulsive purchases online, and (e) a desire to curb online impulse buying. Responses to both frequency questions were made on a five-point scale, which included 1=never, 2=a few times a year, 3=a few times a month, 4=a few times a week, 5=every day.

Participants who did not live in the U.S., were younger than 18 years, had never purchased something online, had never made an unplanned, impulsive purchase online, or did not have a desire to reduce their online impulse buying did not qualify to participate. All others were directed to an informed consent form. Participants were then asked four free-response (text) questions. To aid recall, participants first listed the types of things they have impulsively purchased online in the past. Participants then listed any (a) successful and (b) not successful strategies that they have used in the past to resist making impulse purchases online. Finally, participants were asked, "If you could talk to the designers of an app or online tool that is meant to help you control the amount of impulse buying you do online, what would you tell them to design/build/create for you?" (adapted from [23]).

Participants were then asked about specific web/app features. First, participants selected one response to a multiple-choice question that asked, "I would like to use an app or online tool that makes me wait 1 - 2 (a) minutes, (b) hours, (c) days, (d) weeks, or (e) months before I can checkout"; participants were also given the option of selecting "I don't want an app / tool that makes me wait to checkout." Next participants were presented a list of 19 web tools and were asked to select all that they "would like to use" when trying

to control impulse buying online. The list of tools was developed to represent self-control strategies such as goal setting [10], monitoring [10], avoidance [36], cost assessments [36], and commitment devices [36]. Example tools included, “Reminds me of my goals, such as to save money” and “Reminds me of my past regretted impulse buys online”.

Participants then completed a modified version of the Impulse Buying Tendency (IBT) scale (adapted to focus on online buying) [86]. The IBT scale is a validated, widely-used five-item scale with items such as “When I see something online that really interests me, I buy it without considering the consequences” and “When I go shopping online, I buy things that I had not intended to purchase.” Responses were made on a seven-point Likert Scale anchored by either *Strongly disagree/Strongly agree* or *Very rarely/Very often*. The survey concluded with demographic questions about gender, income, race, and employment status.

Participants. Out of 255 participants who completed the screening questionnaire, 151 qualified for and completed the survey. Participants were 18-65 years old ($M=36.33$, $SD=10.43$, $median=36$) with 86.1% ($N=130$) identifying as women. Most (67.5%) reported annual household incomes less than \$75,000/year. Half of participants (51.6%) earned an Associate degree or higher. Participants worked full-time (38.4%), were stay-at-home parents (27.2%), worked part-time (19.9%), were unable to work or retired (12.6%), were students (9.3%), were out of work (4.6%), or were military (1.3%). They were primarily caucasian (81.5%) and married or living with a partner (72.2%).

Participants were frequent impulse buyers, with 84.8% making impulse purchases online at least a few times per week. Our sample skewed higher than average ($M=25.44$, $SD=5.62$, $median=26$, $range=6-35$) on the Impulse Buying Tendency (IBT) scale, where scores can range from a minimum of 5 to a maximum of 35. Prior work in convenience student populations and shopping mall visitors reported average IBT scores ranging from 14.73 ($SD=4.16$) to 21.30 ($SD=6.95$) [86]. In our sample, 71.5% had average IBT scores of 22 or above.

The most common products that participants reported buying impulsively online included clothing, household items, children’s items, beauty products, electronics, and shoes. Some participants reported specific vendors (e.g., “anything from amazon”; “small stuff from ebay”), while others noted that they had purchased a wide variety of items on impulse, including “almost anything that seems like a great deal” and “if they sell it, I buy it”. Finally, several participants described their past purchases as items they did not “need”, for example “a random car part I didn’t need” and “unnecessary house hold items”.

Analysis. Descriptive statistics (e.g., frequency counts) were used to analyze results from multiple-choice questions. For

qualitative analysis, the lead author read through all open-ended text responses to identify high level themes, followed by a second reading to develop an initial codebook for each of the four questions. The research team reviewed, discussed, and revised the codebook. Responses from each question were coded by the lead author or a research assistant using the coding software, Atlas.ti. The number of codes per question ranged from 24-32 codes.

Results

Desired Self-control Tools. Survey responses revealed seven categories of desired self-control tools: making costs more salient; encouraging reflection; enforcing spending limits; increasing checkout effort; forcing postponement; avoidance; and reducing product desire. For each category we report results from open-ended text responses, followed by any relevant quantitative results.

Make Costs More Salient. Participants reported wanting features that help make costs more salient while shopping online. Suggested tech features included tools that track total spending, show alternative uses of money, or reframe costs in personally relevant ways. For example, “Something with a log that shows recent impulse buys, along with a total of money spent and equivalence to something else (ex: \$50 spent = approximately 10 specialty coffees or 8 Chipotle burritos)”. Participants wanted a tool that “makes me calculate the number of hours I need to work to pay for the product” (54.3%, $N=82$), a tool that “reminds me of my spending budgeting” (51.7%, $N=78$), or a tool that “reminds me of my goals, such as to save money” (49.7%, $N=75$). Less frequently desired tools included reviewing “all the online purchases I have already made that month” (40.4%, $N=61$), a tool that “reminds me of past regretted impulse buys online” (21.2%, $N=32$), or a tool that “shows me pictures of the negative outcomes of over-shopping (e.g., landfills, sweatshop labor, poverty)” (17.9%, $N=27$).

Encourage Deliberation or Reflection. Participants described wanting features that encourage deliberation or reflection by, for example, completing a needs assessment before making a purchase: “Asking what I would use it for and if I truly need it”; “Ask me a series of questions, do you need? What will you use it for?”; and “Do I need it? Do I love it? Does it spark joy?”. Other participants wanted to be prompted to reflect on their current possessions: “Ask me do you really need that. How many do you have now?”. Participants also desired tools that “make me list reasons why I need the product I am trying to buy” (43.0%, $N=65$); or “makes me rate (from 1-10) how much I want to buy each product in my shopping cart” (43.0%, $N=65$). Features that promote a simple awareness of impulse buying behavior were less popular, such as a feature that “gives me a physical warning, like a mobile phone vibration, when I’m about to checkout” (26.5%, $N=40$).

Enforce Spending Limits. Participants also reported wanting tech features that enforce spending limits such as tools that restrict the number of products purchased or the amount spent per website, per product, or within a specific time period (e.g., daily, weekly, or monthly). For example, *“I’d like to see an app where I can put \$X and that is all I can spend. Once it’s gone, I have to wait until the next month. Any time you don’t spend the monthly allowance the extra rolls to the next month”*. While spending restrictions were not included as a suggested tech feature in the survey’s close-ended questions, 28.5% of participants (N=43) indicated that they wanted a tool that *“lets me shop and create wish lists but stops me from actually buying”*.

Increase Checkout Effort. Participants reported wanting tools that make checking out more difficult. Suggested features included (a) require shoppers to click through more steps to complete a purchase, (b) require users to confirm their purchase multiple times, (c) force users to manually enter shipping and payment information for each purchase, and (d) require users to complete puzzles or math problems before checkout. For example, *“Ask ‘are you sure’ a gazillion times, or have captchas.”*

Force Postponement. A commonly requested tool was one that required shoppers to wait a certain amount of time before being able to checkout. For example, *“A firewall that forces you to wait X number of minutes (30? 60?) between when you finalize your cart on a website and when you can process your purchase”*. Most participants, 80.1% (N=121), indicated that they would like to use an app that requires at least a 1-2 minute wait before checkout. Distraction features (i.e., distracting consumers away from the purchase), a closely related strategy to postponement, were less popular. For example, only 28.5% (N=43) of participants indicated they would like a feature that *“shows me pictures of things I care more about than shopping (e.g., friends and family)”*.

Avoidance. Other participants wanted features that help them avoid experiencing shopping temptations in the first place, such as blocking specific websites, making access to specific websites more difficult with passcodes or puzzles, blocking online advertising, imposing shopping time limits, or warning the shopper by flagging products that are likely to be impulse buys. For example, *“it would put [impulse] products in a red mode and if its a product that I don’t impulsively buy, would be in green”*. Participants also indicated an interest in avoidance features that *“warn me when I have been shopping online for too long”* (41.7%, N=63) or *“sends a reminder warning whenever I click on an online advertisement”* (23.8%, N=36).

Reduce Product Desire. Some participants wanted tools that helped reduce their desire for products by emphasizing negative product attributes or by providing more objective product presentations. For example, *“Honest descriptions as far as what something really does and is made of”*. Participants

wanted tools that *“highlight the most negative product reviews”* (55.6%, N=84), that *“shows me the product in a less glamorized way”* (41.7%, N=63), and that hides text like *“limited time offer or only a few left in stock”* (35.1%, N=53).

Unpopular Self-control Tools. Social accountability tools were not popular among participants. Only two participants out of 151 explicitly requested such tools (e.g., *“An app that texts my husband every time I make an online purchase”*) and only 25.2% (N=38) of participants indicated that they would like a tool that *“won’t let me buy without the approval of someone I designate”*. Even less popular social tools included *“posting to social media or emailing a friend every time I...”* (a) *“impulsively buy something online”* (12.6%, N=19) or (b) *“resist buying something online”* (9.3%, N=14).

Participant Strategies for Self-control. Participants reported the successful and unsuccessful strategies that they had used in the past to try to resist impulse purchases online.

Successful Strategies. Three strategies were commonly cited as successful (and were not commonly cited as unsuccessful): reflection, spending limits, and postponement. Participants described how they would try to reflect on actual their *“needs”*; for example, *“I try to really think whether I need the item and how often I will use/wear it. Do I really need the item right now?”*. Others called this type of reflection *“doing a wants vs. needs assessment”*. Some specifically reflected on their needs by taking a mental inventory of what they already owned or by talking it over with someone before making a decision.

Another successful strategy was to implement spending limits. Participants described how they limited the funds available to themselves for online shopping (e.g., *“I try to keep very little money on the card I use for online purchases”*) or restricted access to their own payment sources (e.g., *“hiding my bank card”*). General *“budgeting”* strategies were also mentioned as successful, such as *“creating a budget and only allowing a certain amount of ‘miscellaneous’ purchases”*. Other tactics to limit spending included creating no-buying periods (e.g., no online purchases this week) and sticking to a shopping list. Most strategies to limit spending did not mention a mechanism for enforcing those limits.

Postponement was one of the most commonly cited successful strategies and was described generally as *“sleeping on it”* or *“waiting one day to purchase”*. Other participants described how they used a website’s shopping cart to postpone and ultimately resist online purchases (e.g., *“Putting the item in my cart and walking away from my tablet for a while. Then coming back refreshed and deciding against the item”*). Product wish lists have also been used to avoid impulse buying: *“Making wish lists on Amazon of things I want to buy at the time until the feeling goes away”*. Some participants used postponement to create additional time to deliberate:

“I’ll select an item and add it to my cart then go do something else. It gives me extra time to think about it”. While most postponement strategies involved revisiting the product at a later time, other participants used postponement as a way to forget about the temptation all together: *“let it sit in the basket and forget that i put it there”*. Finally, closely related to postponement, some participants cited distraction as a successful self-control tactic, for example, *“watching Netflix to keep my mind elsewhere”* or *“I have taken a nap or two to resist the urge”*.

Avoidance, Both Successful and Unsuccessful. Avoidance was commonly cited as both a successful and an unsuccessful strategy for curbing impulse buying online. Participants described how avoiding technology in general (e.g., phones, computers, and the Internet), avoiding online shopping (e.g., specific websites, online sales, or online *“window shopping”*), avoiding online groups that encourage shopping (e.g., deal-hunter shopping groups), and avoiding social media in general were strategies that were effective for them in the past. As one participant described, *“Don’t go on Facebook — that’s where most ads are”*. Other participants found success with removing shopping apps from their phone and unsubscribing from promotional emails and sale notifications. Conversely, avoidance was also one of the most commonly cited strategies that participants found to be ineffective. Avoiding technology, online shopping, shopping groups, and social media were all commonly cited as ineffective. Out of the 53 participants who cited avoidance as effective and the 28 participants who described avoidance as ineffective, 11 (13.6%) were participants who cited avoidance as being both a successful and unsuccessful strategy. For example, one participant reported *“Staying off Amazon and Wish[.com] completely is my only chance...”* as a successful strategy but also reported *“Actually staying off the sites... I’m no good at it”* as an unsuccessful strategy.

Unsuccessful Strategies. Relying purely on willpower was commonly cited as an unsuccessful strategy and was not mentioned by any participants as a successful strategy. Participants described this strategy as *“Just telling myself i won’t buy anything”*, *“self-control”*, *“Resisting on my own”*, or *“Trying to browse websites without purchasing anything. Just looking at items is too hard for me! I always see something I think I have to have”*. Some participants noted how difficult it was for them to use willpower to ignore temptations: *“tried to just ignore the impulse, but it did not work”* and *“ignoring emails about deals. You will sometimes get convinced even if you’re just ignoring.”*

4 DISCUSSION

Concerns are growing about design practices that prioritize business goals over the welfare of users [4] and that trick users into doing things that may not be in their best interest

[13, 30]. The current research investigates e-commerce practices that are unintentionally manipulative at best and, at worst, deliberately deceptive and unethical. This work falls among, and in support of, critical research in HCI that takes a strong position in favor of ethical design practices (e.g., value-sensitive design [25], critical design [9], and reflective design [71]). Taking a consumer advocate perspective, this work also contributes to the growing body of “transformative consumer research” that aims to prioritize consumer well-being [58]. With the goal of promoting more responsible design choices, Study 1 identifies the most problematic websites and their impulse design features, whether well-intentioned, ill-intentioned, or the result of design “blind spots” [71]. This work calls for e-commerce firms to explicitly consider the well-being of consumers and to provide greater transparency around design features that may encourage impulsive consumer choices.

However, at present, corporations have little incentive to discourage impulsive consumer decisions [48]. At the same time, consumers report that they would like to reduce their impulse buying [87] and likely cannot “afford” to wait for corporations to change their design practices. Further, some design features that encourage impulse buying are also integral to the user experience. For example, while low stock warnings might unintentionally compel impulsive purchases, they can also help consumers avoid missing out on products they need. Study 1 surfaces these potentially problematic features to empower consumers even against otherwise helpful features. Study 2 goes further to explicitly reach out to users/consumers to understand what types of tools they desire to help them curb impulse buying online. Below, we synthesize results from Study 1 and 2 to propose a variety of technology-based interventions and opportunities for e-commerce transparency that prioritize users’/consumers’ desires for self-control while minimizing their vulnerabilities to existing designs.

Features that lower the perceived risks of shopping online were present on every website sampled, primarily in the form of discounts. Consumers are more likely to impulsively purchase things that they perceive as “good deals” [90]. We found that online impulse buyers recognize this vulnerability and would like tools that make costs more salient. While apps such as Mint and Cinch help users track their high-level financials, for online impulse buyers, tools that provide running totals across websites and automatic budget warnings while shopping online may prove to be more valuable. Similar persuasive technologies have been explored to track and provide feedback on eating [19, 37, 39] and exercise [66] behaviors. Tools could also reframe costs in terms that are personally relevant. For example, a pop-up during checkout could present product prices in terms of hours needed to work (e.g., this product costs the equivalent of 3 hours of

work), other favorite products (e.g., “eight Chipotle burritos”), or savings goals (e.g., 10% of the cost to fly to Italy). Conversely, tools that highlight the potential emotional costs of an impulse buy are not likely to be effective. Few participants (21%) wanted to be reminded of their past regretted buys and research suggests that anticipating negative emotions (shame) is less successful as a self-control tactic than anticipating positive emotions (pride for resisting) [64].

Online impulse buyers also want tools that encourage deliberation, a strategy that participants experienced success with in the past. Recent work in HCI described a browser extension, called Mindful Shopping, that encourages reflection through, for example, guided meditation, before completing purchases [50]. Other tools may be able to detect when an e-commerce site is offering especially deep discounts and, at checkout, require reflection—e.g., reasons for needing the product, how/when/why they will use the product, negative outcomes for purchasing, or how many of the item they already own—especially for those consumers who do not tend to elaborate on outcomes [34]. However, tools should avoid reflection about personal possessions that are used primarily for pleasure. Recent work has shown that while reflecting on recently used utilitarian possessions lowered the likelihood to make an impulse purchase, reflecting on hedonic possessions increased the likelihood to purchase [22].

Features that enhance the perceived temporal proximity of products were common among websites sampled. When consumers believe their impulses can be quickly satiated, impulse buying is more likely [36]. Online impulse buyers indicated they would like tools that help temper the promise of instant gratification, by making it more difficult to checkout. Similar to “dark patterns” that obstruct actions such as opting out of email campaigns [30], online impulse buyers would like tools that obstruct online shopping. These tools could add “friction” [78] to slow down seamless checkout processes by requiring more clicks, confirmations, security checks, or even simple puzzles. Tools could block the ability to save billing and shipping information and disable features that nudge consumers quickly through the checkout process (e.g., quick-add-to-cart, quick-checkout, and one-click buy buttons).

Leveraging social influence, a common type of feature among websites sampled, can encourage herd behavior among consumers [18] and inspire impulse buying [36]. Interestingly, participants did not request tools that specifically address social influence. However, online impulse buyers wanted tools that reduce product desire by, for example, providing more objective product information. Some relevant tools already exist. For example, Fakespot and ReviewMeta help users identify potentially fake reviews and provide adjusted product ratings [14]. For e-commerce firms there is an opportunity for greater transparency by disclosing more

details about product recommendations (e.g., how are “other” and “similar” customers defined?) and customer statistics (e.g., what does it mean that a certain number of customers are “interested?”). When sites like Macys.com highlight the number of customers who have purchased a product, users may benefit from also knowing how many customers ultimately returned the product. On the other hand, online impulse buyers were not in favor of social accountability tools, such as requiring users to post on social media about their impulsive purchases. Indeed, prior work has shown that the prospect of public accountability through social media posts reduced willingness to make exercise goal commitments [60].

While perceived scarcity and urgency features were less frequently utilized on e-commerce sites, participants would like tools that address these features, suggesting that participants perceive them to be effective at encouraging impulsive purchasing. To address scarcity and urgency features, tech interventions could hide “limited-time” or “only a few left in stock” messaging on websites, disable countdown clocks, or locate alternate vendors for products that are presented as exclusive, selling fast, or running low in stock. For e-commerce firms, the opportunity for transparency is in providing more details about inventory replenishment (e.g., “only 2 left in stock—will be restocked in 24 hours”).

Other interventions could require a delay (i.e., postpone the decision to purchase) or impose spending limits; participants reported having success with both strategies in the past. One postponement tool available is Finder.com’s Icebox which requires at least a 24-hour delay in purchases. Future iterations could integrate deliberation prompts during the waiting period. Tools that impose spending limits could track a consumer’s spending across websites and devices to block purchases after reaching a predetermined budget. Participants described wanting postponement and spending limit tools that are forced and automatic, not requiring the user to open an app and proactively manage their purchase cravings (c.f., [39]). It seems that participants, who commonly described using “willpower” as ineffective, recognize that proactively engaging with self-control tools may require more willpower than they have available.

One of the most common types of features were those that enhance perceived physical proximity to the product. While these types of features (e.g., product photography) can encourage impulsive purchasing [80], they are also integral to the user experience, and therefore, we do not recommend removing these features. However, online impulse buyers want tools that help reduce product desire by, for example, showing products in a more objective light. Online impulse buyers who are especially swayed by glamorized product presentations may benefit from tools that showcase consumer-generated photography and provide comparison

tools that highlight discrepancies between that photography and the professional photography shown on e-commerce sites. Participants also reported wanting tools that help them avoid product temptations. Such tools could hide (a) messaging about add-on benefits (e.g., free gift with purchase), (b) advertising (e.g., ad-blockers for sponsored products), (c) browsing features (e.g., product recommendations), (d) investment features (e.g., sign up for price alerts), and (e) shopping momentum features (e.g., suggested add-on products during checkout). Similar tools exist for social media; the Rather plugin allows users to replace unwanted Facebook content with content that the user would rather see (e.g., pictures of cute animals). E-commerce blockers could replace unwanted features or messaging with content that reminds users of their spending goals.

Limitations and conclusion

Study 1's website archiving process introduced certain limitations. First, no paid membership accounts were used, which means features such as Amazon Prime's one-click-buy were not captured. Second, because purchases were not completed, this work does not capture features that appear after a purchase is made. Third, given our sample size ($N=200$ websites), it was not feasible to archive more than one product per website. It is likely that some websites utilize different web features for different types of products (e.g., 360 spin views of shoes but not DVDs). However, our systematic archiving process likely captured the most commonly used features per site. In Study 2, our sample of impulse buyers was comprised primarily (86%) of women. While meta-analysis data show that gender is not predictive of impulse buying behavior [5], more recent data suggests men may be more frequent online impulse buyers [55]. Additional research on the preferences of men may be warranted. Participants in Study 2 were recruited through social media, which excludes online shoppers who are not social media users. Study 2 was only open to adults living in the U.S.—results may differ in other markets.

Finally, this research was conducted outside of a corporate context. Many of the findings and proposed interventions are difficult, or impossible, to implement without the cooperation of e-commerce sites. Though not the primary focus of the current study, greater transparency, ethical practices, or even regulation of sites like Amazon.com or Macys.com may be necessary for supporting consumer rights. While e-commerce sites are designed to encourage impulsive purchasing, there are promising technology interventions that may be able to support consumers by promoting more deliberative and less regretted choices.

5 SUPPLEMENTARY MATERIAL

Study instruments and codebooks are available as supplementary material in the ACM Digital Library. Website PDFs are available at carolmoser.com/resources.

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