Analysis of Dark Patterns in UI/UX Elements of Digital Platforms

by
Anukriti Jain

B.Tech, Electronics and Communications Engineering
Guru Gobind Singh Indraprastha University, India (2016)

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Authored by: Anukriti Jain
Integrated Design and Management Program
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Certified by: Antonio (Tony) Hu
Program Director and Senior Lecturer,
The Riccio Graduate Engineering Leadership Program
Thesis Supervisor

Accepted by: Joan Rubin
Executive Director, System Design and Management Program

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Abstract

5.35 billion people (the equivalent of 66.2 percent of the world's population) are using the internet as of January 2024. As the number of users on the internet is growing and the attention span of an internet user has reduced to 8 seconds, one of the challenges that digital businesses face is acquiring, engaging, and retaining users for their products/services. Some companies employ user interface elements on their websites or apps to trick users into signing up or buying a product. Dark patterns are the tricks used by apps and websites that push users into doing things they didn't intend to, like signing up for a service or making a purchase.

This thesis covers different types of dark patterns, including roach motel, malicious nudging, urgency/scarcity, bait and switch, and confirm-shaming. Dark patterns are also organized into "pressure" and "trickery" categories. Companies leverage dark patterns to meet their business goals, but it is critical to understand the long-term impact of using dark patterns. This thesis explores the possibility of helping users find these patterns and making them vigilant about these dark patterns. These deceptive patterns are common in web flows and are not easily detectable for many people visiting websites. There is a need to build an intervention to create consciousness about dark patterns. This thesis aims to make users aware of dark patterns by building a Chrome extension that will focus users' attention on the information provided and make them aware of dark patterns. First, we will focus on developing a Chrome extension for detecting scarcity/urgency dark patterns.

Thesis Supervisor: Antonio (Tony) Hu
Title: Director, Riccio Graduate Engineering Leadership Program

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This thesis is for

- My parents have supported me in all the highs and lows. They helped me to navigate everything with a smile. My parents remind me to enjoy and smile through the tough times.

- My brothers, Shubham and Saksham, have supported me immensely throughout my academic journey. They made me believe in myself even when I couldn't.

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Chapter 1

Introduction

In the following sections, we will discuss UI (User Interface) patterns companies use in their digital products to increase customer engagement, customer retention, cross-selling, and product education. The user interface patterns that are used to keep the user engaged in the platform are the focus of this thesis.

1.1 Different UI/UX Elements and Dark Patterns

It is becoming increasingly difficult to acquire, engage, retain, and sell to the user; thus, companies employ different design elements on their website and apps to keep the user engaged. UI design influences interaction in computerized devices or software products. There can be gesture-based interfaces, voice-controlled interfaces, and graphical user interfaces. UX (User Experience) covers how users will experience the product, service, or system. UX also influences how a person perceives the interface's ease of use, efficiency, and utility. Some digital platforms may use dark patterns - certain elements on a user interface that trick the user into taking a particular action to get them to engage with or buy the product. This thesis focuses on finding these practices and making the user vigilant of different dark patterns. “Dark pattern” is a term coined by Harry Brignull, who started the website Darkpattern.org (Brignull et al., 2023). He began with a library to name these deceptive practices.

Some examples of dark patterns (malicious nudging in a user interface) are signing up for a service or buying an insurance plan, consuming content by incorporating clickbait or advancing users in funnels by incorporating bold labels or call-outs. Some patterns trick users into sharing more information than they intend to. Users might also be tricked into accepting terms and conditions that the user doesn’t bother to read. (Brignull, 2011)

These deceptive patterns are common in web flows but are generally not easily identifiable for many people to take action on them. The website's design is often manipulated to meet business goals. Many dark patterns perform well in A/B or multivariate testing as these tests are often designed to get conversions rather than help people make informed decisions. Federal laws such as ROSCA, FTC-act, and CAN-SPAM are enacted to protect users. These laws make dark patterns illegal depending on the usage and context of the patterns. Epic Games paid $245 million as they used deceptive patterns in Fortnite's payment system. Noom (diet app) used deceptive patterns to acquire subscriptions and auto-renewal and paid $62 million as a Settlement charge. AT&T also put unauthorized charges on customers’ phone bills without their consent and had to pay $105 million for settlement (Brignull et al., 2023).

Harry Brignull has created a Hall of Shame on Darkpattern.org, which covers dark patterns used by Google, Microsoft, Amazon, Facebook, and other companies to trick users into taking action (Brignull et al., 2023). A few examples are:

- On the email preference page, AT&T alternated the meaning of the on and off buttons.
- Doordash is now warning its customers that their food might be colder if they don't tip the drivers, as the drivers don't like orders where tips are not included.
- Samsung tricked its users into accepting all the terms and conditions, including optional ones. It took the user a lot of time to change the answers.
- Air Canada is forcing customers to accept the conditions for receiving all promotional emails.
- Navi Mutual Funds forces users to share their location and contact data to access their funds. Users cannot withdraw and must accept this condition to access their funds. It is a complete breach of privacy.
- Kayak (travel search engine) enables the user to push the notification button even after the user deactivates it.
- Swiggy (food delivery app) added extra hidden costs during the food order checkout.

This thesis will cover different dark patterns, including malicious nudging, roach motel, confirmation shaming, bait and switch, misdirection, social proofing, and categorization of dark patterns into pressure and trickery. This thesis will detail companies' techniques and describe how designers build these patterns with UI/UX elements. Furthermore, this thesis will also discuss what users of digital products and websites think about these dark patterns, showing how cognizant these users are of dark patterns.

It is critical to recognize the long-term consequences of using dark patterns. UX designers, product owners, and strategic business executives are vital stakeholders in developing dark patterns that are driven to achieve business objectives for the shorter term while sacrificing consumer trust for the long term.

1.2 Chrome Extension

There is a need to build an intervention to create a consciousness about scarcity/urgency inducing dark patterns, which increase the desirability for the users by sharing that the product will become unavailable in some time. Out-of-stock options tend to make the users impulsive about their decisions, and there is a higher probability that the users will fall prey to the scarcity/urgency messaging (Blanchy et al., 2021). To begin with, the Chrome extension will detect scarcity/urgency-related dark patterns and eventually extend to detecting other dark patterns.

To help the users become more aware of the dark patterns, a Chrome extension highlights urgency/scarcity-inducing keywords to find dark urgency patterns on websites. The primary audience for this Chrome extension product is the users who are aware of the dark patterns but

get lured into impulsive buying as they are shown limited time-frame deals while scrolling through the product websites. The overall goal is to help apprise users of dark patterns and detect myriad types of dark patterns in future iterations. Studies showed that design nudges like highlighting keywords could be used to detect dark patterns and focus users' attention on the information provided. An initial list of such words and phrases has been included for detection in the extension product (Blanchy et al., 2021).

We will cover significant aspects of the Chrome extension in upcoming sections.

Chapter 2

UI/UX Elements Used in Digital Products

2.1 Different UI/UX Elements Used in Digital Products

UX designers leverage different interface design elements and journeys, including understanding user research, interaction design, information architecture, and usability techniques to acquire customers and improve engagement. The user interface (UI) allows individuals to interact with a website or application on devices, including computers or mobile devices. Designers aim to build interfaces that improve the user's experience by reducing cognitive load. UX refers to user experience that determines how the user feels about the product, service, or system. It also influences how a person perceives the interface's ease of use, efficiency, and utility (Indeed, 2022).

This chapter provides an overview of the use of UI and UX elements in customer acquisition, engagement, and retention.

2.1.1 User acquisition:

User acquisition is a process that companies employ to find and manage prospective individuals and encourage them to buy the company's product for the first time. Different UI/UX elements are used to acquire new potential users when they visit the website's landing page. Techniques used for user acquisition include email marketing, social media marketing, building communities, and gamification (Decker, 2018).

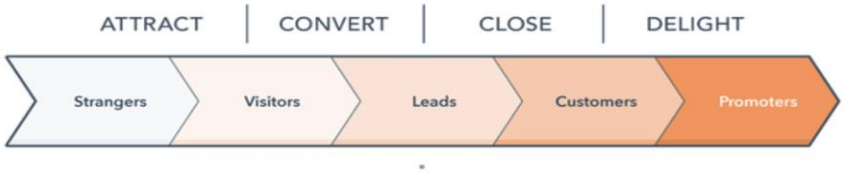

Figure 2-1: User acquisition flow

Source: (Decker, 2018)
https://blog.hubspot.com/service/customer-acquisition

The funnel for user acquisition shows how a stranger is attracted to the product website to become a visitor. After gaining awareness about the brand, visitors consider using the

product/service. After buying the product/service, the user becomes the paying customer of the product. If the customer is delighted by the product experience, the customer becomes the product's promoter.

One of the novel methods in practice to optimize a company's user acquisition efforts is gamifying an individual's journey.

2.1.1.1 Gamification

Gamification adds game-like aspects, such as points and rewards, to non-game situations to engross users in using a product or service. Using gamification, designers appeal to users' natural desires and make the experience enjoyable. In the following example, Temu, an online marketplace that connects millions of brands, manufacturers, and sellers worldwide, uses these UI and UX elements to gamify the experience on the app to lead them into buying products on the platform.

To illustrate with Figure 2-2, as soon as potential customers download the app or go to the Temu website, they can see a rotating wheel that, upon spinning, provides a signup bonus. Suppose the potential customers start browsing the product; in that case, UI/UX elements will again nudge them to log in or sign up to use the bonus so that the company can collect more information about these potential customers. Apps like Distacart also use similar techniques.

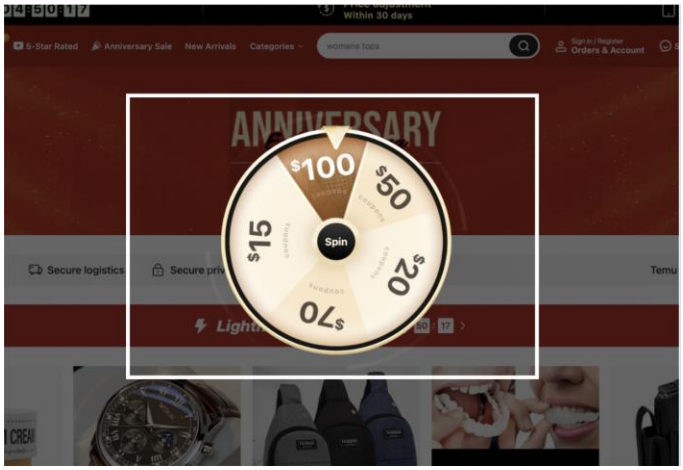

Figure 2-2: The white highlighted box shows the gamification flow for Temu by spinning the wheel.

The screenshot in Figure 2-2 is taken from the Temu app, where the spin-the-wheel icon is displayed on the first interaction. Temu gamifies the entire experience and makes the potential customer interested in taking action by spinning the wheel.

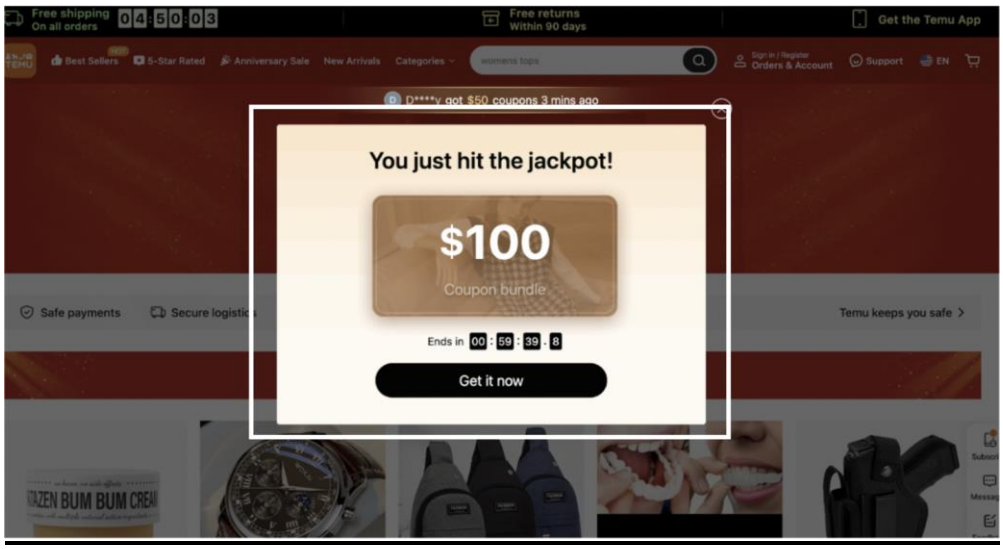

Figure 2-3: White highlighted box shows that the potential customer has hit the jackpot as the potential customer spins the wheel.

To illustrate with Figure 2-3, as soon as the potential customers spin the wheel on the Temu app, a jackpot of $100 is shown on the screen. Temu adds the user sign-up process (“Get it now” on the screen), also indicating the timeframe for utilizing the $100 by the “Ends in” message. Temu uses this technique to speed up the acquisition of new customers.

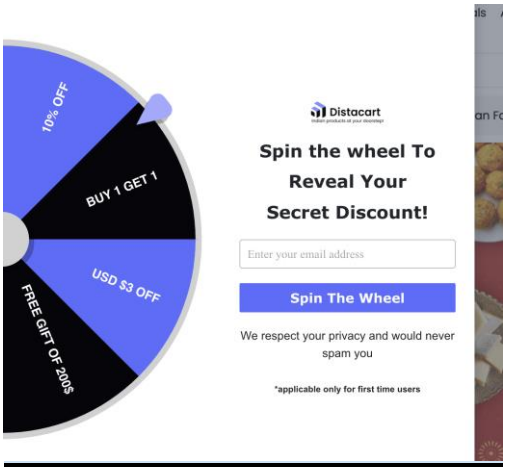

Figure 2-4: Gamification flow for Distacart (e-commerce website) by showing spin-the-wheel

To illustrate with Figure 2-4, as the potential customer lands on Distacart (a major online shopping store for Indian products), they are given a secret discount as they spin the wheel. If potential customers want to access the discount, they must sign up, which is a classic customer acquisition technique.

2.1.2 Customer engagement:

Customer engagement is defined as the process of cultivating the relationship between the company and the customer beyond the standard interaction. It is about building loyalty between the company and the customer so that the company can have an increased lifetime value with the customer. It allows for understanding customer needs and collecting insightful data about the customer at every touchpoint. Customer engagement metrics can be as follows:

- Proactiveness: The company actively finds new ways to interact and strengthen customer relationships.
- Volume: The total volume of interactions that occur over small time intervals or the whole lifecycle of the customers.
- Longevity: Total amount of time when customer interactions happen, and the customer remains loyal to the brand.
- Context: This covers the situation in which the interaction is happening between the brand and the customer.
- Frequency of interaction: The number of times the user interacts with the product.

In section 2.1.2.1, the Amazon rewards-gaming section covers UI and UX elements that increase engagement on the e-commerce app.

2.1.2.1 Amazon rewards: Gaming section

Amazon.in has an instant rewards section where customers can win a scratch card by making bill payments on the Amazon Pay app (a quick payment solution launched by Amazon in India). Amazon.in is directing users from its Amazon.in e-commerce app to the Amazon Pay app, facilitating engagement on the Amazon Pay app. However, the scratch card rules on Amazon Pay state that users must activate the daily payment or successfully recharge on the Amazon Pay app. This method facilitates customer engagement on the Amazon Pay app using Amazon.in an e-commerce app.

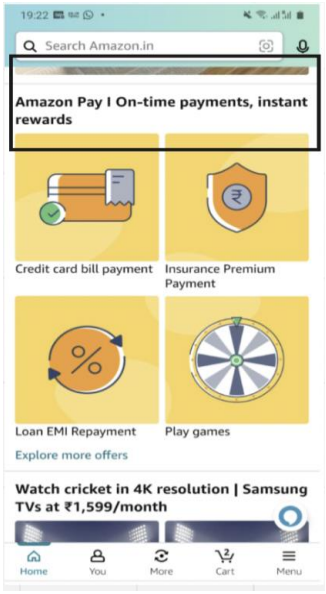

Figure 2-5: Black highlighted box shows Amazon.in facilitating customer engagement using instant rewards.

To illustrate with Figure 2-5, as the customer lands on the rewards section of Amazon.in the app, the user will be shown methods to win instant rewards by making credit card bill payment, insurance premium payments, or loan EMI payments using the Amazon Pay app.

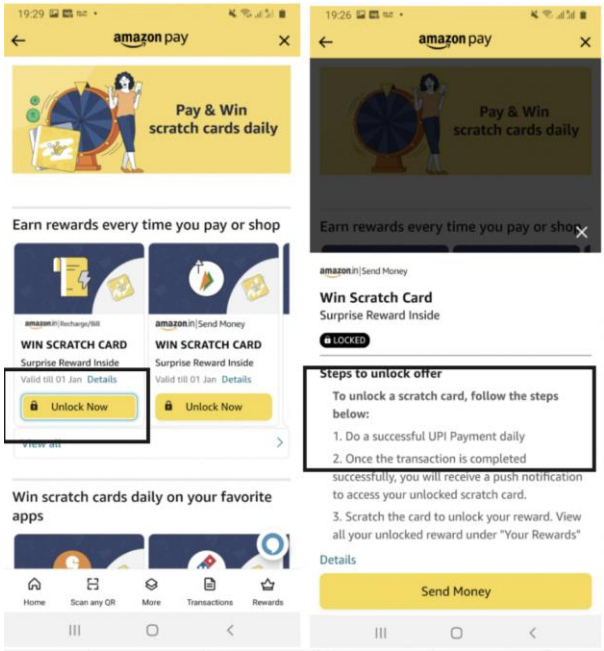

Figure 2-6: Black highlighted box shows the steps to unlock an offer on the Amazon Pay app.

To illustrate with Figure 2-6, as the customer lands on the Amazon Pay app, the customer can unlock a scratch card following the steps, such as successfully completing UPI payment daily.

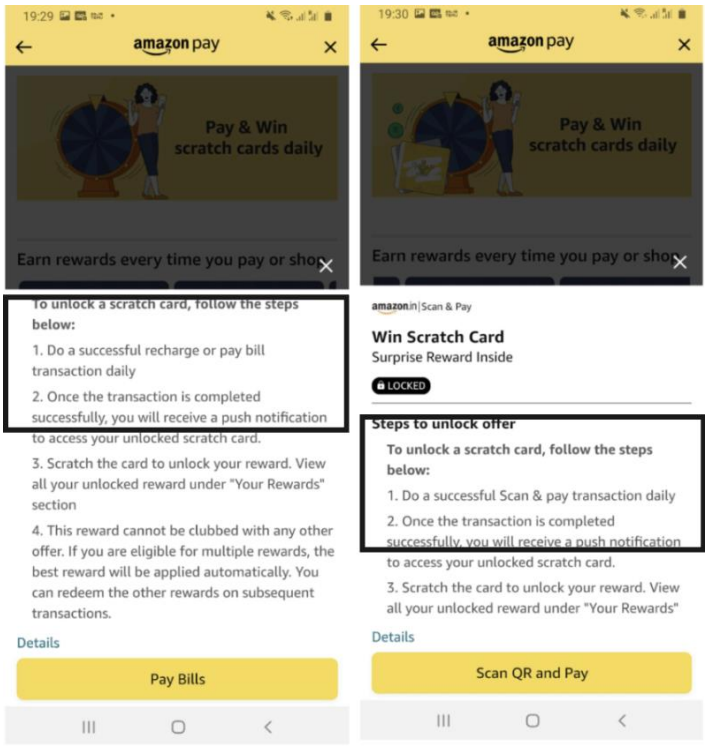

Figure 2-7: The black highlighted box shows a way to unlock the offer; the user must successfully recharge/pay a bill on Amazon Pay.

To illustrate with Figure 2-7, as the customer lands on the Amazon Pay app, the customer can win a scratch card by successfully recharging or making the bill transaction daily.

2.1.2.2 Bundling and Product Education

Bundling combines multiple gamification techniques to inculcate product education, develop user product awareness, and increase user engagement. Gamification is an effective way of understanding the extrinsic and intrinsic motivation of the users and leveraging game mechanics such as badges, points, and leaderboards to unlock user enjoyment and product education (*11 powerful gamification techniques for better engagement*,n.d.).

Bundling incorporates multiple gamification techniques, such as:

- Learning and development using bite-size content creation, including quizzes and knowledge checkpoints, enabling engagement and new information retention.
- Incentivizing users with rewards as they progress can help develop motivational momentum. These incentives can be converted into real-world incentives as the user's engagement improves daily.
- Healthy competition among the users can keep them engaged, and their badges of achieving milestones can help achieve social validation.

In the example illustrated in Figure 2-8, Amazon bundles two gamification techniques to facilitate product education and product engagement. As users land on the Amazon app, UI/UX elements nudge them to spin the wheel, offering monetary incentives on the first step. This spin-the-wheel gamification technique is coupled with a bite-size quizzing technique, inculcating product education in the second step. The quizzing technique enables engagement and product information retention.

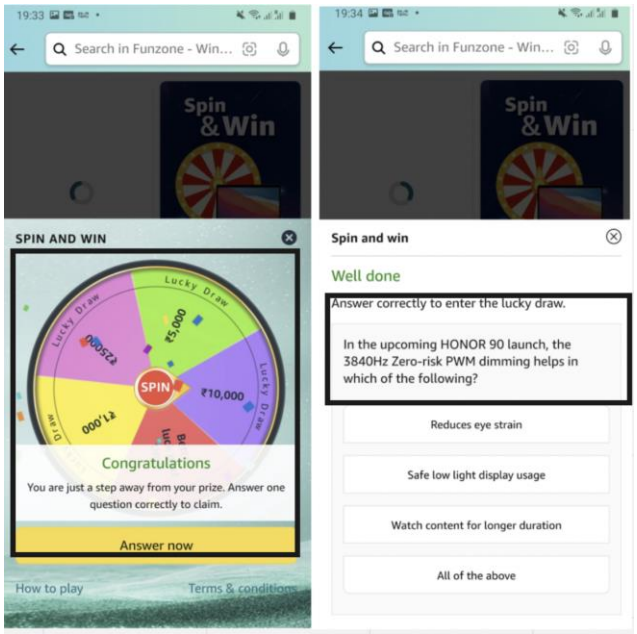

Figure 2-8: A black highlighted box shows that Amazon is bundling two gamification techniques called spin the wheel and product quizzing to facilitate engagement and product education.

As illustrated in Figure 2-8, the user has to answer specific questions about the product (Honor 80), which leads to the user's education about the product.

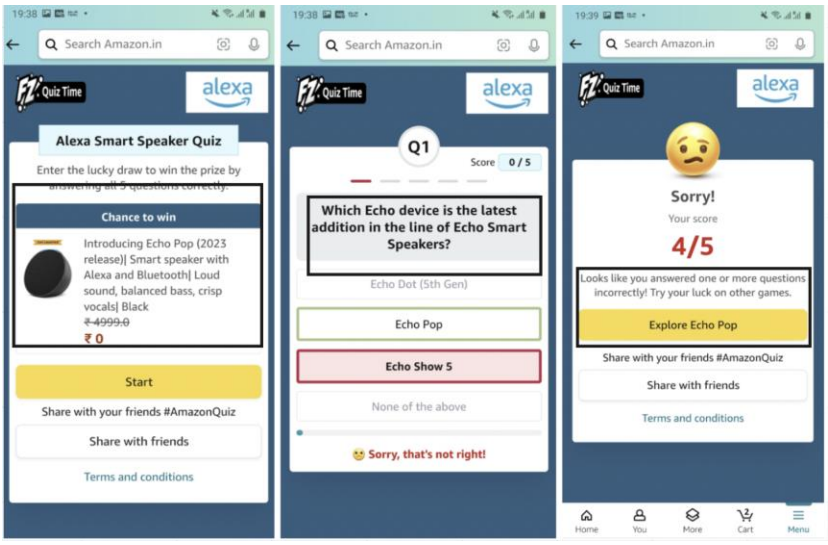

Figure 2-9: Black highlighted box shows that the users are taking part in a bite-sized quiz where they can win Alexa smart speaker

As illustrated in Figure 2-9, the bite-sized quizzing technique is used to inculcate product education about Alexa smart speaker. Users can also explore the features of Echo Pop after taking the quiz and share it with their friends.

2.1.2.3 Customer Engagement through Product Videos

Product videos demonstrate tangible advantages and unique features associated with the product. Users spend 19 hours (an average) per week watching Facebook, YouTube, and TikTok videos. Companies leverage engaging, informative, and relatable narrative elements of product demonstrations to increase customer engagement and education. These product demonstration videos showcase how products can solve real-life problems the user faces. As illustrated in Figure 2-10, Amazon Live (Livestream product demo on Amazon e-commerce website) has a live product demo where they hire social media influencers to display trending products. Users can interact on the live product demonstration sessions to get their questions about the features of the products answered (Santiago, 2023).

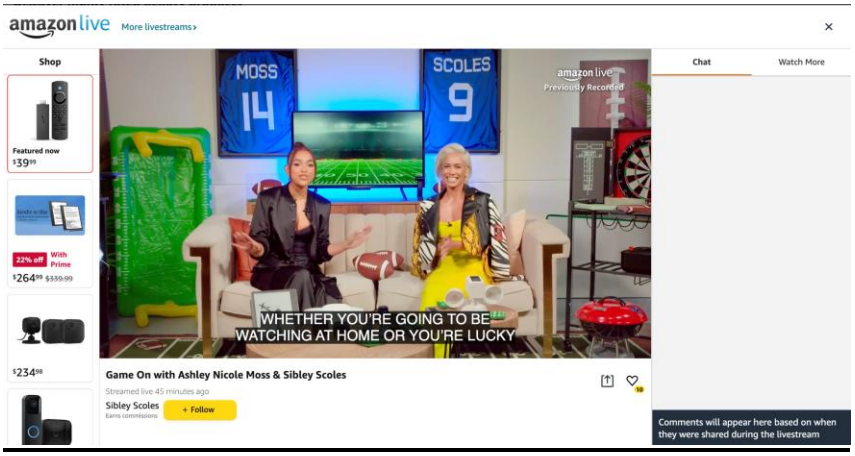

Figure 2-10: Influencers using live video sessions to explain Amazon products on Amazon Live

Influencers are sharing their experience using Amazon products in live videos on the Amazon website. Influencers can discuss the product's distinct features and unique stories to keep users engaged in the video.

2.1.3 Customer Retention

Customer retention is a process of measuring customer loyalty or the capability of the business to keep its customers over a period of time (Gillis & Sachs, 2021). Businesses must retain

customers as repeat buyers can save costs while driving revenue. Customer retention is a function of customers feeling valued and companies developing empathetic relationships, providing offers and experiences to the customers that they cannot get anywhere else (Olson & Writer, 2023). Retention of the customer is measured over a period of time, and it can vary from a month to a year. Important metrics to measure customer retention:

- Number of customers at the start of the period (S)
- Number of customers at the end of the period (E)
- Acquisition of new customers in the given period (N)

Customer retention formula: (E-N)/S *100 = Retention rate

Data can be used to understand customer feedback, personalize customer interactions and offer personalized services to the customers increasing customer retention (Olson & Writer, 2023).

2.1.3.1 Creating yearly plans for customer retention

Subscription is a revenue model where customers pay a monthly fee or yearly fee to consume a product or service. Companies are building different subscription models, from simple fixed rates to complex pay-per-usage models (Brien, 2023).

As illustrated in Figure 2-11, Adobe has built a subscription plan for Adobe Acrobat Pro where if you don't cancel your subscription within 14 days of subscribing, you will be charged a high cancellation fee. Even if a user wants to unsubscribe, they are given an option to change the plan or pay a high cancellation fee. This technique helps retain customers and reduce customer churn (customer churn means users not returning to the company website). If the user opts to change the plan by subscribing to a new product from the Adobe product suite, the plan begins with a new yearly cycle, which may be difficult to exit with a high cancellation fee. This subscription cycle will continue until the customer agrees to pay a high fee to unsubscribe.

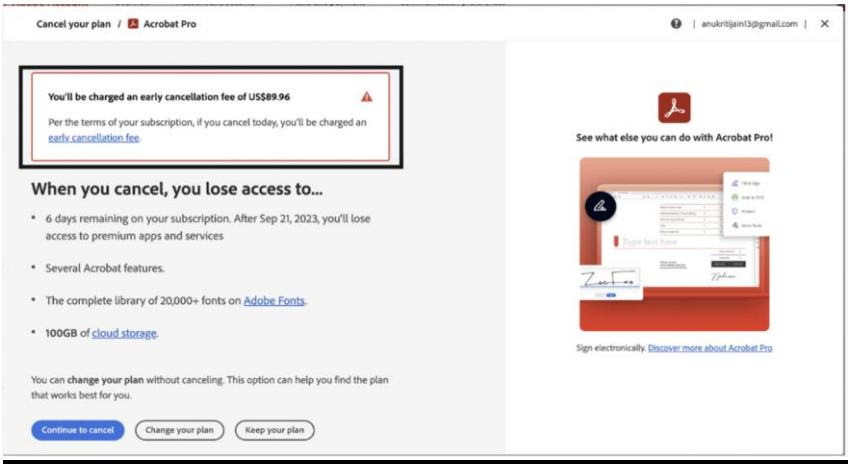

Figure 2-11: A black highlighted box shows that the user has to pay an early cancellation fee of US $89.96 for canceling a subscription to Adobe Acrobat Pro.

As illustrated in Figure 2-11, this screenshot is taken from Acrobat Pro and shows an early cancellation fee of US $89.96. The customer forgot to cancel the subscription within the first 14 days of signing up and has to pay a high cancellation fee.

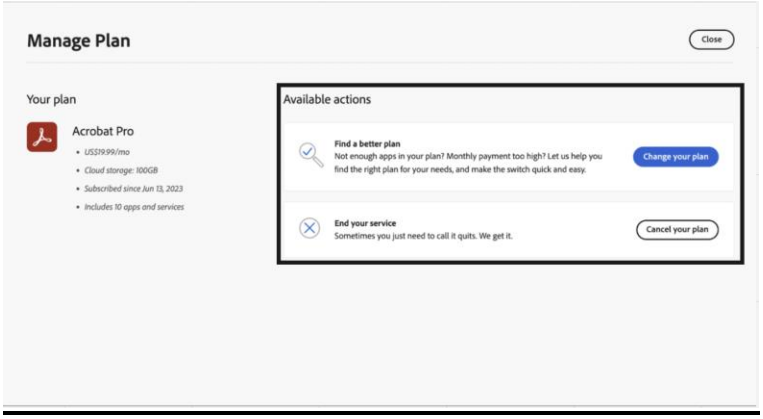

Figure 2-12: The black highlighted box shows that the user has the option to either change the plan to another Adobe product or end the service.

As illustrated in Figure 2-12, the customer continues and is shown an option of finding a better plan (offered as the first preference) and a second option of ending the service by canceling the existing plan. Users will typically switch to a better plan where they have to pay a low monthly payment subscription fee rather than paying a high cancellation fee.

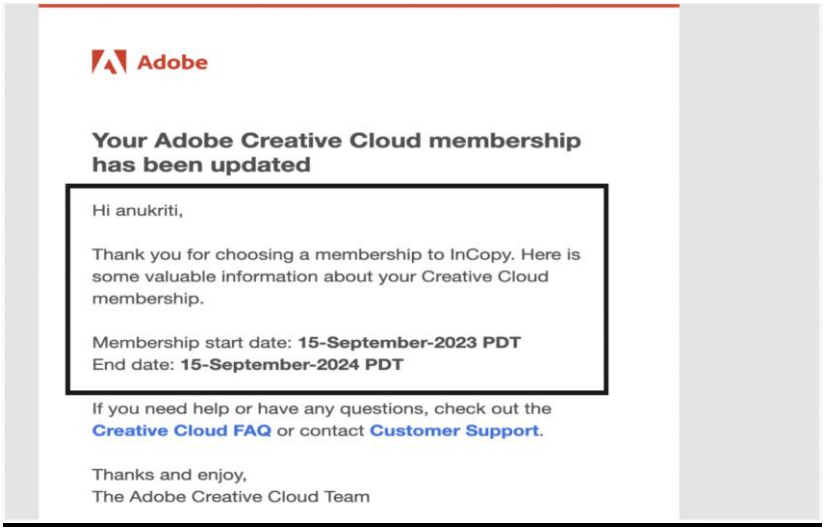

Figure 2-13: The black highlighted box shows the user subscribes to another Adobe product from the product suite.

If the user pays for another Adobe product with a low monthly subscription fee, the subscription cycle starts from the beginning. This technique will get users to stay in the subscription loop, and there will be less probability of opting out of this subscription cycle.

2.1.4 Cross-Selling

Cross-selling is the process of building trust with existing customers and selling additional products or services that are compatible with the ones the customer is purchasing. Segmenting customer data into groups based on attributes like age, location, and average spending is critical to understanding customers' purchasing behavior. While building the cross-selling strategy, it is essential to analyze metrics and data to understand the following:

- Identify which product or service to cross-sell per the customer's interest.
- Identify which customers to cross-sell the product to.
- Create a strategy or campaign to cross-sell and identify how the customer journey will look during cross-selling (Salesforce, 2018) (*Christoffersen,2017*).

Techniques like market basket analysis (the best possible combination of frequently bought products) are leveraged to motivate users to make an additional purchase (*Christoffersen,2017*) (Salesforce, 2018).

Cross-selling helps improve engagement, customer satisfaction, sales revenue, and customer lifetime value with the company by integrating closely with the customer (Salesforce, 2018).

In section 2.1.4.1, we understand UI/UX elements are used to cross-sell items on Zomato.

2.1.4.1 Cross-selling after purchase through coupons:

As illustrated in Figures 2-14, Zomato (a food delivery app in India) understands customers' purchasing behavior and cross-sells scratch cards, recommending products from another app called Blinkit (**a grocery delivery app owned by Zomato)**.

It helps in user acquisition for Blinkit, and customers must order within three days until the scratch card expires. It helps create urgency for the user to download (customer acquisition for Blinkit) or visit Blinkit and use this coupon in the next three days.

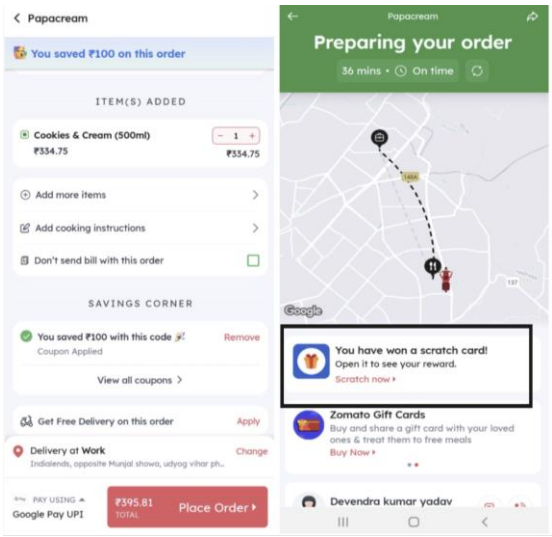

Figure 2-14: A Black highlighted box shows that the user ordering on Zomato (food delivery app) wins a scratch card from a different app.

As illustrated in Figure 2-14, the user is ordering on Zomato. As Zomato prepares the order, a slider on the screen says that the user has won a scratch card and has to open the scratch card to see the reward.

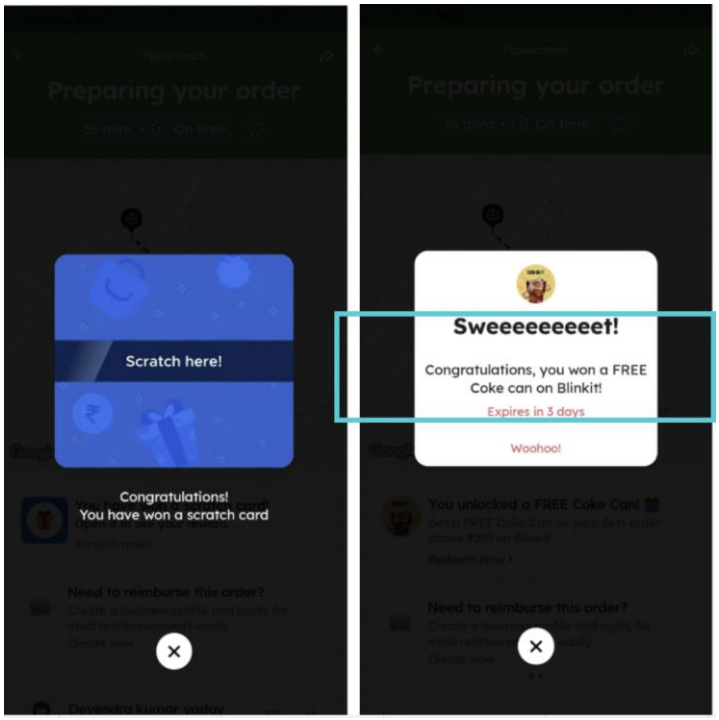

Figure 2-15: As the user proceeds with the scratch card, the blue highlighted box shows the user won a free Coke can on Blinkit (a grocery delivery app owned by Zomato) with three days validity.

As the user further scratches the scratch card, it shows the user won a free Coke can on Blinkit. The user has three days to use the scratch card.

Chapter 3

Dark Patterns

We covered UI/UX elements used for customer acquisition, customer engagement, customer retention, and cross-selling in the previous chapter. In this chapter, we focus on defining dark patterns, types of dark patterns, and categorization of dark patterns.

3.1 Definition of Dark Patterns

A dark pattern, also known as malicious nudging, is a technique designed to trick platform users into taking action. Examples include signing up for a service or buying an insurance service the user doesn't intend to purchase. Using web data, companies build exploitative online choice architecture practices that impair customers' autonomy and free will. Choice architecture is designed to hide critical information and take the user's attention to scarce product options or set default options that might not align with the user's preferences. Online choice architecture can include tactics like countdown clocks (i.e., imposing pressure on the buyers of the product) or eye-catching discounts (where real price reductions might not have taken place) (Rendle, 2022).

Dark patterns can cause detrimental effects as companies exploit personal data and can have an economic impact on the user. Confirm shaming, fake scarcity, fake social proofing, fake urgency, nagging, obstruction, sneaking, and trick wording are different dark patterns (Brignull et al., 2023).

Dark patterns make it difficult for users to make decisions freely, where users' choices are affected by the design and behavioral choice architecture options given to them. Companies designing dark patterns exploit users' laziness, biases, and vulnerabilities by nudging, pressurizing, manipulating, and deceiving them. Dark patterns can be data-driven, personalized or use scarcity, cognitive, and behavioral biases to make the user act in a particular direction (Rendle, 2022).

Dark patterns can be classified into AI & machine learning-based, and UX-based dark patterns.

Figure 3-1: The flow displays AI & machine learning-based and UX-based dark patterns. Source: (Kinnaird, 2020) (Salina & Sangaraju, 2021) https://uxdesign.cc/dark-patterns-powered-by-machine-learning-an-intelligent-combination-f2804ed028ce

AI & machine learning-based dark patterns

AI & machine learning-based dark patterns aim to change users' behavior over time. As the user visits the product website, the user's behavioral data is collected, and algorithms use this behavioral data to learn and optimize by reacting to the user's actions. As these AI and machine learning-based dark patterns keep optimizing, they will align their goal with the user's agenda. As the user takes action over and over due to behavioral changes, the action would seem willful to the user after some time, and the user voluntarily aligns with the algorithm's goal (Kinnaird, 2020) (Salina & Sangaraju, 2021).

Example: The algorithm used by video streaming websites (like YouTube) is to update users' feeds so that the users keep watching the videos. The algorithm is optimized to change users' behavior over time to make users keep watching videos (Kinnaird, 2020).

UX-based dark patterns

UX-based dark patterns are manipulative tactics designed to mislead users into taking an action they would not necessarily want to take. UX-based dark patterns exploit human psychology to push a company's profits at the cost of the user's experience (Varela, 2023). Users might fall prey to emotional triggers like fear of missing out, guilt, sunk cost fallacy, confusion, and frustration. These dark patterns may trick users into staying longer on the platform, paying for something the user might not ordinarily want to pay for, or inviting the user's friends to the platform (Varela, 2023) (Salina & Sangaraju, 2021).

Example: Duolingo shares that the user is making the Duolingo bird mascot sad when the user is not visiting the platform. It also cues the user to start a 5-minute lesson immediately (Varela, 2023).

Concerning the scope of this thesis, we will focus on UX-based dark patterns, primarily how UI/UX patterns are used to trick users into taking action.

3.2 Types of Dark Patterns

3.2.1 Bait and Switch:

Bait and switch is a sales tactic companies use to initially recommend a desirable product at a reasonable price to make a deal seem good for the user. As the user proceeds further in the journey, the company switches the offer, converting it into a less desirable deal for the user. Users are highly likely to take this offer as they may want to reduce the sunk cost considering the time and effort spent. Bait and switch are used by a company that advertises an exciting product but ships a low-quality product to the user (Pfeifer, 2019).

Another example of bait and switch is when a platform shows fake information to the user related to their interest area. As the user clicks on the information, it takes them to another link or page where the information changes. Platforms use bait and switch to get more clicks or make users perform an action that the user might not want to accomplish (Singh, 2021).

Baiting and switching are also employed when showing an attractive offer to the user and switching the offer with a more expensive service or product as the user becomes interested.

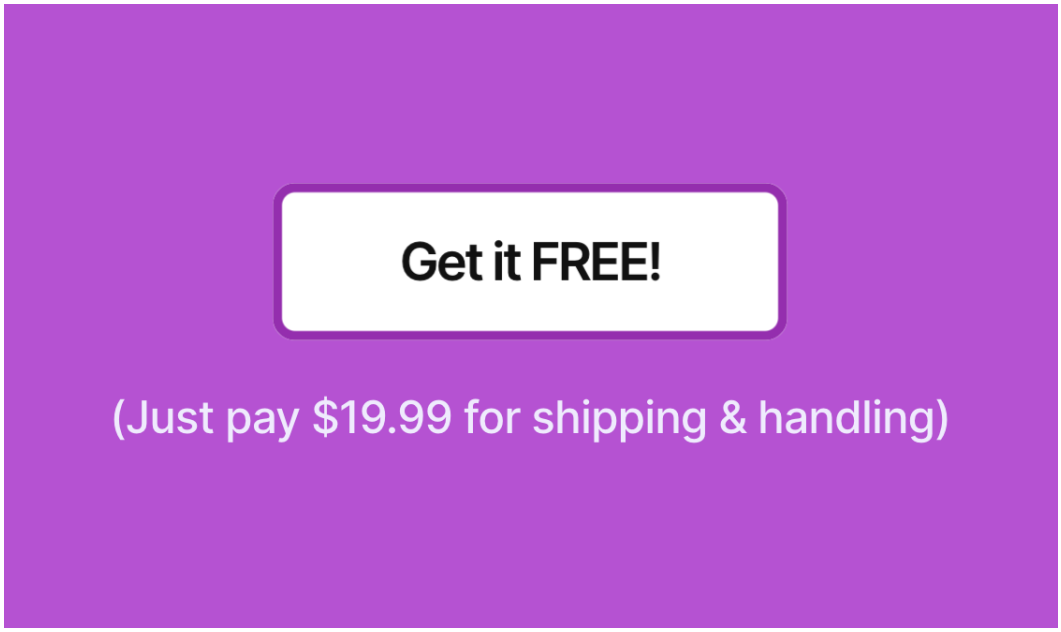

Figure 3-2: The screen shares the bait and switch technique where the user is shown that they can get a product for free, and as the user proceeds further, they are asked to pay $19.99 for shipping and handling
Source: (Sapio, n.d.)
dannysapio.com/evilux

As illustrated in Figure 3-2, the bait and switch technique used can impact the users who are not paying close attention or those who might misunderstand the situation. The users are shown that they can get a product for free, and as they proceed further, they are asked to pay $19.99 for shipping and handling. This technique can erode user trust.

3.2.2 Scarcity/Urgency:

The scarcity tactic involves building a false notion of limited supply or popularity of a product, which can force the user to purchase the product within the displayed time range. An example of scarcity messaging can be communicating that x number of users have the product in their cart or that the product will become unavailable in some time. Similarly, out-of-stock options always make the users impulsive about their decisions, making them fall prey to scarcity messaging. These out-of-stock options may not be linked to any data and deliberately mentioned to specific products to increase desirability (Bowring, 2023).

Urgency messaging tactics involve pressuring the user, which creates a time constraint to complete an action. Websites use a countdown timer to force the user to make the purchasing decision quickly. There is no way to determine if the discount countdown timer is authentic (Bowring, 2023).

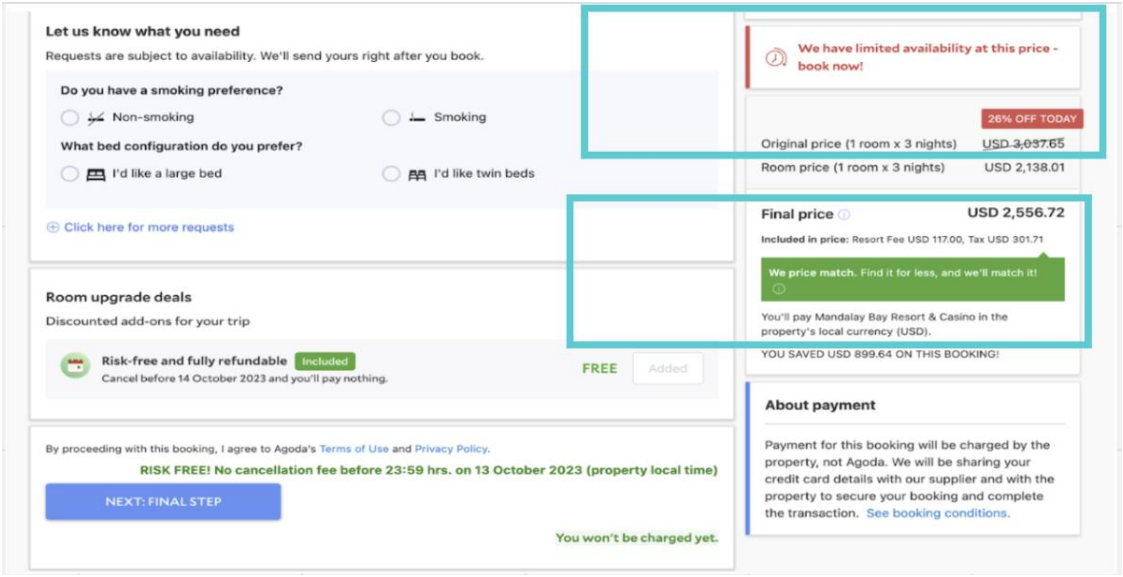

Figure 3-3: Turquoise box highlights a screen taken from Booking.com. It shows that the user is communicated a low-stock message saying that the website has limited hotel availability at the given price.

As illustrated in Figure 3-3, taken from Booking.com (a travel website), a low-stock message says that the website has limited hotel room availability at the given price. It is creating urgency by sharing that they have limited rooms at 26% off today.

Booking.com also tries to build trust by sharing that they will do a price match if the user finds a particular hotel room for a lesser price. If the user finds a specific hotel room for a lower price and tries to claim a price match, Booking.com shares that this price match claim applies to bookings where no discount was applied. As illustrated in Figure 3-3, the discount was auto-applied to the booking, and the user will not get their hotel price matched.

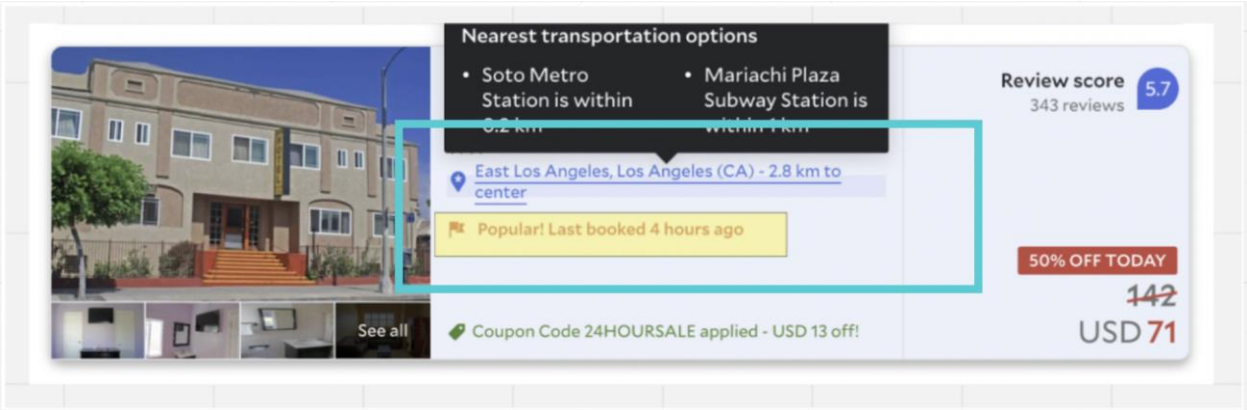

Figure 3-4: The turquoise highlighted box displays that the user is shown a particular hotel is popular and was last booked 4 hours ago.

As illustrated in Figure 3-4, Booking.com shares the message of high demand by saying that the “property is popular! Last booked 4 hours ago”. This messaging increases the desirability of the property.

3.2.3 Confirm shaming:

Confirm shaming is a deceptive tactic that prompts emotions like shame or guilt to influence the users’ decision-making process. Apps or websites employ this deceptive pattern to make users feel guilty or bad by not opting for a feature or service that the company offers. It targets the users’ self-image to manipulate them into performing a particular action they wouldn’t have performed otherwise. The decline option of a product or service is phrased in a way that induces a sense of guilt. Confirm shaming shows the opt-out option of a product or service in a demeaning manner, making users feel inadequate about themselves (Brignull et al., 2023) (Singh, 2021).

Figure 3-5: The turquoise highlighted box shows that Duolingo uses a deceptive technique where it shows that the language bird is crying: learn Italian today, or he will eat a poisoned loaf of bread.

As illustrated in Figure 3-5, Duolingo uses an example of a language bird crying: learn Italian today, or he will eat a poisoned loaf of bread. It also says that the following email will be a funeral e-vite. Duolingo is manipulating the user into learning Italian by prompting the emotion of guilt. It shares that the next email will be a funeral e-vite if the user does not start learning Italian. Duolingo is exposing users to the trauma of death by meticulously wording the decline option in a way that induces a sense of guilt.
Source: Social and Ethical Responsibilities of Computing Fellowship

3.2.4 Misdirection:

Misdirection uses language and visuals to direct the user's attention away from making a choice. Misdirection is a technique where users are made to direct their attention to a particular element so that it can distract their attention from other vital components. A specific section of the page is highlighted intentionally so that the user focuses on the highlighted part rather than focusing elsewhere, which may contain information like marketing opt-outs. Confusing wording is also used to direct the user's attention to accept terms and conditions that the user assumed had an opposite meaning (Martinson, 2020).

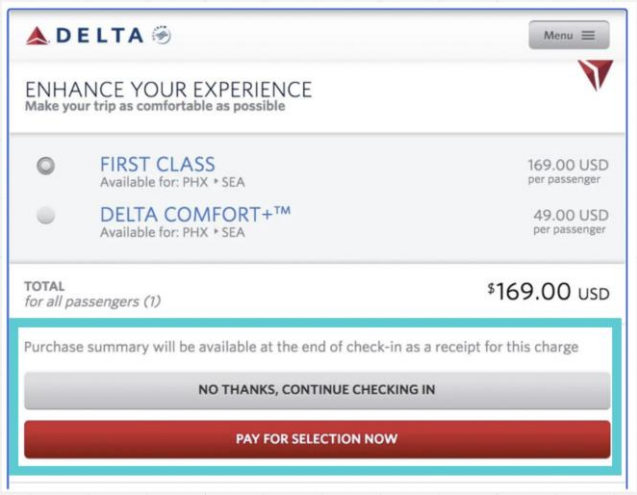

Figure 3-6: The turquoise highlighted box shows the red call-to-action button designed for the user to select the first class option for Delta Airlines and go forward with the "pay for selection now" option.
Source: (Martinson, 2020)
https://davidmartinsonnyc.medium.com/ux-dark-design-pattern-misdirection-c90cd5a8b9f6

As illustrated in Figure 3-6, the user is made to pay attention to the "pay for the selection now" red button. This button will select the first-class flight option for Delta Airlines. The other option, "No thanks, continue checking in", is intentionally made grey so that the user focuses on the "Pay for selection now" option and proceeds further with a costlier first-class flight option.

3.2.5 Roach Motel:

Roach Motel (also known as trammel net design) is a dark pattern that provides a straightforward and smooth pathway to get in but a complicated pathway to get out. The screen design is such that signing up for a service is effortless, but the user must follow a list of instructions to cancel, stop, or undo the service, making it challenging to opt-out. Actions that benefit the user are complex and ambiguous, whereas those that help the company are tempting and intuitive (Brignull, 2013).

Further in Figure 3-7, the example is from Amazon Prime, where the user is trying to unsubscribe to the service, and triggers are being thrown at the user to remind them later, three days before the membership renews, about unsubscribing. The user will mostly forget about unsubscribing to Amazon Prime by that time.

In Figure 3-8, Amazon also shows a pause button that asks the user to pause the service for some time and return whenever they want to use it. Amazon Prime is keeping the “End Membership” option at the bottom of the screen, which was the primary action the user was trying to take.

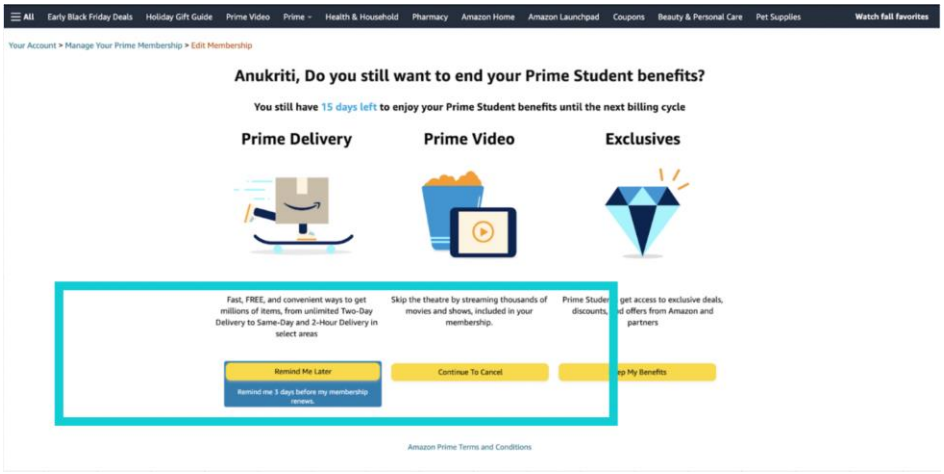

Figure 3-7: A turquoise highlighted box shows the user trying to unsubscribe; “Remind me later” is shown as the first option (inside the blue box).

As illustrated in Figures 3-7, the user is trying to cancel the membership for Amazon Prime. The first option, shown on the left, is “Remind Me Later,” then “Continue To Cancel,” and “Keep My Benefits”. “Remind Me Later” is highlighted in blue as Amazon wants the user to focus on this option.

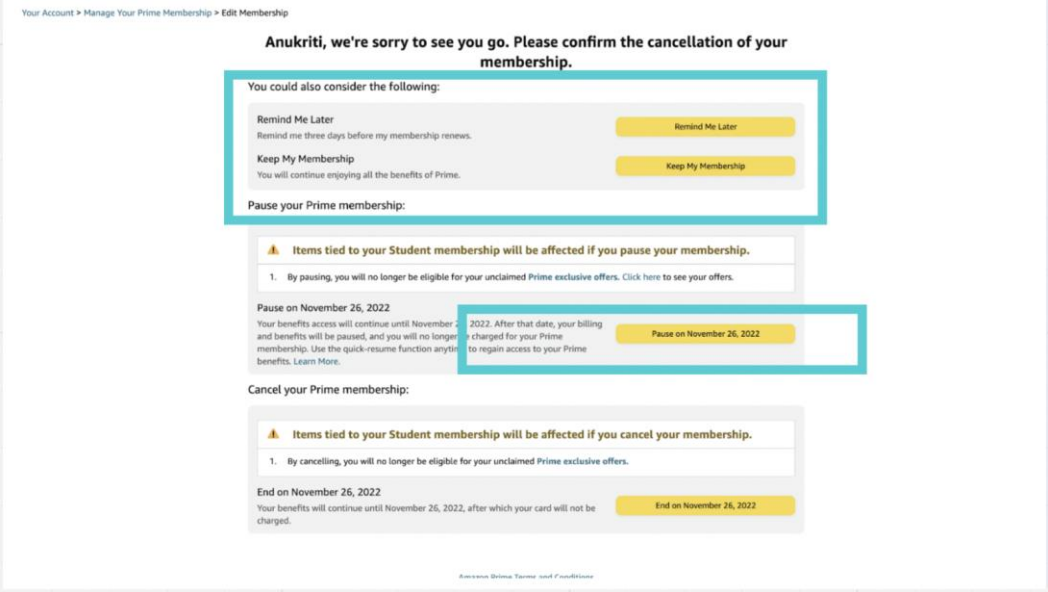

Figure 3-8: The turquoise highlighted box shows that the user is shown: “Remind Me Later,” “Keep My Membership,” and pause options on the top.

As illustrated in Figures 3-8, opting out of Amazon Prime service is deliberately made complicated when the user continues to cancel. The user is shown the following again - “Remind Me Later and “Keep My Membership” options on the top; the next option, while traversing from top to bottom, is to “Pause on November 26, 2022”, with much explanation; the last option shown is “End on November 26, 2022”. Amazon Prime is luring users into keeping their membership using these communication techniques. The user may get tricked into not ending the membership.

3.2.6 Triggering Fear

This dark pattern pushes users not to opt out of a service or subscription by triggering fear in their minds. The primary target for triggering fear is users with less knowledge about the application or the website they are using. This dark pattern shows that opting out of a service may not have positive consequences, as users might miss out on advantages or significant savings. Companies make up deceptive information or use misleading words to make users feel they are missing out on significant experiences if they opt out of the service (Singh, 2021) (Ramotion, 2022).

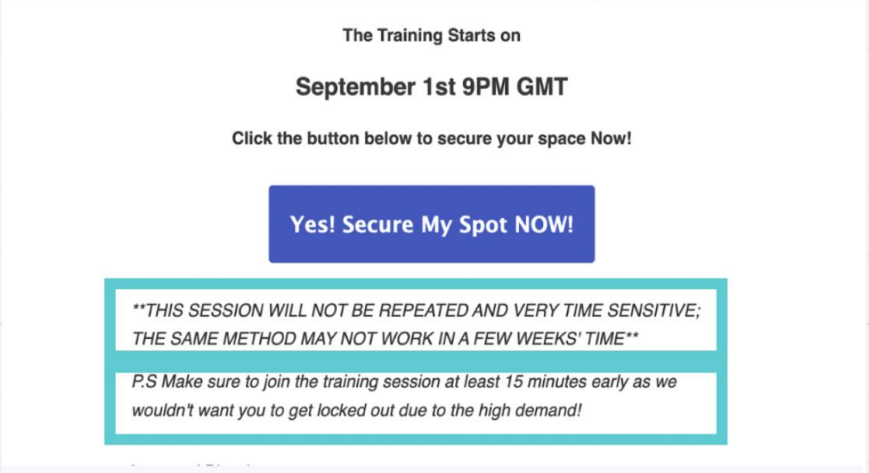

Figure 3-9: The turquoise highlighted box shows that the company triggers fear by sharing that "This session will not be repeated and is very time-sensitive."

The example illustrated in Figure 3-9 shows that a company triggers fear by saying, "This session will not be repeated and is very time-sensitive," as the teaching method will not work after a few weeks. They also trigger fear by saying the user should join the session early if they don't want to get locked out due to the high demand.

3.2.7 Social Proofing

Certain businesses influence the behavior of the users by sharing the success stories of similar users who purchased the product or service from them in the past. It is a psychological technique where the actions of the existing business users are demonstrated to be correct in a particular scenario, influencing the new users to take action quickly, and the new users feel validated by conforming to the social norm. Social proofing is common when users cannot determine the appropriate behavior and assume that the people around them know more about the consequences of that decision. Alternatively, it is also called "herd mentality" (Singh, 2021) (Dynamic yield, n.d.).

In the example illustrated in Figure 3-10, Temu (an e-commerce website) shares that "o****r got $10 coupons 4 mins ago"; this messaging motivates users by suggesting that they can also get a coupon and influences them to take action immediately. E-commerce websites use social proofing to showcase the high demand for a product by sharing the number of product views, add-to-carts, and user purchases in a period (Dynamic yield, n.d.).

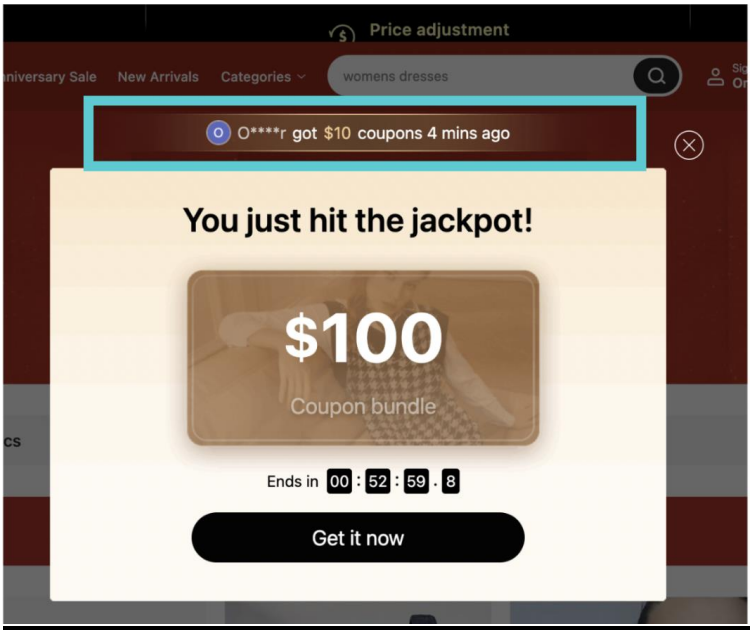

Figure 3-10: The turquoise highlighted box shows that the user got a 10-dollar coupon four minutes ago, influencing new users to get the coupon.

As illustrated in Figures 3-10, Temu uses social proofing to show a user who visited Temu's website that another user got a 10-dollar coupon four minutes ago. Social proofing influences the new user to act on "Get it now" and sign up.

3.3 Categorization of dark patterns as per manipulation:

Dark patterns are categorized based on manipulation. Manipulation can be categorized into trickery and pressure.

3.3.1 Trickery:

Trickery capitalizes on emotional and mental attitudes (beliefs and desires) to influence the user's behavior. Belief is the acceptance of information to be true irrespective of any evidence that supports it. Meanwhile, desires are what individuals wish for and can be aspirational to them (Luguri & Strahilevitz, 2021) (Noggle, 2020).

Example:
As illustrated in Figure 3-11 below, the user is getting tricked by sharing a general agreement for the user to keep in touch. Virgin Media makes the user tick the box to stay in touch. If we look closely, we find out that ticking the box means Virgin Media "won't contact you or share your information with other Virgin companies for marketing purposes."

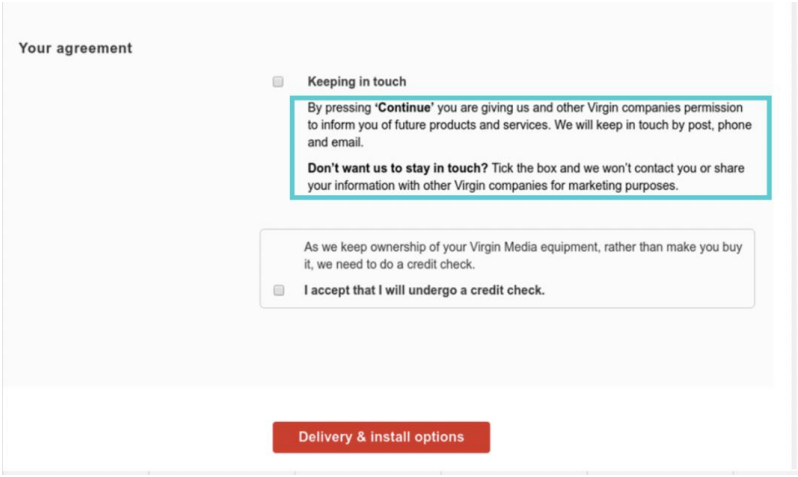

Figure 3-11: The turquoise highlighted box shows that the users may think the company will keep in touch by ticking the "Keeping in touch" box, but Virgin Media won't contact you or keep in touch if you tick the box.
Source: Social and Ethical Responsibilities of Computing Fellowship

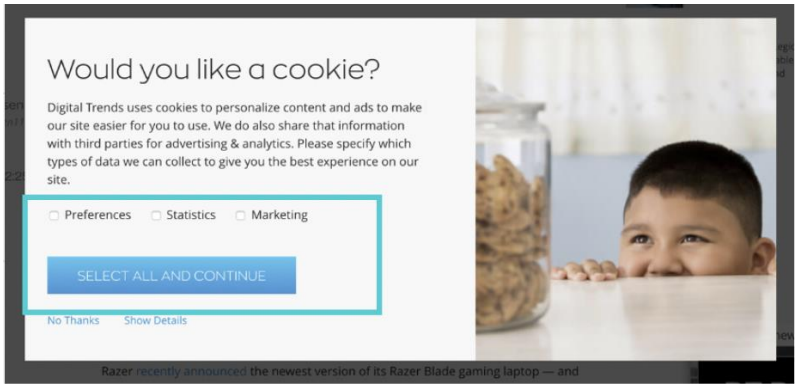

Figure 3-12: The turquoise highlighted box shows that users may "Select All and Continue" and unknowingly share data with third parties for advertising and analytics.
Source: Social and Ethical Responsibilities of Computing Fellowship

Figure 3-12 illustrates that the company can personalize content and make its website more accessible if it tracks preferences, statistics, and marketing data. The company also shares all the cookie information with third parties for advertising and analytics. A big blue button allows the user to select all and continue, and many users may continue to click on the blue button without going through the options. Users may assume the blue button will consider the checkboxes the user opted into, whereas the blue button selects all the checkboxes. Users are getting tricked into selecting all and continuing without reading the above-mentioned content.

3.3.2 Pressure:

Pressure is a technique that makes options such that the users prefer the worst option and discourages them from taking action on the intended option. Users are forced to choose between two not-good options (Noggle, 2020).

Some examples of pressure are as follows:

- Friction: Friction is the process of making it very difficult for the user of the product/service to take action by adding hindrances to the action. Example: “You can easily cancel your subscription for a full refund! Just email us the letter”.
- Nagging: Users might try to act on a particular product element but are persistently interrupted by requests to act on something else they might not want to act on. “It is your choice, but I will not leave you alone unless you make the one I want.”
- Bundling: Bundling uses a combination of dark patterns to force the user to take a particular course of action. Example: Locked out of your Facebook account. Give us biometric data if you want to get into your Facebook account again.

Source: Social and Ethical Responsibilities of Computing Fellowship

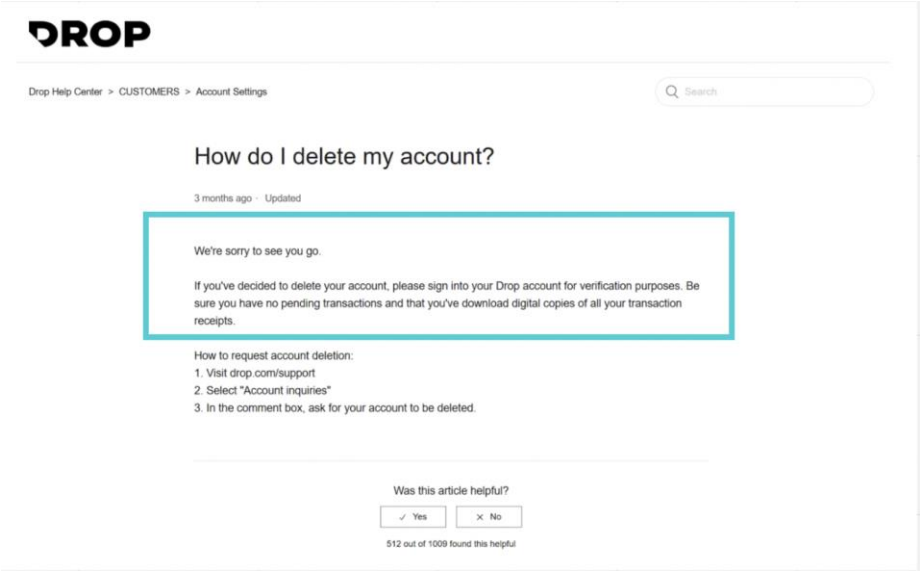

Figure 3-13: The turquoise highlighted box shows that the whole account deletion process is complicated on Drop’s website.
Source: Social and Ethical Responsibilities of Computing Fellowship

As illustrated in Figures 3-13, the user is trying to delete their account on the Drop website; Drop.com has added friction by asking the user to follow three steps by visiting the drop.com/support website. The user has to visit Drop.com, select account inquiries, and, in the comment box, ask for the account to be deleted. As the user performs these steps, they are pressured to submit a request and wait for deletion, which is a dark pattern.

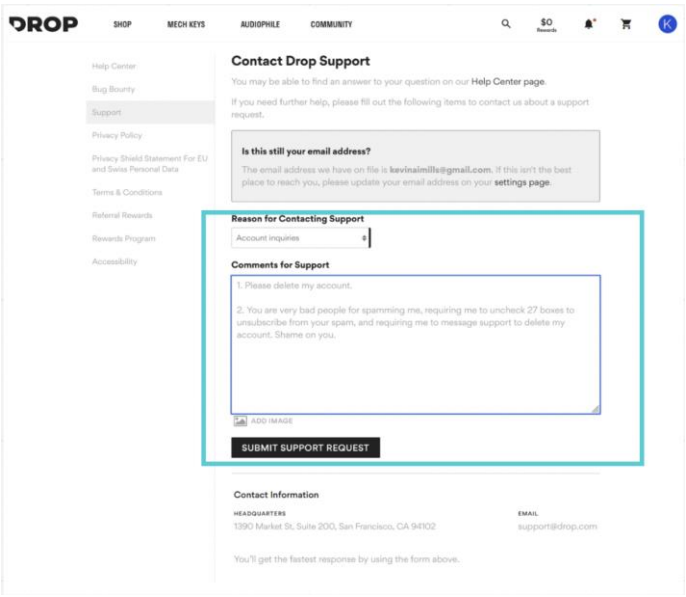

Figure 3-14: The turquoise highlighted box highlights that the user has to put the comments giving the reason for account deletion.

As illustrated in Figures 3-14, as the user is visiting the Drop.com support, the user has to enter comments for why they are placing the request for deletion. This whole process of reporting to the support makes it difficult for the user to get out of the Drop.com system and to delete their account with the Drop website.

Chapter 4

Companies and Dark Patterns

Brick-and-mortar stores started using dark pattern techniques to increase sales. Due to rapid digitization, companies began using these manipulation and deception techniques online to increase customer acquisition, engagement, retention, and revenue. After monitoring the constant use of these techniques, Harry Brignull coined the term “dark pattern” to describe the trick used by apps and websites to deceive users (Kollmer & Eckhardt, 2022) (Singh et al., 2023).

These dark patterns violate autonomy by not allowing the users to make informed choices. For example, Instagram (a social networking platform) asks users if they would want to activate notifications of the application, and users have only two options: “activate” and “not now.” Instagram is not showing “not activate” as an option, infringing on the user's autonomy. Organizations use psychological vulnerability, which states that users tend to have *status quo* bias; thus, they keep the pre-selected choices displayed to them. For example, companies tend to keep subscription options preselected to facilitate the subscription of newsletters. Dark patterns such as infinite scrolling, pull to refresh, and autoplay nurture technology addiction and lead to infringement of autonomy (Kollmer & Eckhardt, 2022).

Users react in different ways depending on the information presented in dark patterns.

Example:

- Changing the choices on the digital interfaces from “Accept” or “Decline” to “Accept and continue” affects the users’ choices. Users are more susceptible to choosing “Accept and continue” to move forward.

- While choosing between a cheap and a costly option on a platform, the cheap option is generally shown after multiple steps. Users may lose patience while following these steps and end up choosing the costly option.

- Framing a prompt in a way that users may find it ambiguous can lead them to agree. If a website prompt states, “Would you like to decline this month’s credit history report?” users are likely to choose a yes instead of a no (Brignull et al., 2023)

4.1 Conceptualization of Dark Patterns

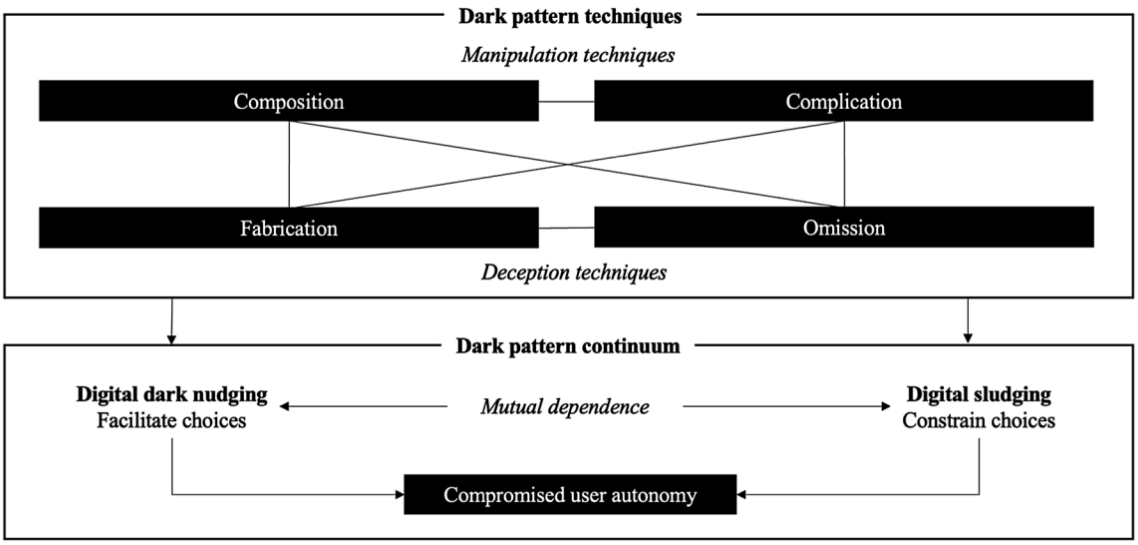

Figure 4-1: Conceptualization of Dark Patterns
Source: (Kollmer & Eckhardt, 2022)
https://doi.org/10.1007/s12599-022-00783-7

Dark patterns leverage digital nudging and sludging to infringe on user autonomy (shown in Figure 4-1). Manipulation provides accurate information to the user but averts informed choices through complication and composition of choices. Deception techniques involve omitting appropriate data or fabricating false data to build choices for the user (Kollmer & Eckhardt, 2022).

Figure 4-1 illustrates that digital nudging is a dark pattern technique that uses composition, complication, fabrication, and omission to manipulate the user's choice and autonomy. Non-essential options are included in the choices just to nudge the user in a particular direction. Dark patterns also include unjustified *blockers* called digital sludges, making it difficult for the user to complete the task (Kollmer & Eckhardt, 2022).

4.2 Long-term Consequences of Dark Patterns on Companies

Understanding the long-term consequences of using dark patterns is essential. UX designers, product owners, and strategic business executives are involved in developing dark patterns. All these stakeholders have specific responsibilities when it comes to the development and utilization of dark patterns.

Using these dark patterns can create an unfair advantage for the service or product company leveraging it and leads to a loss of free market competition. Using dark patterns will give a positive result for a short time, but in the long run, if the product or service user recognizes that the company is using these techniques, there will be a loss of trust at the users' end. The users might never return to the product because of a negative experience, and they may share their product experience in their network, leading to a decrease in market share.
Proper compliance in the form of unified design principles must be set up to monitor the dark patterns and ensure the regulations are implemented. Suitable design principles will help protect the user from the potential adverse effects of dark patterns (Kollmer & Eckhardt, 2022).

4.3 Role of designers when it comes to dark patterns:

Designers who design dark patterns as the requirement for the company should have an ethical code of conduct. There should be research that defines compulsory unified design principles that can help in preventing dark patterns. These unified design principles will cover the design process, design science research, and regulations around preventing the creation of dark patterns. As technology is advancing with upcoming advancements in virtual reality and metaverse, there is a high probability of an increase in the number of dark patterns. The government has introduced and enforced regulations regarding dark patterns, but many companies do not abide by organizational compliance regarding dark patterns. It is critical to define unified design principles and find a method to establish organizational compliance to comply with regulations around dark patterns (Kollmer & Eckhardt, 2022).

Chapter 5

Users and Dark Patterns

Dark patterns typically engage users by using deception and manipulation techniques instead of caring about their right to protect their personal information. The significant goal of this chapter is to understand the users' dark pattern blindness and the effective measures to counter these dark patterns. In this chapter, we explore user's awareness of dark patterns.

Referencing from the research cited, 406 individuals were surveyed in this research to understand the effect of manipulative designs; individuals were aware of manipulative designs, but their awareness did not necessarily mean that they could avoid these dark patterns. Dark patterns steer the attention of the user towards quick gratification, free services, or ease of use.

For example, When users are exposed to hyperbolic discounting on a website they are visiting, they tend to have psychological bias where they overvalue immediate satisfaction and reward and discount the cost associated with future risks (Blanchy et al.,2021)

We identified the following factors responsible for users' dark pattern blindness:

- Lack of awareness about dark patterns,
- Inability to recognize the dark pattern,
- Inability to resist the dark pattern after awareness and recognition of the dark pattern.

Different strategies can be employed to help users who are affected by dark patterns:

- Adding friction in the design to interrupt the automatic behavior so that the user becomes cautious of dark patterns.
- Policy level change and steep fines against companies who are using these dark patterns.

In the paper cited (Blanchy et al.,2021), the research shares that people under 40 years of age who had completed higher education had a higher probability of finding out about dark patterns compared to people who only had high school diplomas. The research shares that respondents could not identify dark patterns in a platform, but they became more vigilant when they were told that the text might contain dark patterns. 413 participants were exposed to ten interfaces to evaluate their understanding of dark patterns where interfaces have been redesigned uniformly and freed from any brand's reference. The type of dark patterns used are shown in Figure 5-1. The dark patterns could cause data privacy, financial, and time harm.

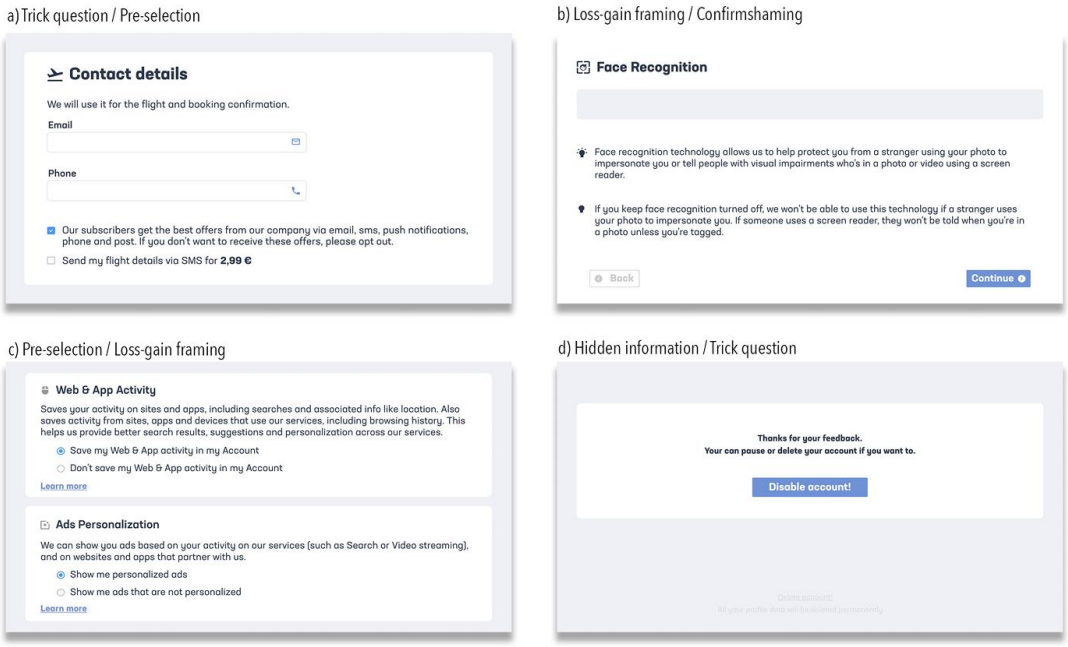

Figure 5-1: Interfaces used for evaluating understanding of dark patterns
Source: (Blanchy et al.,2021)
https://doi.org/10.48550/arXiv.2104.12653

Respondents were exposed to a combination of screens with and without dark patterns from popular and lesser-known brands ranging from e-commerce websites, social media and dating apps. In the qualitative analysis of the respondent's responses, participants shared that they associated dark patterns with companies like Amazon, Instagram, Netflix, Facebook, and Twitter. They shared that these dark patterns influence their content consumption, spending behavior, etc. Most respondents were aware of the harms caused by such patterns, such as financial harms, cybersecurity threats, and the impact on their purchasing patterns. Users believed that they were well aware of these manipulative patterns, and they said that they were more concerned about vulnerable user groups like children and older people. These users thought dark patterns could cause financial losses and misleading information could affect the mental and physical health of vulnerable groups. Users with higher education have a higher understanding of these dark patterns. Users who use online services regularly have a higher probability of manipulative designs impacting their behavior (Blanchy et al.,2021)

5.1 Dark pattern detection by people

In the research cited above, when the respondents were shown mild dark patterns, they were not able to identify them in comparison to aggressive dark patterns. There has been an excessive use of social proof and scarcity messages on websites, causing users to ignore many of these communications. Detecting the dark pattern correlates with the frustration it causes. If the web flow experience has less friction, then a dark pattern will likely go unnoticed.

Users acknowledge that online designs influence their choices and behaviors, and many participants agreed that manipulative designs affect their psychological and physical needs, as well as potentially introduce financial harm. In the research, few people know about the dangers related to misinformation.

For the users, it is essential to have transparency about these dark patterns, which can help them in controlling their influence. It is necessary to understand that after building transparency, users will still be influenced by these dark patterns even after developing the capability to spot them. When the users were told about dark patterns being present in an article, 59% of the participants could find more than five dark patterns out of nine. Dark patterns included bundled+forced consent, trick questions, pre-selection, limited-time messages, and confirmed shaming.

Warnings can be designed that will help the users to counterbalance the tendency to not pay enough attention to manipulative patterns. From the research, many participants could detect limited-time messages and confirm shaming messages. However, seeing other dark patterns like trick questions and hidden information was complex. Research also shared that if users are more aware of their vulnerabilities, it does not trigger their self-defense automatically. Creating obstructions on websites with such dark patterns can give users a moment of reflection and help them think intentionally about their decisions. Creating obstruction will lead to the repetitive use of analytical thinking to build procedural rules, eventually developing protection heuristics in their minds when they are exposed to dark patterns. It will create a more secure online environment for them and nudge them to counter infinite scrolling and consent to data access. In the further chapters, I will explore how to create this obstruction so that users can be given a moment to reflect on their decisions (Luguri & Strahilevitz, 2021) (Blanchy et al.,2021)

5.2 Intervention spaces for counteracting dark patterns

There can be multiple solutions to help users become aware of the dark patterns. As illustrated in Figure 5-2, different kinds of interventions are needed based on the awareness of dark patterns:

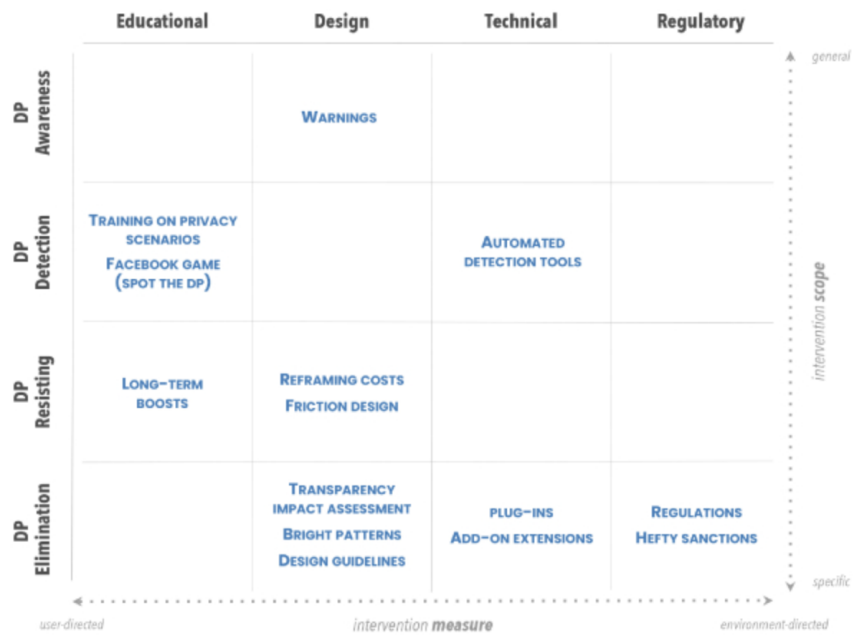

Figure 5-2: Intervention spaces for counteracting dark patterns
Source: (Blanchy et al.,2021)
https://doi.org/10.48550/arXiv.2104.12653

Raising awareness about the dark patterns: Users who are knowledgeable about the dark patterns generally tend to ignore the dark patterns in the flow of using the web due to optimism bias or hyperbolic discounting. Any kind of subtle nudge in the web flow can raise awareness and counterbalance the possibility of underestimating any type of online threat.

Facilitating detection of dark patterns: Many users can recognize confirm shaming, and limited-time messages, but very few users can detect trick questions and hidden information combined with forced consent and pre-selection nudge. There are types of dark patterns that become difficult to spot. High cognitive activation with the correct mental model can help in facilitating the detection of dark patterns.

Training on data privacy scenarios (cause and effect) can help users detect manipulation dark patterns. Gamification can be a way to help users recognize and categorize dark patterns in real settings. Tools and algorithms built of reliable data and a corpus of dark patterns can be leveraged to identify and flag dark patterns in real-life settings.

Resisting the dark pattern

Resisting the dark pattern means introducing resistance in the path of user flow and avoiding becoming prey to dark patterns. It can be done by applying friction designs in the pathway of the dark pattern so that the user can reflect and think about what they are doing. These nudges can oppose the mindset of consenting to sharing your data and infinite scroll. People who can find dark patterns in the web flow are less likely to be influenced by them. The cost of resisting dark

patterns depends on deceptive and nudging strategies and how these strategies are implemented to avoid dark patterns. Some strategies that prevent the user from accomplishing a task, like adjusting preferences for cookie settings, come at a high cognitive cost.

Eliminating dark patterns

Dark patterns can be found frequently in shopping experiences. Solutions like *do not track*, add-on extensions, and plugins can be used to eliminate dark patterns. Browser plugins or extensions like consent-o-matic (janusbk, 2023), *Consent management platform (CMP) - cookie manager - cookiebot*™ 2020) (Cookiebot, 2020), and Do not track extension (Mayer, 2012). can weaken other plugins on these websites. Technology heuristics can be used to understand the manipulative effect of these designs, and impact assessment can also be done to understand transparency in the interface design process. Legal preventive measures can be taken to understand the unlawfulness of the different dark patterns (Blanchy et al.,2021).

Chapter 6

Chrome Extension

6.1 Goal:

In this chapter, we investigate the possibility of building an obstruction to help users become aware of dark patterns. The goal is to help build procedural rules in the users' minds by nudging them about a dark pattern. The obstruction will help users use their analytical thinking repetitively in protection heuristics, which will eventually help protect them.

Building friction designs in the flow of dark patterns can help counteract the mechanism of dark patterns. Users will develop the muscle to detect these dark patterns by building awareness through these friction designs. In the long run, customers may lose trust in a brand if they learn about these friction designs. It is challenging to build a friction design or intervention to help remove all dark patterns from the internet. Dark patterns exist by constraining options given to the user, making one choice more prominent than others, creating scarcity, etc. Building one friction design/intervention cannot help users learn about different friction designs. Creating one friction design for all these use cases is a design problem.

Considering the design and time constraints, we are developing a Chrome extension to help users detect the dark patterns creating urgency and scarcity. As mentioned in the previous chapter, if a dark pattern is used excessively and the friction caused by the dark pattern is not much, then there is a high probability for the user to ignore it. When a user is told about a dark pattern on a website, 59% of respondents could spot 5 out of 9 dark patterns. Urgency patterns are used excessively, and friction caused by these patterns is not high. Low friction leading to user ignorance is one of the reasons we are developing an urgency/scarcity detector Chrome extension (Blanchy et al.,2021).

6.2 Inspiration:

In the research paper (Graßl et al.,2021), bright patterns were used to steer the user's attention toward dark patterns associated with cookie consent and help users pay attention to privacy-friendly options. Bright patterns are effective color-highlighted interface design solutions that care for the users' goals and protect user-autonomy over business objectives (Graßl et al.,2021) (Sandhaus, 2023).
Friction design can be efficient in helping users spot urgency and scarcity messages and turning off these messages.

6.3 Vision:

The vision of this Chrome extension is to build an intervention that will give users a moment of reflection on scarcity and urgency-inducing dark patterns. The extension will help the user learn about these scarcity and urgency dark patterns on the website they are visiting. Currently, this is achieved by feeding keywords in the extension, which companies use to build scarcity and urgency in the web flow.

Considering the scope of this thesis, we are building a Chrome extension that will detect urgency and scarcity dark patterns, but the Chrome extension's vision is to help users detect other dark patterns on the website in the future. We are starting with urgency and scarcity dark patterns; this Chrome extension will eventually include different dark patterns like confirm shaming, misdirection, and roach motel.

6.4 Target group:

The target group for this Chrome extension is the set of people aware of the dark patterns and are lured into impulsive buying when presented with a limited time frame for a deal. They often forget about dark patterns when they are making e-commerce purchases. We have chosen this user-group because if users are already aware of dark patterns, they will know the importance of utilizing this tool to help them detect these dark patterns. This user-set has some awareness of dark patterns but might not notice dark patterns when they are browsing through websites. Nudging users about the existence of urgency/scarcity dark patterns is the goal of this tool.

6.5 Methodology

The methodology followed in developing this Chrome extension is to scan the webpage's text in real time for embedded keywords and phrases related to urgency/scarcity dark patterns.

Phrase example: **CHEAPEST PRICE YOU'VE SEEN!**

We will focus on dark patterns called urgency and scarcity for the current version. Urgency refers to forcing the users to make a hasty decision to buy a product/service by putting an artificial deadline on the product's sale. The scarcity tactic involves building a false notion of limited supply or popularity of a product, which can force the users to purchase the product to avoid a fear of missing out (Mathur et al.,2019)

As mentioned above, studies showed that design nudges like bright patterns could be used to detect dark patterns and to focus user’s attention on information about privacy. Bright patterns

are effective color-highlighted interface design solutions that care for the user's goals and protect user autonomy over business objectives. We plan to use bright patterns to detect scarcity and urgency dark patterns. We are finding keywords/phrases from the following website categories: E-commerce, flight booking, hotel booking, and ticketing websites. Relevant phrases and keywords will be taken from the booking flow on various websites, including Agoda, Temu, Shein, and Booking.com.

Phrase/Keyword types we are embedding:

We have taken the phrases (mentioned below) from the following websites: Agoda, Temu, Shein, and Booking.com and embedded these keywords into the extension.

- Prices might go up;
- rooms might sell out
- We can't hold this room and rate for you.
- room types have already sold out for your dates!
- CHEAPEST PRICE YOU'VE SEEN!
- Our last rooms!
- NO RISK!
- No cancellation fee
- We price match!
- % off today
- Limited time deal
- Almost sold out
- Lowest price ever
- Lowest price in 30 days
- In 999+ other carts
- Find it for less, and we'll match it!
- Offer ends in
- Complete your booking with complete confidence!
- If you can find and show us a booking on another website for the same room and dates
- we will match or beat the price.
- you'll never regret any booking you make with us.
- THIS SESSION WILL NOT BE REPEATED AND IS VERY TIME SENSITIVE;
- THE SAME METHOD MAY NOT WORK IN A FEW WEEKS
- Only x left
- sold just now
- Last booked
- Ends in
- JUST MISSED IT

We have manually found the keywords mentioned above. As we are scaling up the process of embedding keywords in Chrome extension, we would explore artificial intelligence methods to scrape these keywords from the websites. This scraping process will automate the detection of urgency/scarcity dark patterns. We can explore using the keyword scraping technique for building solutions for bait and switch to confirm shaming.

6.6 Prototype solution

In the development of the Chrome extension, we have covered how users can counterbalance the tendency of not paying attention to manipulative patterns by paying attention to the warnings given by the Chrome extension. Using the tool, a moment of reflection for the users is introduced. We have color-coded urgency and scarcity phrases in yellow to draw the users' attention to these phrases in web flows and make them cautious while browsing the website.

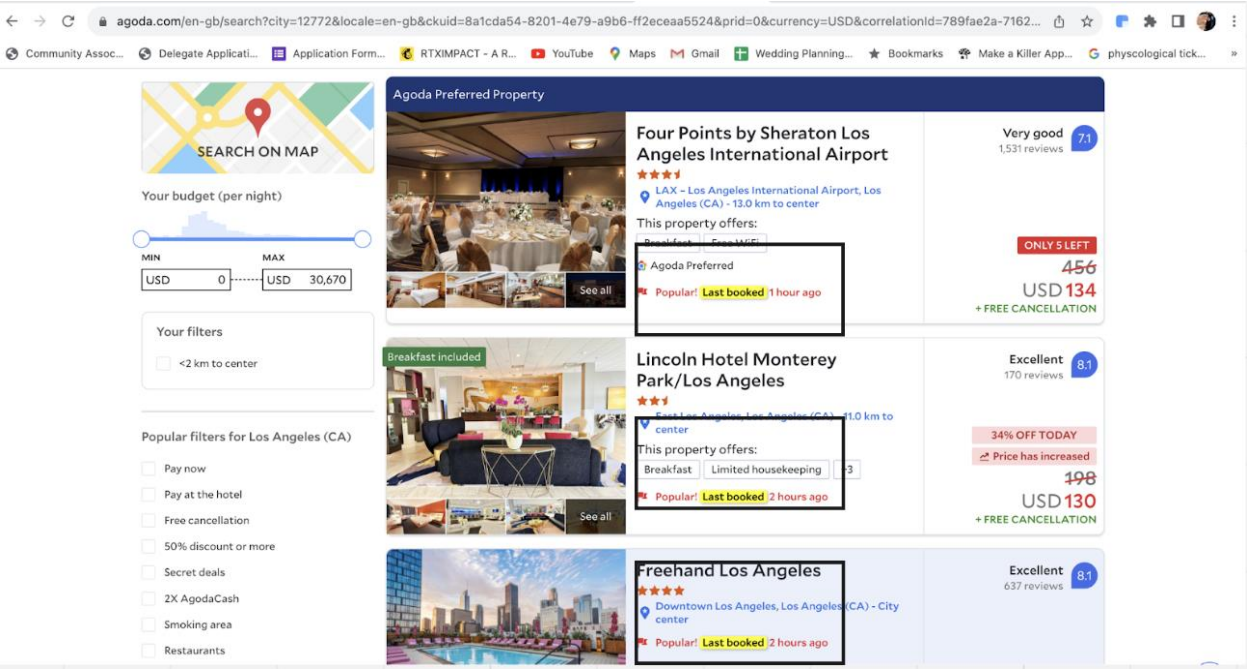

Figure 6-1: The black highlighted box shows Agoda's website's yellow-colored urgency/scarcity embedded phrases (detected by Chrome extension).

Figure 6-1 illustrates the Urgency/scarcity detector tool installed on Google Chrome. On the Agoda website, it showed the “Last booked” keyword highlighted in yellow.

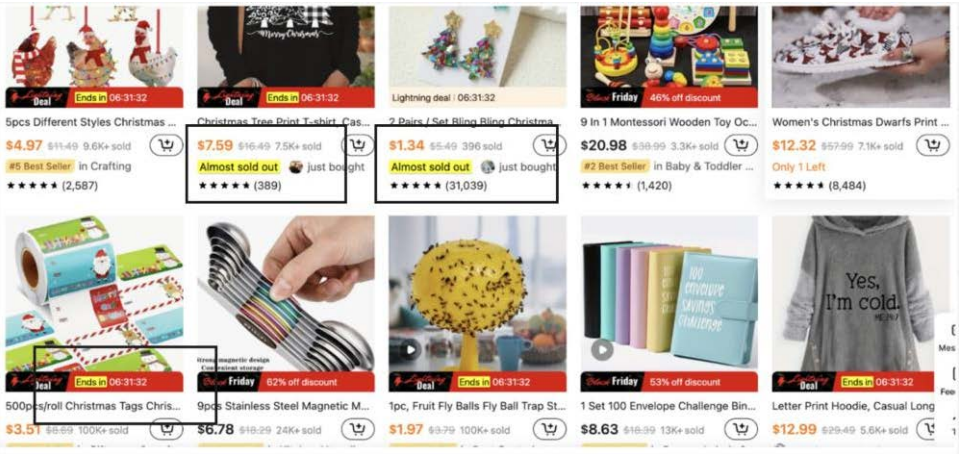

Figure 6-2: The black highlighted box shows the yellow-colored urgency/scarcity phrases on Temu's website.

As illustrated in Figure 6-2, the tool showed the "Almost sold out" and "Ends in" keywords highlighted in the text.

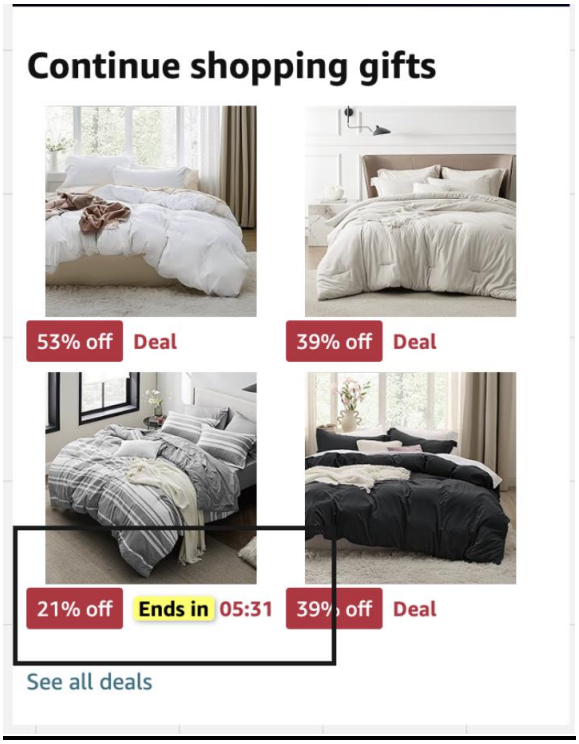

Figure 6-3: The black highlighted box shows the yellow-colored urgency/scarcity embedded phrases

As illustrated in Figure 6-3, the tool showed the "Ends in" keyword highlighted in the text on Amazon's website.

This prototype tool is built on Javascript and is reading the content of the entire webpage. It is checking for the urgency and scarcity phrases on the webpage.
The tool embeds an auxiliary HTML code to change the background of the text, which contains the urgency/scarcity phrase, to yellow. Urgency and scarcity keywords have been pre-loaded in the local storage so that the user does not have to bother and just start by installing the tool.

6.7 Testing the Chrome Extension:

This section covers users' awareness of companies' dark pattern techniques to sell products. The users are mindful of dark patterns but get lost when scrolling through the websites; nudging these users about the existence of urgency/scarcity dark patterns is the goal of this tool. We conducted two user tests to start the testing process of the Chrome extension.

User Test 1:

The first user test was done with a person who was going to Vietnam, and they were looking to book a hotel room for a trip to Vietnam. During this user test, they had just started exploring hotels in Phu Quoc Island and they frequently used Agoda for booking hotels. The user shared that as they proceeded in the hotel selection journey, they selected and chose from the initial few hotel options on the website. As the user scrolled through the website, they felt sad that they missed a great hotel deal and wanted to hurry up.

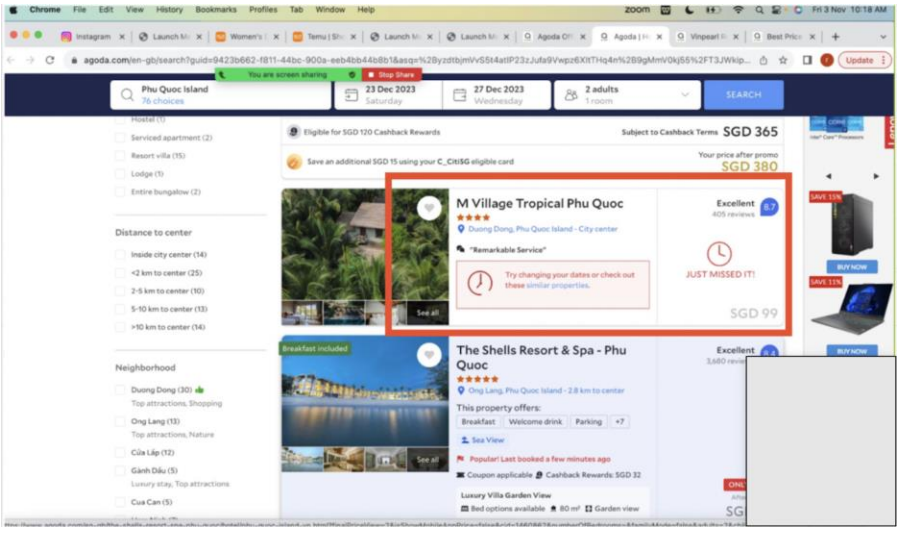

Figure 6-4: The red highlighted box showed that the user had just missed a hotel deal on Agoda.

As illustrated in Figure 6-4, the user shared that as they proceeded in the hotel selection journey, they selected and chose from the initial few hotel options. If the property summary said

that this particular property was popular and was booked 3 hours ago or that they just missed a deal for the property, it forced them to take quick action.

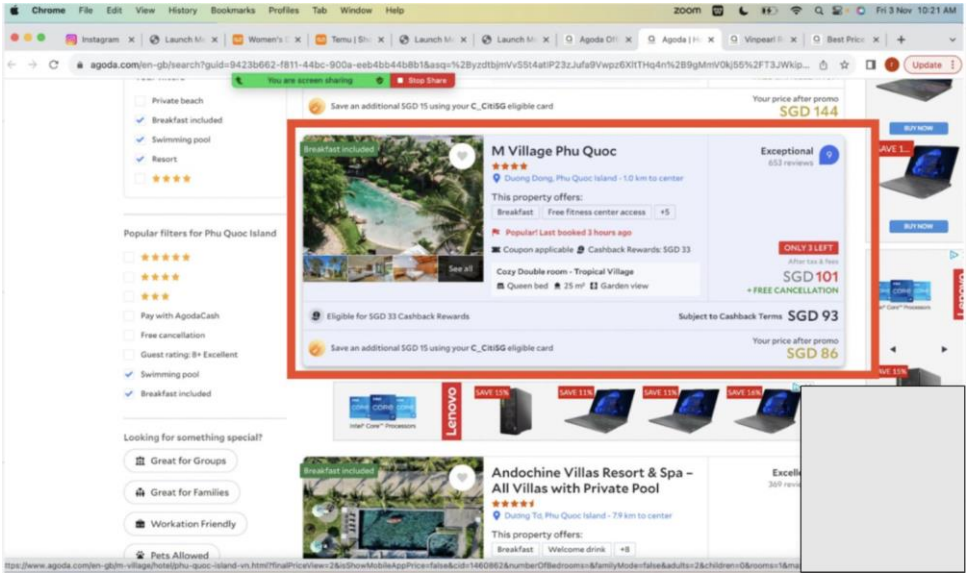

Figure 6-5: The red highlighted box showed that only three rooms were left for the property.

As illustrated in Figure 6-5, the user proceeded further, and if the communication said that only three rooms were left, they felt a sense of urgency. In that situation, they wanted to move further quickly. Because the user frequently booked on Agoda, if the property detail booking page said “we are holding your price if you needed additional time,” that urgency pattern did not impact the user. The user was affected by phrases like “Last booked 1 hour ago”, “Only 3 left”, “Just missed it” and “Popular! Last booked a few minutes ago”.

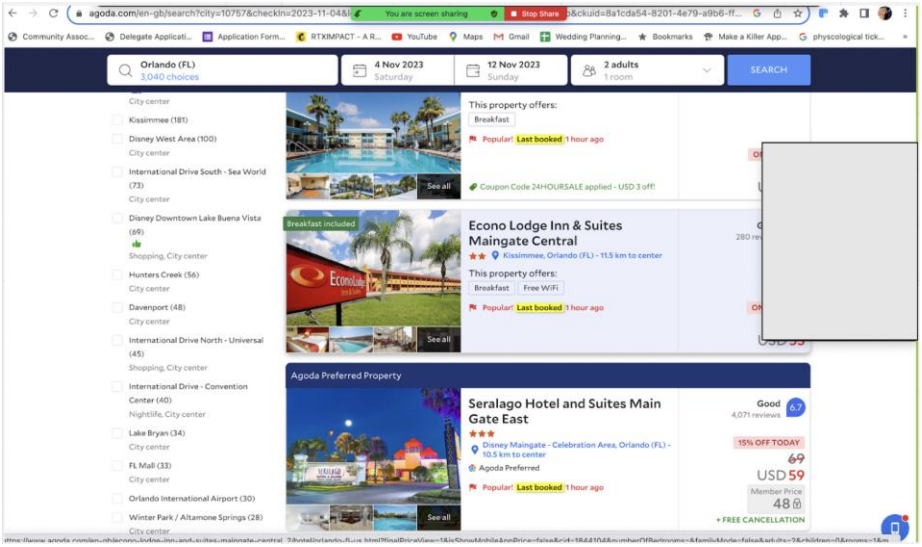

Figure 6-6: The user could see yellow highlighted keywords (with the tool installed) on the Agoda website.

Figures 6-6 illustrated that the user had installed the Chrome extension tool and was seeing the highlighted keywords on the website. The user paid more attention to the urgency/scarcity dark patterns like “Last booked 1 hour ago” using the extension. The user shared yellow highlighted text helped them be more careful of their choice by using the tool as they had installed it recently. They shared that they might need additional reminders to remember what yellow highlighted keywords were signifying. They were also interested to know more about urgency/scarcity dark patterns and how these patterns might impact their finances.

User Test 2:

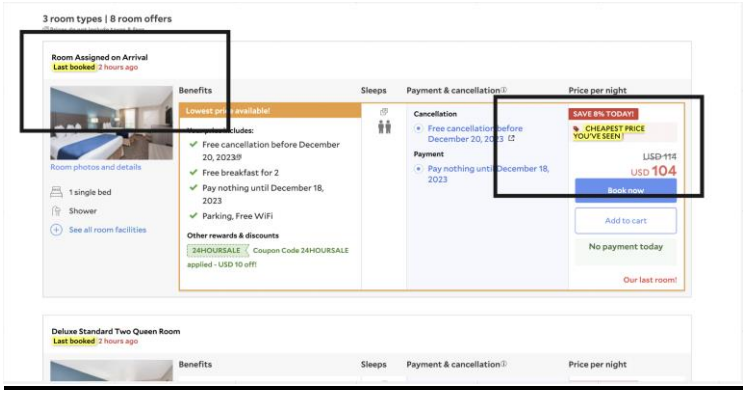

Figure 6-7: The black highlighted box shows the user was paying attention to the yellow-highlighted “Last booked 3 hours ago” and “cheapest price you’ve seen” phrases.

The second user test was done with a user who was 22 years old and had started their first job. The user shared that they were booking a hotel for their trip to Goa, India. They were looking for a good, affordable deal, and they also checked the hotel's location and whether the meals were included. As illustrated in Figure 6-7, while testing with the second user, if “Cheapest price you have ever seen” was shown, they would proceed further with the booking process. The user shared that “Cheapest price you have ever seen” motivated them to take action as they wanted to save money. When users installed the Chrome extension tool, they understood that “Cheapest price you’ve seen” and “Last booked 2 hours ago” were dark patterns in the web journey. They shared that installing the extension helped them to identify the dark pattern, and they would go on other travel websites to book the hotel instead of Agoda. They shared that they would also want to remain vigilant on other e-commerce websites.

Our hypothesis while building the Chrome extension was to develop an intervention to give users a moment of reflection using keywords on scarcity and urgency-inducing dark patterns. The extension helps the user learn about these scarcity and urgency dark patterns on the website they are visiting. We tested with two users who knew about dark patterns but lost track of dark patterns when making purchases online. When conducting user testing, we asked the user to book the hotel on Agoda with and without the Chrome extension. Without the Chrome

extension, both the users wanted to book quickly when they saw phrases like “Last booked 1 hour ago”, “Only 3 left”, “Just missed it”, “Popular! Last booked a few minutes ago” and “the Cheapest price you have seen” as they did not want to miss out on good deals.

When these users installed the Chrome extension and started exploring hotels, they could check yellow highlighted phrases, which helped them focus on urgency/scarcity keywords. We have learned that highlighting phrases helps in focusing user attention on these patterns, but eventually, we learned that we would also like to have a popup on the webpage saying that this page may contain a dark pattern. We hypothesize that this popup will optimize the dark pattern detection process. It should reduce the possibility of users missing the dark pattern alert.
We started user testing of the Chrome extension with users ages 22 to 30, Indian nationality, pursuing a full-time job, and having knowledge of dark patterns. As we proceed, we would like to test with users with different demographics and less knowledge about dark patterns. As we would be testing with users having less knowledge about dark patterns, we would like to validate our hypothesis that we can steer users’ attention using highlighted patterns even when users do not know about dark patterns.

6.8 Future Goal

This section covers the future goal of the tool as we go forward in the development process:

- To build functionalities that detect other dark patterns like bait and switch and confirm shaming. The type of design intervention needed for bait and switch to confirm shaming will differ from urgency. Each dark pattern might require a different design intervention.

- A major constraint for the tool currently is to check if a website's product's lowest price claim is genuine. It is critical to check whether a website shows the product's lowest price or just creates this information regarding the lowest price at a specific time to sell the product to the user. Tracking prices of hotels/flights/products and checking dynamic changes in pricing using historical data can be a potential way to understand if the lowest price claim shown by a website is genuine. An attempt to build dynamic pricing tracking can allow users to check the genuineness of the lowest price claim on the website.

- We will continue the testing process of the extension with the new users to further understand if adding a friction design helps the user to pay more attention to dark patterns.

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