

CounterSludge in Alcohol Purchasing on Online Grocery Shopping Platforms*

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Abstract

We investigate how deceptive patterns (sludge) within online grocery shopping can influence the purchase of alcohol through design intervention, and how to counter them. Previous research investigated online shoppers' purchasing behaviors in sustainability and healthy eating. However, current research in alcohol is limited to modifying simulated platforms to aid in the increase of purchasing lower alcoholic beverages by altering product offerings. We conducted a heuristic evaluation on online shopping platforms highlighting the use of sludge, before developing five design intervention prototypes. Our goal is to develop interventions that engage light to moderate drinkers in alcohol reduction with respect to the deployment context of online grocery shopping platforms.

Keywords

deceptive patterns, alcohol, online grocery shopping, purchasing behavior

1. Introduction

The online purchase of alcohol within the United Kingdom (UK) is above the global average, even before the COVID-19 pandemic [1]. The pandemic impacted drinking behavior significantly with most recent models indicating that over the next 20 years within the UK alone there will be over 200,000 additional alcohol attributable hospital admissions and over 7,000 alcohol attributable deaths [2]. This would carry an additional cost of £1.1 billion to the National Health Service (NHS) compared to if drinking had remained at pre-pandemic levels [2]. Compared to pre-pandemic online grocery shopping, the online grocery retail space saw a 79.3% in sales [3].

The engagement of heavy drinkers is widely explored via both digital and physical studies [4] [5] [6]. Heavy drinkers are classified as those drinking more than 35 units per week [7]. Light to moderate drinkers are those consuming under 14 units of alcohol a week [8]. Those classed as heavy drinkers have a different range of resources available to them in comparison to those drinking in the other groups, but the general alcohol support tab on the NHS website does not list resource access according to the different drinking categories [9].


Heavy drinking in combination with binge drinking behavior is dangerous and has unintended negative health effects, such as a reduction in years of healthy living by around three to six years [10]. This metric of years of healthy life lost is one utilized when speaking of the global

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burden of disease (GBD), and aims to quantify health loss via attributes such as injury, illness, and risk factors (in this case alcohol consumption) [11]. Adamaczyk [12] has found that there is a degree of pre-planning and automated decision making in online grocery shopping, resulting in online grocery shopping platforms having fewer consumers trying out new products [13]. Most recent work in the area has said that it is actively in the shopping platform's best interests to keep profits up, thus harming the health of consumers [14].

To investigate how alcohol is purchased through online grocery shopping, it is important to actively involve alcohol consumers to ensure interventions and methodologies are appropriate. When researching online grocery shopping platforms there needs to be an understanding of the user interaction or design patterns used to up sell products (e.g., button labels or online sale banners), often referred to as deceptive patterns [15] [16]. There are a range of different taxonomies within the overarching area of deceptive patterns and they serve different purposes [15] and in this case we most closely referred to the taxonomy analysis related to commercial patterns.

Brignull [15] states that deceptive patterns (formerly 'dark patterns') are user interfaces which have been carefully crafted to trick users into doing things. These deceptive patterns are embedded within the grocery shopping websites that serve as a purchase point for alcohol. Design factors such as allowing for the user to purchase the same cart as prior [17], thus automating the user decision making process and changing where and how many decisions are made about what is being purchased. Making a purchase point decision can have different nudge points depending on its context. A nudge point is a point where an aspect of the decision environment (choice architecture) can be modified to influence the behavior and decision-making of groups or individuals [18]. For example, grocery shopping in a physical store allows for opportunities to include enticing product displays whereas online grocery shopping has opportunities to include pop-ups (e.g., a marketing banner). Additionally, aspects like removing products from the cart have different degrees of difficulty online as opposed to the physical environment. Any interventions developed will have to exist in an platform with a range of deceptive patterns present.

This paper explores modifications to online shopping platforms that aim to counter existing deceptive patterns in the web-platform. We aim to understand the following research questions: (1) Which deceptive patterns are encountered in online grocery shops in the UK? (2) How can we represent alcohol purchasing reduction interventions in online grocery shopping platforms?

To address these questions, we first performed a heuristic evaluation of the current UK online grocery shopping infrastructure by way of identifying deceptive patterns. Using insights gain from this analysis, we developed five prototypes of interventions (no/low alcohol product swap options, warnings, no/low alcohol product promotion, sort options by alcohol unit, and modifying the salience of alcohol unit information.)

2. Related work

In this section we will review existing literature in the space of choice architecture and deceptive patterns while cross examining it against alcohol purchasing behavior.

2.1. Online Purchasing Behavior of Alcohol

While sizing, availability, and proximity proved to be helpful interventions to improve dietary choices, labeling alone was not effective [19]. The availability of other types of products (in the case of this work, alcoholic versus non-alcoholic products) cannot be modified due to the existence of supplier contracts.

There is also the concern around how to motivate the trying of new products in the digital space. Previous work has found that the trying of new products is motivated by perceived value and pricing differences [20]. Multiple previous studies have indicated taste as a major contributor to alcohol preferences and consumption [21] [22] [23] [24]. Pricing, and specifically minimum unit pricing (MUP) in the UK has shown changes to alcohol purchases in both on-license and off-license contexts, but mostly in heavier drinking populations [25][26] [27].

Current work in alcohol purchasing studies have been conducted in mostly simulated settings where the goal has been reducing alcohol units purchased one study found: substantially increasing the proportion of non-alcoholic drinks—from 25 to 50 or 75—meaningfully reduces alcohol selection and purchasing [28]. Other studies have tied the promotion of no-low alcoholic beverages to increased risk of consuming alcohol specifically as it related to online marketing via social media of the no alcohol products [29].

Food swaps in online grocery shopping have been studied, specifically around swapping to lower calorie "healthy alternatives" where success was deemed to be lower kcal ending values of the total shopping basket and lower kcal value per product [30]. Other studies have found making nutritional scores visible on products leads to healthier overall baskets [31]. A scoping review of nudging in the online grocery context was also limited to only food products [32]. Just because this works in food, does not necessarily mean the same will hold true across lower alcohol products. A massive social factor which impacts alcohol [33]. With one third of adults in the UK reporting they have consumed at least one no/low alcoholic beverage in a calendar year, there is an opportunity to understand if no/low alcohol product swaps are possible like healthy food swaps are via nudges [34].

2.2. Sludge and Deceptive Patterns

The term "deceptive pattern" comes from user experience (UX) designer, Harry Brignull [15]. The deceptive practices are as follows: comparison prevention, confirshaming, disguised ads, fake scarcity, fake social proof, fake urgency, forced action, hard to cancel, hidden costs, hidden subscription, nagging, obstruction, preselection, sneaking, trick wording, and visual interference [15]. Deceptive patterns are also called sludge in the space of human computer interaction (HCI) [35].

2.3. Sludge Analysis

Previous work identifying, defining, and subsequently redefining deceptive patterns across multiple areas in HCI have provided a framework of analysis to apply to the online grocery shopping platforms central to this work [36]. The core deceptive patterns came from the source that originally coined the term dark (later deceptive) patterns [15]. Early work looks at a more holistic view of all web pages and how different uses of the deceptive patterns can lead to the

same outcome of exploitation of the user by way of interface manipulation, but were largely more vague and overarching as opposed to being specific design practices or methods [37]. Patterns specific to game design were also identified in the onset of the mobile gaming space, with some principles being potentially applicable to app specific food ordering especially as it relates to the design choices made in a more condensed virtual environment[38]. These individual design choices that made up the deceptive patterns later became more common place and practice in the area of user experience (UX) design. Not only were these deceptive patterns being used, but there was some degree of awareness of these patterns being ethically questionable on the part of the designer [39][17]. There has even been discourse on how to go about countering these deceptive patterns dating back a decade [40]. If more recent works are any indication, these design practices will propagate further, despite calls for more ethical design to be utilized, with specific points involving privacy concerns being a frequent topic within the news cycle and policy circles [41].

In the space of social media the aforementioned works all factored into the thematic analysis and heuristic evaluation of the major social networks popular in the western world [42]. By utilizing this method of sludge analysis on online grocery shopping platforms there is an opportunity to gain insight into the design context of any health intervention developed for the e-commerce space. Deceptive patterns are in present on thousands of e-commerce websites alone [35]. There is no avoiding deceptive patterns in e-commerce based health intervention design.

3. Sludge analysis in online alcohol shopping

Our goal was to identify deceptive patterns presented across the online grocery shopping platforms. To do this, we performed a heuristic evaluation based on previous sludge analysis framework.

3.1. Method

Using the current academic literature on deceptive patterns as a starting point we created a table which became the foundation for our analysis of the chosen online grocery shopping platforms. We did this by modifying an existing table used to analyze major western social media platforms [42]. The modifications were done because the original "dark pattern" source has been modified and changed to encompass more of the patterns that were highlighted by other sources e.g. Bösch et al [41]. To avoid repetition and redundant patterns being used in this work, the most recent list of deceptive patterns were identified by first reviewing the Deceptive Patterns book [15] before examining the papers cited in the table in the social media paper [42]. Any additional patterns were cross referenced with this table before being added to the list. All cited papers were checked for updated versions before adding them to the list.

3.1.1. Selecting the online grocery platforms

We selected 11 grocery delivery websites. There were three low-cost retailers (Aldi, Asda and Iceland), two bulk retailers (Costco and Marks and Spencer (M&S)), one delivery partner (Ocado),

one high-cost retailer (Waitrose), and four middle-costing retailers (Tesco, Sainsbury's, Co-op, and Morrison's). For the purposes of the study M&S was viewed as a separate entity from Ocado as M&S solely relies on Ocado for grocery deliveries with the alcohol specific exception for cases of wine.

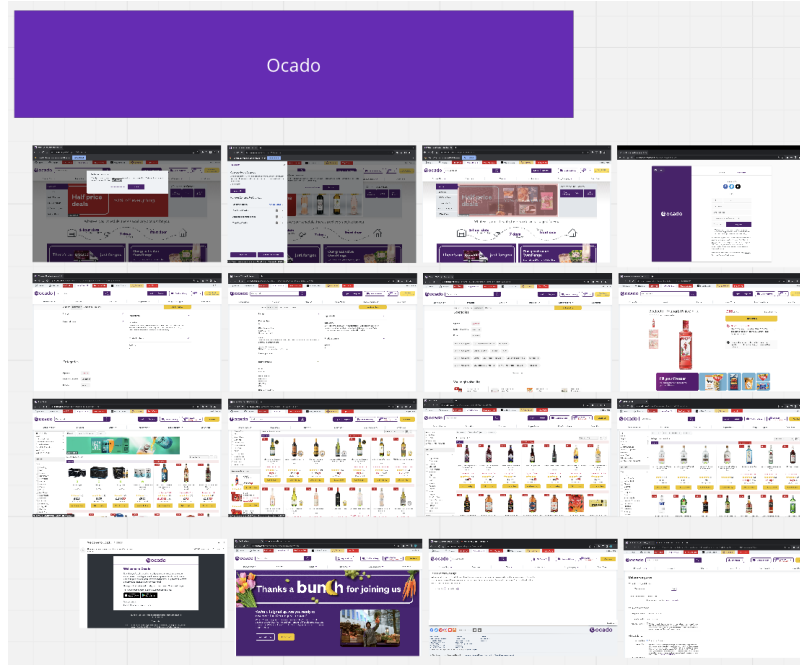


Figure 1: Some Screenshots of Ocado platform as taken for the Heuristic Evaluation. 50 screenshots were taken as part of Ocado's evaluation.

3.1.2. Evaluating the platforms user interaction

We signed up to each grocery shopping platform in turn, using a pre-prepared research email address and a study telephone number so that the website was fully accessible for analysis. For the purposes of capturing website content, the same procedure was followed for every store's website. Every time something had to be clicked on or hovered over to advance a screenshot was taken (e.g., hovering over drinks list to access alcohol tab). Screenshots were taken on the same day over two hours. The sample task was adding one wine, one beer, one cider, one spirit, and one no/low product to the cart before selecting check out. Purchases were not completed and the cart was emptied before logging off the grocery shopping platform (see Figure 1).

Prior to evaluating, we cross-referenced each website, paper or book that the set of deceptive patterns originated from for definitions and to decide on a final set of heuristics to evaluate each grocery store website against, to identify any deceptive patterns. We analyzed each grocery store website for the patterns one by one and the total number of deceptive patterns were calculated at the end. The review session involved ticking the table to indicate the presence of a deceptive pattern while measuring the time it took to complete the shopping activity.

3.2. Results

The deceptive patterns and which online grocery shopping platforms had them present can be found in Table 1. The heuristic review took two hours of active engagement and an additional hour of waiting for account set-up email confirmations to arrive in order to gain access to the full website. Time taken to complete the task does not include the time spent paused waiting for the account set-up email to arrive. We specifically noted how alcohol unit information was presented on the platforms. All of the analyzed platforms required scrolling on the product information page to find the alcohol content information. Seven websites had only alcohol content percentages, three had alcohol content percentages but did not always have units, and two had both the alcohol content percentage and unit information. The lowest amount of deceptive patterns and screenshots were taken on the bulk purchasing platforms (see Table 2). Across all the platforms the deceptive patterns present on all of the platforms were: Hidden Legalese Stipulations, Immortal Accounts, Pre-Defined Content, and Disguised Data Collection. "Hidden Legalese Stipulations" relate to the representation of legally required content in a format that is not easily comprehensible by the user base [41]. This was identified as a long terms and conditions portion of the web-page or the customer information related to the online grocery shopping delivery passes. "Immortal Accounts" are required user accounts because they are necessary for service fulfillment [41]. Every grocery shopping platform required registering account information to be able to schedule a delivery slot, view the cart, or modify an order after placing it. "Pre-Defined Content" refers to the features you can access without registering or paying for the account [38]. There are tabs that are not accessible until one is logged in or creates an account on the platform, most often being the previous orders tab being unavailable without registration. "Disguised Data Collection" is defined as information which is collected to build a rich user profile, without the consent of users [40]. The consent information regarding cookies does not fully explain how the cookies enhance the user experience, what the functionality of cookies are in an understandable way.

3.3. Intervention Prototype Development

We developed prototype in direct response to the deceptive patterns identified. When developing the initial prototypes, the purpose of the intervention was defined as: providing, clarifying, or explaining information to lead to a decrease in the net purchase of alcohol units per person.

From the heuristic results we discovered that the deceptive patterns had specific challenges. These being accessing alcohol unit information, identifying no/low alcohol products, offering lower alcohol product suggestions that fit the taste preferences of the customer, and engaging with relevant sorting functions. Alcohol unit information was presented in different places across the product information page, but was not searchable on the product grid page. A representation for alcohol units on the product grid page was something that was designed using symbols. The symbol that was developed was visually similar in style to a hazard warning sign on a public road [43] [44]. The unit warning symbol displayed no numerical representation of units, but served as a visual cue to distinguish no/low products from higher alcoholic products in a mixed alcohol level product grid in order to counter hidden information [17].

As a results we create a range of prototypes spanning from warning banners, sort functionality,

Table 1

The Deceptive Pattern Table used for Online Grocery Shopping Platform Analysis. This table was originally created by Mildner et al. [42], but was modified to reflect changes in the Deceptive Patterns in the latest publication of Brignull [15]. Depicts the deceptive patterns found on 11 online grocery shopping websites in the UK.

Author	Deceptive Patterns	O	T	S	As	C	Al	M	W	I	MS	CO
Brignull [15]	Comparison Prevention	●	●	●	●	●	●	●	●	●	●	○
	Confirshaming	○	○	○	○	○	○	○	○	○	○	○
	Disguised Ads	●	●	○	○	○	○	○	○	○	○	○
	Fake Scarcity	○	●	○	○	○	○	○	○	○	○	○
	Fake Social Proof	○	○	○	○	○	○	○	○	○	○	○
	Fake Urgency	○	○	○	○	○	○	○	○	○	○	○
	Forced Action	●	●	●	●	●	●	●	●	●	○	○
	Hard to Cancel	●	●	●	○	○	○	○	○	○	○	○
	Hidden Costs	●	●	●	○	○	○	○	○	○	○	○
	Hidden Subscription	○	○	○	○	●	○	○	○	○	○	○
	Nagging	●	●	○	○	○	○	○	○	○	○	○
	Obstruction	●	○	●	○	○	○	○	○	○	○	○
	Preselection	○	○	○	○	○	○	○	○	○	○	○
	Sneaking	○	○	○	○	○	○	○	○	○	○	○
Trick Wording	○	○	○	○	○	○	○	○	○	○	○	
Visual Interference	●	●	○	○	○	○	○	○	○	○	○	
Mathur et al. [51]	Forced Enrolment	○	○	○	○	○	○	○	○	○	○	●
	Pressured Selling	○	○	○	○	○	○	○	○	○	○	○
	Visual Interference	●	○	●	○	○	○	○	○	○	○	○
	High-Demand Messages	○	○	○	○	○	○	○	○	○	○	○
	Low-Stock Messages	○	○	○	○	○	○	○	○	○	○	○
	Activity Notifications	○	○	○	○	○	○	○	○	○	○	○
	Testimonials	●	●	●	○	○	○	○	○	○	○	○
	Countdown Timer	○	○	○	○	○	○	○	○	○	○	○
	Limited-Time Messages	○	○	○	○	○	○	○	○	○	○	○
	Bosch et al. [41]	Address Book Leeching	○	○	○	○	○	○	○	○	○	○
Bad Defaults		○	○	○	○	○	○	○	○	○	○	○
Forced Registration		●	●	○	○	○	○	○	○	○	○	○
Hidden Legalese Stipulations		●	●	●	○	○	○	○	○	○	○	○
Immortal Accounts		●	●	●	○	○	○	○	○	○	○	○
Privacy Zuckering		●	●	●	○	○	○	○	○	○	○	○
Shadow User Profiles		○	○	○	○	○	○	○	○	○	○	○
Zagal et al. [38]	Grinding	○	○	○	○	○	○	○	○	○	○	○
	Impersonation	○	○	○	○	○	○	○	○	○	○	○
	Monetized Rivalries	○	○	○	○	○	○	○	○	○	○	○
	Pay to Skip	●	●	●	○	○	○	○	○	○	○	○
	Playing by Appointment	○	○	○	○	○	○	○	○	○	○	○
	Pre-Defined Content	●	●	●	○	○	○	○	○	○	○	○
	Social Pyramid Schemes	○	○	○	○	○	○	○	○	○	○	○
Gray et al. [39]	Gamification	○	○	○	○	○	○	○	○	○	○	○
	Aesthetic Manipulation	○	○	○	○	○	○	○	○	○	○	○
	False Hierarchy	●	●	●	○	○	○	○	○	○	○	○
	Hidden Information	○	○	○	○	○	○	○	○	○	○	○
	Toying with Emotions	○	○	○	○	○	○	○	○	○	○	○
	Intermediate Currency	○	○	○	○	○	○	○	○	○	○	○
	Greenberg et al. [40]	Attention Grabber	○	○	○	○	○	○	○	○	○	○
Bait and Switch		○	○	○	○	○	○	○	○	○	○	○
Captive Audience		○	○	○	○	○	○	○	○	○	○	○
Disguised Data Collection		●	●	●	○	○	○	○	○	○	○	○
Making Personal Info Public		○	○	○	○	○	○	○	○	○	○	○
The Milk Factor		○	○	○	○	○	○	○	○	○	○	○
Unintended Relationships		○	○	○	○	○	○	○	○	○	○	○
We Never Forget		○	●	●	○	○	○	○	○	○	○	○
Gray et al. [17]	Automating the User	○	○	○	○	○	○	○	○	○	○	○
	Controlling	○	●	●	○	○	○	○	○	○	○	○
	Entrapping	○	○	○	○	○	○	○	○	○	○	○
	Misrepresenting	○	○	○	○	○	○	○	○	○	○	○
	Nickling-And-Diming	○	○	○	○	○	○	○	○	○	○	○
	Two Faced	○	○	○	○	○	○	○	○	○	○	○
	Conti & Sobhick [37]	Coercion	●	●	●	○	○	○	○	○	○	○
Confusion		○	○	○	○	○	○	○	○	○	○	○
Distraction		○	○	○	○	○	○	○	○	○	○	○
Exploiting Error		○	○	○	○	○	○	○	○	○	○	○
Forced Work		●	●	●	○	○	○	○	○	○	○	○
Interruption		●	●	●	○	○	○	○	○	○	○	○
Manipulating Navigation		●	○	●	○	○	○	○	○	○	○	○
Obfuscation		●	○	●	○	○	○	○	○	○	○	○
Restricting Functionality		●	●	●	○	○	○	○	○	○	○	○
Shock		○	○	○	○	○	○	○	○	○	○	○
Trick		○	○	○	○	○	○	○	○	○	○	○
	Deceptive Patterns	O	T	S	AS	C	AL	M	W	I	MS	CO
	<i>Total</i>	24	25	27	20	12	16	27	20	11	10	8

Legend:
 ○ – Ocado
 T- Tesco
 S- Sainsbury's
 As- Asda
 C- Co-op
 Al- Aldi
 M- Morrison's
 W- Waitrose
 I- Iceland
 MS- M&S
 CO- Costco

Table 2

Heuristic Review Findings Table depicting the number of captured pages per platform, deceptive patterns present, time spent completing the shopping task, and alcohol unit interaction.

Grocery Shopping Platforms	Number of Pages	Number of Deceptive Patterns	Time Spent Completing the Task	Interaction Locating Alcohol Units
Ocado (O)	36	24	7 m 14 s	Scroll (percentage and units available)
Tesco (T)	38	25	7 m 23s	Scroll (percentage always available, units not always)
Sainsbury's (S)	42	27	8 m 11s	Scroll (percentage always available, units not always)
Asda (As)	39	20	9m 52s	Scroll (percentage and units available)
Coop (C)	21	12	5m 28s	Scroll (percentage only)
Aldi (Al)	25	16	6 m 47 s	Scroll (percentage only)
Morrison's (M)	33	27	7 m 41s	Scroll (percentage always available, units not always)
Waitrose (W)	32	20	7 m 14 s	Scroll (percentage only)
Iceland (I)	26	11	5m 35s	Scroll (percentage only)
M&S (MS)	15	10	4m 9s	Scroll (percentage only)
Costco (Co)	12	8	4m 36s	Scroll (percentage only)

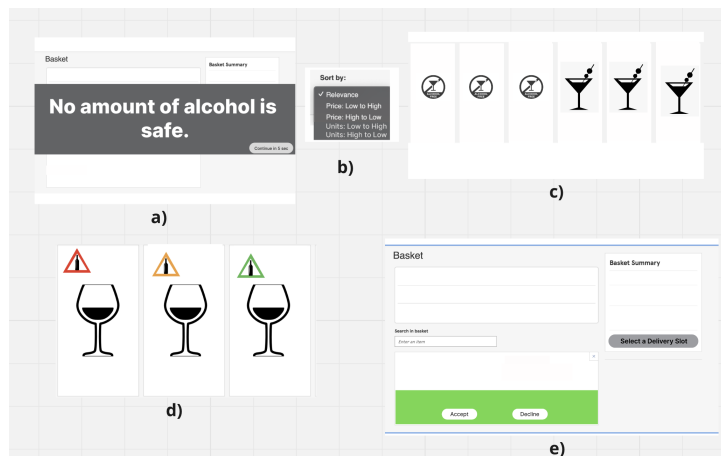


Figure 2: Five Original Intervention Designs: (a) Intervention 1 - Alcohol Warning Banner, (b) Intervention 2 - Unit Sort Function, (c) Intervention 3 - No/Low Alcoholic Product priority listing, (d) Intervention 4 - Unit Warning Label, and (e) Intervention 5 - Swap Function.

priority listening, warning labels and shopping basket exchange. The designs were looking to modify or move current information on the platforms and are presented below

- **Intervention 1:** An alcohol Warning Banner (Figure 2a) that has specific health messaging designed to be engaged at the basket summary page to not obstruct shoppers and interrupt their product selection process, but rather give them the opportunity to engage with a five second brief intervention before completing their purchase. The five second time frame utilizes familiar imagery from YouTube advertisement skipping designs [45]. The specific messaging was developed by combining the messages from many alcohol harm focused papers [46][47].
- **Intervention 2:** A unit Sort Function (Figure 2b) included the option to sort by "units: low to high" and "units: high to low", with the aim of improving difficulties in product comparisons [15].
- **Intervention 3:** The No/Low alcoholic product priority listing (Figure 2c) proposed to have no/low alcohol products before their alcoholic equivalents was also prototyped. This is to better counter the difficulty in product comparison [15].
- **Intervention 4:** A unit warning label (Figure 2d) enabled participants to consume a one sentence summary of the alcohol harm work coming out of the UK in the past five years without it disrupting the task of grocery shopping. This is to counter obstruction and visual interference [37][35].
- **Intervention 5:** A swap function (Figure 2e) provided health-promoting product swaps. This method used accept/decline options and bright colors to allow shoppers to identify and subsequently engage with the proposed product swap (Figure 2e). By limiting the choices, the scaffolding was done to best facilitate decision making by utilizing choice architecture [48] [49].

4. Conclusion

In this paper, we contribute to this body of research through the application and iterative designing of alcohol purchasing reduction interventions designed to exist on platforms with deceptive patterns. Supported by content analysis, we investigate 11 different online grocery shops in the UK (Ocado, Tesco, Sainsbury's, Asda, Coop, Aldi, Morrison's, Waitrose, Iceland, M&S, and Costco) and confirm that the platforms all deployed many different combinations of deceptive patterns and designed alcohol purchasing reduction interventions with participant input to exist in these different contexts. The future work included further development of the counter-sludge interventions into a browser extension.

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