Spring 5-11-2024

Manipulative, Dark, and Unethical Design Practices in UI & UX Design

Ryan Edward Brown

MANIPULATIVE, DARK, AND UNETHICAL DESIGN PRACTICES IN UI & UX DESIGN

By
Ryan Edward Brown

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College.

Oxford, MS
May 2024

Approved By

_____
Advisor: Dennis Irwin

_____
Reader: Tyler Barnes

_____
Reader: Timothy Holston

ACKNOWLEDGEMENTS

I would like to thank several people who have been instrumental in the completion of this honors thesis. First, I want to express my gratitude to my advisor, Dennis Irwin, for his guidance, expertise, and support throughout this research. I also want to thank Tyler Barnes and Timothy Holston for their feedback and assistance during the writing process. Additionally, I extend my appreciation to the faculty and staff of the Sally McDonnell Barksdale Honors College and the School of Journalism & New Media for providing a supportive academic environment. Finally, I am deeply grateful to my family, especially my parents, Patrick and Ginger Brown, for their love, encouragement, and for pushing me to complete this thesis. Their support has been invaluable, and I am incredibly fortunate to have been raised by them alongside my siblings.

ABSTRACT

This thesis examines the pervasive and detrimental effects of manipulative user interface and user experience design (UI/UX) practices on individuals and society. Focusing on three critical areas – accessibility, dark patterns, and polarization – the study employs a mixed-methods approach, combining findings from a comprehensive literature review, an analysis of specific design patterns and methods, and a survey of user experiences.

The literature review covers topics such as the importance of accessibility in design education, the prevalence of dark patterns in mobile and desktop sites, the role of personalization algorithms in shaping user experiences, and the formation of echo chambers on social media platforms. The survey explores users' awareness of manipulative design practices and their perceptions of the ethical implications of such designs.

The findings reveal that manipulative UI/UX design practices can negatively impact user behavior, well-being, and access to opportunities. Survey results indicate that a significant portion of users recognize the influence of design elements on their trust, engagement, and purchasing decisions. Accessibility barriers can exclude vulnerable populations from critical online resources. Dark patterns, which describe deceptive design tactics that trick or manipulate users into taking actions that may not be in their best interest, can negatively impact user trust. Polarizing design, driven by

recommendation algorithms and filter bubbles, contributes to political fragmentation, their spread of misinformation, and the crumbling of a commonly accepted reality.

To address these issues, the thesis proposes recommendations that prioritize inclusive design practices, establish ethical guidelines, promote digital literacy, and encourage transparency within the tech industry. Most notably, digital media literacy and design education. These recommendations aim to create a more inclusive, transparent, and user-centered digital world that supports well-being, autonomy, and social cohesion.

In conclusion, this thesis advocates for a significant shift in design priorities towards a more ethical and responsible approach to UI/UX design, acknowledging and actively working to reduce the harms caused by manipulative design practices. This shift should be supported by an emphasis on digital literacy and education initiatives targeting both designers and users, which will contribute to the development of a more inclusive, transparent, and user-centric digital landscape.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADA	The Americans with Disabilities Act
CDC	Center for Disease Control and Prevention
POUR	Perceivable, Operable, Understandable, and Robust
UI	User Interface
UX	User Experience
WCAG	Web Content Accessibility Guidelines
W3C	World Wide Web Consortium

LITERATURE REVIEW

For this study, twenty sources were drawn upon to provide insights and research into manipulative, dark, and unethical UI/UX design.

Peter Cederberg's thesis, "Shifting Mindsets: Designing for Accessibility in Design Education," investigates the state of accessibility in design education, identifying gaps in knowledge and skill among designers and educators. The study emphasizes the need for a shift in mindset and the development of tools to support reflection and learning in the field of digital accessibility. Through literature reviews, surveys, and interviews, Cederberg identifies issues faced by professional designers, educators, and students, and proposes concepts for shifting designers' mindsets and aiding in reflection and learning.

Matteo Cinelli et al., in the study "The echo chamber effect on social media," explores the formation of echo chambers on social media platforms, comparing the dynamics of information spread across different platforms. The authors find that the aggregation of users in homophilic clusters dominates online interactions, and selective exposure to content can lead to the rapid proliferation of misinformation when polarization is high. The study also reveals how feed algorithms and interaction paradigms vary across platforms, influencing the construction of social perceptions and the framing of narratives.

Linda Di Geronimo et al., in their paper "UI Dark Patterns and Where to Find Them: A Study on Mobile Applications and User Perception," analyze the prevalence of

dark patterns in mobile applications and conduct an online experiment to assess users' perceptions of these manipulative design practices. The study showed that a high percentage of applications contain dark patterns that users often struggle to recognize, highlighting the need for increased awareness and measures to combat deceptive interfaces. Di Geronimo et al. also discuss the implications of their findings and propose future research on methods to identify and characterize dark patterns.

In the research note "Towards responsible media recommendation," Mehdi Elahi et al. discuss the concept of responsible media recommendation, proposing strategies for designing recommender systems that focus on user well-being, diversity, and transparency. The authors review the challenges and threats posed by automated media recommendation technology and outline steps to reduce undesired social effects. The research note emphasizes the need for improved mechanisms to avoid negative effects like filter bubbles and the amplification of misinformation. Ultimately, this work highlights the ethical considerations that should guide the development of recommendation systems.

Giacomo Figá Talamanca and Selene Arfini re-examine the notions of filter bubbles and echo chambers, considering the limitations of human cognitive systems in everyday interactions with digital technologies in their paper, "Through the Newsfeed Glass: Rethinking Filter Bubbles and Echo Chambers." The two authors argue that the discomfort experienced when confronting opposing viewpoints in online environments may prompt users to reinforce their preexisting beliefs and attitudes. They survey philosophical reflections on the epistemic limitations of human cognitive systems and propose that the "immediate" way users experience contrasting opinions online

contributes to the reinforcement of existing viewpoints.

Colin M. Gray et al. introduce a taxonomy of dark patterns and explore their psychological underpinnings, providing a basis for understanding and identifying manipulative design practices in user interfaces. The paper, “The Dark (Patterns) Side of UX Design,” highlights the ethical concerns raised by practitioners and the need for a broader research agenda on the ethics of user experience. A corpus of practitioner-identified dark patterns is analyzed as the implications for UI/UX design education and practice are discussed. Gray et al. contribute to the growing body of research on dark patterns and further emphasize the importance of ethical considerations in UI/UX design education and practice.

In “Investigating the effects of explicit and implicit personalization on content diversity in Google News,” Mario Haim et al. investigate the effects of personalization on content discovery, finding only minor effects on content diversity but a bias in the representation of certain news outlets. The authors discuss the limitations of their study and the need for increased transparency from platforms regarding algorithmic changes that affect news selection. Two exploratory studies provide empirical evidence on how explicit and implicit personalization affects both content and source diversity and suggest that the filter bubble phenomenon may be overestimated in the case of Google News.

Siti Zaiton Mohd Hashim and Johan Waden discuss the methodology and benefits of content-based filtering algorithms in social media platforms in their paper “Content-based filtering algorithm in social media.” The paper highlights the role of content-based filtering algorithms in providing personalized recommendations and increasing user

engagement. The authors also acknowledge the potential limitations of these algorithms, such as the creation of filter bubbles and the need for strategies to promote diversity in recommendations. Their paper explains how content-based filtering creates user profiles based on activity and continually updates recommendations while incorporating strategies to promote diversity and serendipity.

Julia Ioane et al. offer a critique of the rapid move to online therapies during the COVID-19 pandemic, raising concerns about the security and accessibility of online therapeutic practice. The article, "The Challenge of Security and Accessibility: Critical Perspectives on the Rapid Move to Online Therapies in the Age of COVID-19," provides a framework for making practical and culturally appropriate decisions regarding the provision of online therapy, informed by legislation and practice in the United Kingdom and cultural perspectives from Pacific communities in Aotearoa, New Zealand.

Cristian Lieneck et al. conduct a systematic review to identify facilitators and barriers associated with vaccine promotion through social media use in "Facilitators and Barriers of COVID-19 Vaccine Promotion on Social Media in the United States: A Systematic Review." The study reveals the influence of misinformation, polarization, and the lack of regulation on social media platforms as barriers to effective vaccine promotion. They analyzed 25 articles and identify common themes, giving insights and recommendations for improving public health campaign promotion on social media and informing policy on misinformation prevention.

In "Dark User Experience: From Manipulation to Deception," Marc Miquel-Ribé distinguishes between manipulation and deception in dark patterns, arguing that this distinction can help users understand and avoid being tricked by manipulative design

practices. The author suggests that empirical research based on these concepts can inform users, researchers, and legislators about the most deceptive or manipulative practices. This work proposes that manipulation-based dark patterns can be countered with better education and design awareness, while deception-based patterns may be easier to combat with legislation.

Abiodun Olalere and Jonathan Lazar evaluate the accessibility of U.S. federal websites and analyze the content of existing website accessibility policy statements in their 2011 study "Accessibility of U.S. federal government home pages: Section 508 compliance and site accessibility statements." The study finds that many federal websites remain inaccessible despite regulations and guidelines and provides recommendations for improving policy related to Section 508 compliance. Three contributions are offered: an accessibility evaluation of federal home pages, a content analysis of accessibility policy statements, and a discussion of the relationship between actual compliance and existing policy statements.

Neil Richards and Woodrow Hartzog published "The Pathologies of Digital Consent" to discuss the concept of consent in the digital context, offering a vocabulary of "pathologies of consent" to describe different kinds of defects in consent models. The authors propose conditions for valid consent in the digital world and argue that understanding consent pathologies can shed light on the "privacy paradox" and the need for alternative approaches to consumer protection. The article, published in 2019, suggests that the further we fall from the conditions of infrequent choice, vivid and easy-to-imagine harms, and correct incentives, the more pathological and suspect a particular consent will be.

Deepansha Singh et al. explore the accountability for malicious content in human-computer interaction, focusing on user exploitation and dark patterns in “Who is Responsible for the Prolonged Use of Dark Patterns?” Singh et al. discuss the ethical dilemmas faced by practitioners and the impact of business interests on user needs and privacy. The paper aims to stimulate research on implementing solutions to help practitioners balance ethical considerations with client demands and user needs. The authors highlight the increasing awareness and reactive turmoil expressed by users online regarding felt manipulation and the lack of felt integrity from practitioners and businesses.

The reviewed literature highlights the complex ethical challenges surrounding UI/UX design, particularly in the context of accessibility, dark patterns, and polarization. The studies underscore the need for increased awareness, regulation, and the development of ethical design practices that prioritize user well-being and agency. Moreover, the literature emphasizes the importance of digital transparency and a user-centric digital environment. In their works, the authors propose various solutions, including empirical research, legislative action, and the implementation of strategies to promote diversity in algorithmic recommendations. Overall, this literature review and these works provide an extensive overview of the current state of research on the ethical implications of UI/UX design and offer solutions for future work in the field.

I. INTRODUCTION

In a rapidly evolving technological and digital landscape, UI/UX design plays a crucial role in shaping how users interact with technology and access essential services. As digital platforms and services become more integrated into daily life, the visual design choices made by developers and designers hold significant influence over user behavior, well-being, and access to opportunities. While many design practices try to create user-friendly and engaging experiences, there is a concern about manipulative and unethical design practices that put business goals, visuals, and profit over user needs.

This thesis explores three key areas where manipulative UI/UX design methods can have detrimental effects on users: accessibility barriers, dark patterns, and polarizing interfaces. Digital accessibility is one of the most pressing issues facing UX and technology. The failure to adhere to accessibility guidelines and standards creates unneeded barriers for users with visual, auditory, motor, and cognitive impairments. These digital interfaces still fall short of proper inclusivity despite the existence of established frameworks like the Web Content Accessibility Guidelines (WCAG) and legal requirements such as the Americans with Disabilities Act (ADA).

Dark patterns help categorize deceptive design tactics that trick or manipulate users into taking actions that may not be in their best interest. A dark pattern is an umbrella term for many of these design methods, including various methods such as nagging, sneaking, obstruction, interface interference, and forced action. The effectiveness of dark patterns and their psychological underpinnings will be examined by

looking at specific examples as well as the spectrum that they exist on, in addition to methods to combat and rectify dark patterns.

Political fragmentation, echo chambers, and the spread of misinformation online all stem from polarizing interface design online. Personalized content feeds, recommendation algorithms, and a lack of exposure to different viewpoints all feed into the creation of homogenous ideological online communities and the reinforcement of existing beliefs. The decrease of beneficial discourse, the escalation of conspiracy theories, and the spread of misinformation are all real-world consequences that stem from polarization online. This chapter will explore potential solutions to remedy these problems through design interventions, transparency, and the promotion of digital literacy.

Insights from a user survey conducted as part of this research are incorporated in order to provide a better and deeper understanding of users' experiences and perceptions of design practices. Results from the survey will provide a better vision of how users and the respondents encountered inaccessible design, dark patterns, and polarizing content. The following sections will take a closer look into the key areas, examining specific design patterns, mechanisms, and the societal impacts of manipulative UI/UX practices.

II. ACCESSIBILITY

i. Introduction

In the present-day digital age, the Internet has become an indispensable tool for communication, education, employment, and access to essential services. As more aspects of daily life move online, it is crucial to ensure that these digital spaces are accessible to all users, regardless of their abilities or disabilities. Despite the existence of well-established accessibility guidelines and standards, many websites, applications, and services continue to present considerable barriers for users with impairments. The survey conducted revealed that a significant portion of users recognize the impact of inaccessible design on their ability to fully engage with digital content. 87% of respondents said that a digital interface's design has an impact on their trust, engagement, or enjoyment of using the application.

According to the Centers for Disease Control and Prevention (CDC), up to 1 in 4 adults in the United States have some type of disability (CDC, 2023). This diverse population includes individuals with a wide range of conditions that could impact their ability to perceive, understand, navigate, and interact online. For example, a person with visual impairments may rely on screen reading technology to convert text to audio, whereas someone with motor impairments may require larger click targets to effectively use a website. When websites, apps, and other platforms fail to accommodate these needs, they essentially shut out a large portion of people from fully engaging and participating in online spaces. This exclusion can limit access to education, employment,

social networks, and critical services like healthcare and government resources. In a society increasingly reliant on technology and digital spaces, inaccessible design in these areas reinforces existing inequalities faced by those with disabilities.

Recognizing the importance of digital accessibility, certain guidelines and standards have been developed to ensure that websites and applications are inclusive and manageable for all. The WCAG provides an extensive framework for creating accessible digital content. Despite the existence of these guidelines and other legal requirements like the ADA, many UI/UX designers and developers still fail to prioritize accessibility in their work. This chapter aims to explore the current landscape of digital accessibility, examining common barriers faced by users with disabilities and the impact of inaccessible design on their lives. By evaluating specific design elements like color contrast, text alternatives, and keyboard navigability, it becomes clear where many interfaces fall short of inclusive design standards.

ii. Defining Disability & Accessibility in a Digital Context

In the context of digital interfaces and design, accessibility refers to the design of websites, applications, and other digital services in a way that allows users with disabilities to perceive, understand, navigate, and interact with the content and functionality of the service (WCAG, 2021). An accessible digital interface ensures that all users can access the same information and perform the same tasks, regardless of their abilities. This includes providing alternative ways to access content, such as text alternatives for images, captions for videos, keyboard navigability for users who cannot use a mouse, and much more.

To effectively address this issue of digital accessibility, it is essential to first understand the range of disabilities that can impact a user's ability to use digital interfaces. To simplify this, disabilities can be broadly categorized into four main types: visual, auditory, motor, and cognitive. Each of these categories covers a wide spectrum of conditions that may require specific accommodations in the design of websites, applications, and other digital services.

Visual impairments include conditions such as blindness, low vision, and color blindness. Users with visual impairments may rely on assistive technologies like screen readers, which convert text to audio, or magnification tools to navigate content. Auditory impairments, such as deafness or hearing loss, can impact a user's ability to perceive audio content, requiring accommodations like closed captioning or transcripts. Motor impairments like paralysis, tremors, or limited fine motor control can affect a user's ability to navigate interfaces using devices like a mouse or touchscreen. These users may rely on keyboard navigation, voice commands, or other alternative input methods to effectively navigate. Finally, cognitive impairments, including learning disabilities, attention deficit disorders, and memory impairments, can impact a user's ability to both process and understand digital content. Users with cognitive impairments may benefit from clear, concise language, logical navigation, and simple design.

The goal of digital accessibility is to create an inclusive online environment that allows equal participation for all users. This is not only a matter of compliance with legal requirements but also a fundamental aspect of user-centered design. By designing with accessibility in mind, designers can craft interfaces that are more usable and intuitive for all users. These design practices benefit a wide range of users, including older adults,

individuals with temporary impairments, and those using mobile devices or slow internet connections.

To create truly accessible digital experiences, designers and developers must shift their perspective from a one-size-fits-all approach to one that recognizes and accommodates the needs of users. This requires a proactive approach when designing, where inclusive design principles are integrated into every stage of the design process, from ideation to testing and implementation. By prioritizing accessibility as a major aspect of user experience design, digital interfaces will be created that include all users.

iii. Accessibility Guidelines & Standards

The WCAG is a set of international standards for the accessibility of web content, developed by the World Wide Web Consortium (W3C). The W3C is an international public-interest non-profit organization that works to develop web standards, establishing the long-term growth and accessibility of the web. The first version of WCAG, WCAG 1.0 was published in May 1999. This initial set of guidelines provided a foundation for web accessibility, outlining 14 guidelines and a set hierarchy for creating accessible web content in the internet's earlier days. In 2008, WCAG 2.0 was released, updating the original guidelines to address the evolving nature of the Internet. 2.0 introduced a more flexible and technology-agnostic approach, basing the guidelines around four key principles: perceivable, operable, understandable, and robust (WCAG, 2021).

In June 2018, the W3C published WCAG 2.1, which built upon the success of 2.0 by adding additional guidelines to address users with cognitive and learning disabilities, low vision, and mobile devices. The latest version, WCAG 2.2, was released in 2021,

further expanding the guidelines to address the needs of users with cognitive disabilities and users of touch-based devices (WCAG, 2021). The development of WCAG is an ongoing process and it acts as a live document, with the W3C continually working to improve and update the guidelines to keep pace with the rapid evolution of web technologies. These guidelines are constructed through a collaborative process that involves stakeholders, more than 350 members, staff, government agencies, and over 14,700 developers worldwide (WC3, 2020).

WCAG 2.0 and its subsequent versions are organized around four key principles, often referred to as POUR: Perceivable, Operable, Understandable, and Robust. (WCAG, 2021). These principles provide the structure for creating accessible web content and serve as the foundation for the specific success criteria outlined in the guidelines.

As defined by WCAG 2.1, a digital interface is perceivable if the information and UI components are presentable to users in ways they can perceive (WCAG, 2021). This principle ensures that users can access content through multiple senses, such as sight, hearing, and touch. Guidelines under this principle include providing text alternatives for non-text content, providing captions and audio descriptions for multimedia, and assuring that content is adaptable and can be presented in different ways without losing meaning.

UI components and navigation must also be operable, the second key principle of POUR outlined in WCAG. Operability makes sure that users can interact with and navigate web content using different input methods, such as a keyboard, mouse, or other assistive technology. Making all functionality available from a keyboard, providing users with enough time to read and use content, and helping users navigate and find content all fall under the operable guideline (WCAG, 2021).

Information and the operation of interfaces must be understandable, meaning that users can comprehend the content and functionality of web interfaces. Guidelines for the understandable principle include making text content readable and logical, making content appear and operate in predictable ways, and helping users avoid mistakes (WCAG, 2021).

The last of the key principles from WCAG 2.0 is the content must be robust enough that it can be interpreted reliably by a wide variety of users, including assistive technologies. The robust principle makes sure that web content remains accessible as technologies evolve. Guidelines under this principle include maximizing compatibility with current and future users, including assistive technologies (WCAG, 2021). By designing web content with these four principles in mind, designers and developers can certify that their content is accessible to a wide range of users with diverse abilities and needs. The specific criteria outlined by the W3C provide both measurable and actionable steps for putting these principles into practice (WCAG, 2021).

Moving away from the WCAG, Section 508 of the ADA is a civil rights law that prohibits discrimination against individuals with disabilities in various areas of public life, including employment, transportation, and public accommodations. The ADA does not explicitly mention website or digital accessibility, yet there are obvious technical standards for the Section 508 regulations, which apply to federal websites and other federally funded information technology (Olalere & Lazar 2011). Furthermore, under Title III of the ADA, businesses and organizations that are considered “places of public accommodation” must provide equal access to their goods and services, including those offered online (ADA, 1990). This means that websites and applications must be

accessible to users with disabilities, allowing them to access the same content and functionality as users without disabilities.

As mentioned previously, Section 508 of the Rehabilitation Act is a federal law that requires all electronic and information technology developed, procured, maintained, or used by the federal government to be accessible to people with disabilities (FCC, 2024). This includes websites, software applications, and other digital tools used by federal agencies. Under Section 508, federal agencies must ensure that their digital content and services are accessible to all employees and members of the public with disabilities (Olalere & Lazar 2011). This means that websites and applications must meet specific technical standards for accessibility, such as those outlined in WCAG. While Section 508 applies specifically to federal agencies, many state and local governments have adopted similar accessibility requirements for their digital content and services. Additionally, some private sector organizations have voluntarily adopted Section 508 standards as a benchmark for their accessibility efforts.

One of the primary challenges in implementing these types of accessibility guidelines is a lack of awareness and understanding among designers and developers. Many professionals in the digital design and development field may not be familiar with the specific requirements of accessibility standards as laid out in WCAG or Section 508 or may not fully grasp the importance of creating inclusive digital experiences. This lack of awareness stems from insufficient training and education on accessibility in design and development programs, as well as a general lack of emphasis on accessibility in the industry (Cederberg, 2022). As a result, many designers and developers may not consider

accessibility a priority in their work, leading to the creation of digital interfaces that exclude a large portion of users.

Another challenge in implementing accessibility guidelines is the anticipated cost and time required to create accessible digital content. Organizations may view accessibility as an additional expense or a time-consuming process that detracts from other design and development priorities. However, some research has shown that incorporating accessibility from the beginning of the design process can save time and money in the long run (Cederberg, 2022). By designing with accessibility in mind, organizations can avoid costly retrofits and certify that their digital content is usable by a wider audience, increasing overall user satisfaction and engagement.

The rapid pace of technological change poses another challenge for implementing and enforcing accessibility guidelines. As new technologies and design trends emerge, accessibility standards must continually evolve to keep up with and make sure digital content remains inclusive. For example, the increasing use of touch-based devices and gesture-based interactions has introduced new accessibility challenges, requiring designers and developers to rethink traditional approaches to navigation and user input. Likewise, the rise of virtual and augmented reality technologies presents new challenges for creating immersive experiences that adhere to accessibility guidelines. To address this, guidelines like WCAG are regularly updated to reflect the latest developments and remain relevant and effective (WCAG, 2021). Keeping up with these changes can be difficult and requires ongoing training and education for UI/UX designers and developers.

iv. Common Accessibility Barriers

Despite the existence of WCAG, ADA, and Section 508, many digital platforms still present serious barriers for users with disabilities. The survey results underscore this reality, with 68% of respondents believing that interfaces and services should be designed in the users' best interest. Furthermore, only a mere 9% stated that the design choices of a digital space have no impact on their mood, indicating that a majority of users claim to be affected by the design of digital interfaces. These barriers, often created without the user in mind and stemming from inaccessible design elements, can range from minor usability issues to total exclusion from content and functionality.

Visual barriers are among the most prevalent and noticeable accessibility issues in digital interfaces, ranging from complete blindness to limited or low vision. Due to this prevalence and noticeability, visibility and readability are incredibly important in UI/UX design. 62% of respondents pay attention to how color schemes and other design influence their emotions and behaviors when using a site. Users with visual impairments can use screen magnification, high-contrast themes, text-to-speech services, and braille displays to access content (Dodson, 2018). One common visual barrier is insufficient color contrast between text and background elements. When the contrast is too low, users with low vision or color blindness may have difficulty reading the text. This leads to frustration and exclusion from important information. Another common visual barrier is the lack of text resizing options, which can make content difficult or impossible to read for users who require larger text. Additionally, images and other non-text content that lack alternative text descriptions can be inaccessible to users who rely on screen readers. Figure 1 illustrates an example of a low-color contrast design that fails to meet

accessibility guidelines, hindering users with visual impairments from navigating and comprehending the content. The shape on the left of Figure 1 showcases the UI for an e-commerce application. It fails to meet both the AAA and AA accessibility guidelines for color contrast, making it difficult to read for visually impaired users. In contrast, the screen on the right demonstrates a corrected version of the design. The purple background at the top is changed, along with the text. Changing the text to white and slightly altering the purple background makes sure that the UI is readable. At the bottom, the background color is again altered to allow the text to be readable. These adjustments enhance the readability of the content and make it more accessible to more users.

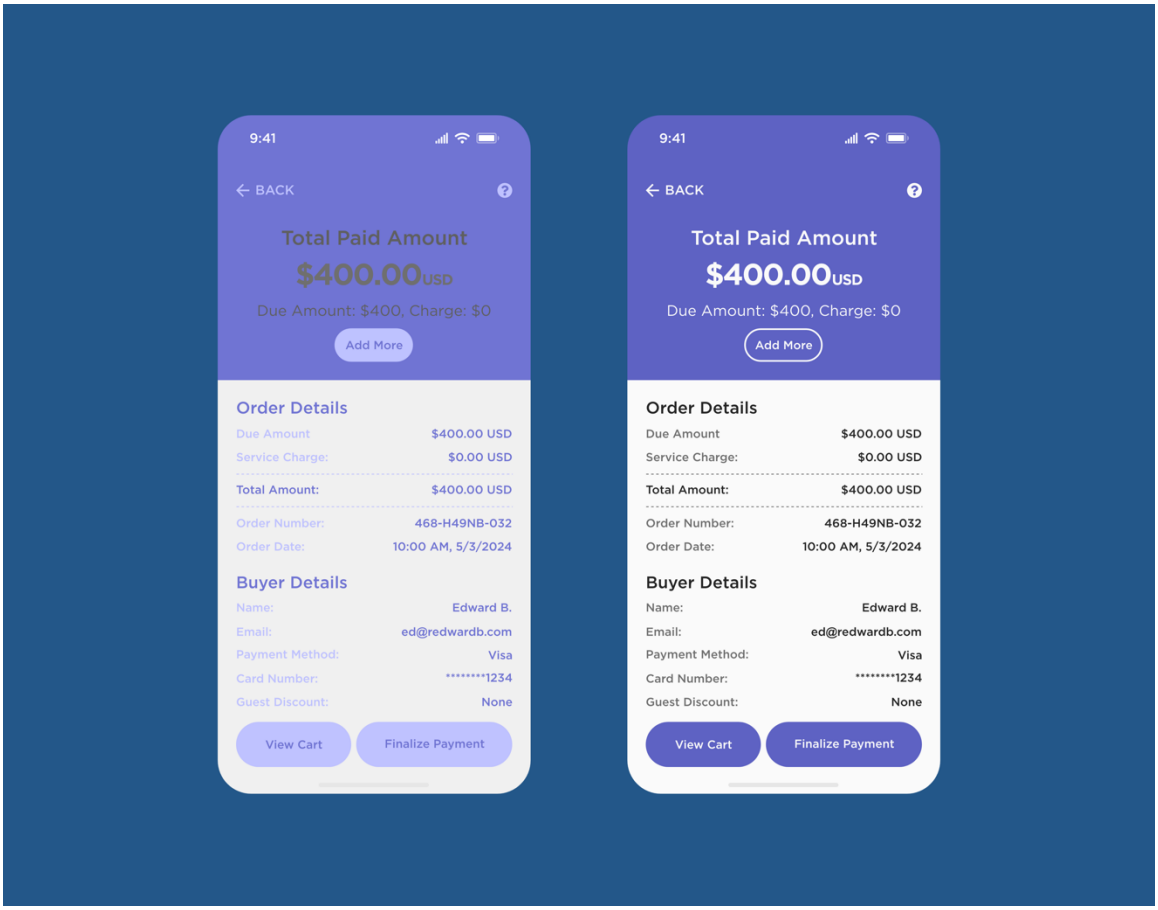

Figure 1: Low-Contrast Visual Barrier Design

Auditory barriers can also affect the accessibility of digital content for users with hearing impairments. These impairments range from speech processing difficulties to trouble hearing certain frequencies to complete inability to hear sound (Dodson, 2018). The lack of captions or transcripts for audio content, such as videos or podcasts, is a major barrier for users with auditory impairments. Without text alternatives, users who are deaf or hard of hearing may be unable to access the information conveyed through audio. Another major auditory barrier is the use of auto-playing videos or audio content without user controls, which can be disruptive and disorienting for all users, especially those with hearing impairments.

Motor, or dexterity, impairments can make it difficult or impossible for users with physical disabilities to navigate and interact online. They may affect a user's ability to use a computer mouse, touchscreen, or other pointing devices (Dodson, 2018). One common motor barrier is the lack of keyboard navigability, which is crucial for users who cannot use a mouse or other pointing device. When websites and applications require the use of a mouse or rely on complex gestures or time limits, users with motor or dexterity impairments are excluded. Additionally, small click targets and tightly spaced links can be difficult for users with limited fine motor control to activate.

Cognitive barriers can impact users with a wide range of cognitive and learning disabilities, making it difficult for them to understand and navigate digital content. This is a broad category, encompassing ADHD, dyslexia, autism, and much more (Dodson, 2018). One common barrier is complex site structure, which can be disorienting and overwhelming for users with cognitive impairments. When digital interfaces lack clear, consistent navigation and organizational structures, users may have difficulty finding the

information they need or completing desired tasks. Distractions, flashing, heavy animations, and other visually overwhelming design elements all make it difficult for these users to focus on content and functionality (Dodson, 2018). The use of complex language or jargon can also be difficult for users with learning difficulties or limited language proficiency to understand.

It is important to note that these barriers often overlap and intersect, meaning that a single design issue can impact several users with different types of disabilities. For instance, a video without captions is inaccessible to users who are deaf or hard of hearing, but it may also be inaccessible to users with cognitive impairments who benefit from the reinforcement of visual and auditory information. To create truly inclusive digital interfaces, designers and developers must be proactive in identifying and addressing these common accessibility barriers. This requires a combination of adhering to established accessibility guidelines like with WCAG, conducting thorough accessibility testing with diverse users, and continuously educating themselves and others on inclusive design.

v. Impact of Inaccessible Design

The impact of inaccessible digital design extends much farther than just inconvenience or frustration for users with disabilities. When websites, applications, and other digital services fail to meet accessibility standards, they create obstacles that can exclude individuals with disabilities from fully participating in certain aspects of society.

One of the most significant areas where inaccessible design can have a detrimental impact is access to essential services and information. Many vital services,

such as government resources, healthcare information, and educational platforms, are primarily found online. When these digital resources are not designed with accessibility in mind, they can effectively shut out users with disabilities from accessing the services and information they need. For instance, if a government website providing information about public benefits or voting procedures is not compatible with screen readers or does not offer keyboard navigation, individuals with visual or motor impairments may be unable to access the information. This would, in turn, hinder their ability to fully participate in civic life.

The shift towards online learning and services during the COVID-19 pandemic further underscored the importance of accessible design. An area where this was evident was in the provision of online therapy during the pandemic. As people and communities dealt with the challenges of isolation and lockdown, the demand for online therapies increased. This quick transition highlighted the crucial role of accessibility in making sure that these services were available to all during the pandemic. In addition, the transition to online therapy also exposed a need for therapists to be trained in these ethical and accessible design principles and to be aware of the specific needs of clients with disabilities (Ioane et al., 2021).

Inaccessible job application processes and e-commerce platforms can restrict economic opportunities for individuals with disabilities, contributing to persistent unemployment and financial disparities. The social isolation that can result from inaccessible social media and communication apps also has great implications for mental health and well-being. When these platforms are not designed with accessibility in mind, users with disabilities may be excluded from fully engaging with their peers and

participating in online communities. The consequences also spread beyond just the individual level, affecting families, communities, and society as a whole. When these people are excluded from participation in digital spaces, their perspectives, talents, and contributions are lost.

Finally, the impact of inaccessible digital design is not limited to individuals with permanent disabilities. Temporary impairments, such as a broken arm or short-term vision loss, can also make it difficult for users to navigate and interact with interfaces that are not designed with accessibility in mind. As the population ages, the number of individuals with age-related impairments, such as reduced vision, hearing, and mobility, is expected to increase, making the need for accessible digital design even more pressing. By creating digital interfaces that are inclusive, individuals with disabilities will have equal access to the opportunities and resources that are essential for full participation online (Cederberg, 2022).

vi. Conclusion

Digital accessibility is a critical issue that demands the attention and action of designers, developers, and organizations. As more and more aspects of daily life move online, inclusive and accessible digital spaces must be created, regardless of a person's abilities or disabilities. This section explored the various facets of digital accessibility, from disabilities that can impact digital interface use to the specific guidelines and standards that have been developed to ensure inclusive design. It showed how common accessibility barriers, such as low color contrast, lack of keyboard navigability, and

complex navigation, can create significant challenges for users with visual, auditory, motor, and cognitive impairments.

The survey revealed that 68% of respondents believe that interfaces and services should be designed in the users' best interest, highlighting the demand for user-centered design practices. As the majority of users are affected by these design choices, with only 9% stating that design has no impact on their mood, it is clear that putting more emphasis on accessibility is a big part of creating positive user experiences. The solution to this problem is obvious: prioritizing accessibility as a fundamental aspect of the design process and design education. This takes an approach that goes further than just following legal requirements and instead embraces accessibility as a core component of user-centered design and training. To achieve this, designers, developers, and decision-makers must work to raise awareness and understanding of digital accessibility. This involves providing proper education and training on accessibility guidelines and best practices, as well as changing designers' and teachers' mindsets to approach accessibility design thoughtfully (Cederberg, 2022).

III. DARK PATTERNS

i. Introduction

Designers and developers are constantly seeking new ways to engage users and drive desired behaviors. While many design practices aim to enhance UX, satisfaction, and autonomy, recent years have witnessed the emergence of a negative trend called dark patterns. These design tactics exploit psychological vulnerabilities and deceive users into taking actions that may not be in their best interests, putting business goals over user needs and preferences.

The term “dark patterns” was first coined by UX researcher Harry Brignull in 2010 to describe deceptive design practices that intentionally mislead or manipulate users (Miquel-Ribé, 2022). Since then, the concept has gained widespread attention, with researchers and consumers calling for greater awareness and accountability in the design of digital interfaces.

Dark patterns can take many forms, from subtle interface elements that hide important information to obvious tactics that pressure users into making unwanted purchases or sharing personal data. The survey conducted found that up to 89% of respondents noticed dark patterns like clickbait headlines, misleading advertisements, or attempts to keep them engaged on apps and sites (Q4). Furthermore, 78% of the respondents felt tricked into spending more time on these apps (Q7), and 33% felt tricked into purchasing something due to deceptive design elements (Q6). These findings highlight the prevalence of dark patterns as well as their impact on user behavior and

trust. Dark patterns becoming increasingly common across websites, mobile apps, and digital services ultimately raises concerns about the ethical responsibilities of designers and the potential harm to users (Gray et al., 2018). By exploiting cognitive biases and psychological vulnerabilities, dark patterns can ruin user trust, subvert informed decision-making, and lead to financial and privacy harm. They can be particularly detrimental to susceptible populations, such as elderly individuals or children, who may be less equipped to recognize and resist manipulative tactics.

Examining both the popularity and consequences of dark patterns is important. This chapter provides an overview of dark patterns, exploring their common characteristics, psychological underpinnings, and impact on users. Specific examples will be examined as well as the tactics used by unethical designers to deceive and manipulate users. The ethical implications of these patterns will be studied, in addition to the concept of "consensual deception," questioning the boundaries between persuasion and manipulation in design and looking deeper into the role of user awareness and consent. Addressing these issues requires examining the responsibilities of designers, developers, and platforms in creating ethical UI/UX design. This may involve raising awareness, promoting user education, advocating for stronger regulations, and prioritizing user-centered design training and education.

ii. Defining Dark Patterns

The term "dark patterns" has gained attention in recent years as the design community and general public have become increasingly aware of some of the manipulative practices found online. Titled by Brignull in 2010, the term refers to

deceptive design tactics that intentionally mislead or manipulate users into taking actions that may not be in their best interests (Miquel-Ribé, 2022).

Brignull initially identified a set of common dark patterns and created a website, darkpatterns.org, to raise awareness and document examples of these practices. Since then, the concept has evolved and expanded as researchers, designers, and more have contributed to the growing body of knowledge surrounding dark patterns.

At their core, dark patterns share several common characteristics that distinguish them from proper ethical design practices. First, dark patterns deliberately mislead or deceive users. They utilize numerous tactics to obscure important information, create false impressions, or guide users toward unintended actions. By exploiting cognitive biases and psychological vulnerabilities, dark patterns capitalize on the inherent limitations of human decision-making processes (Miquel-Ribé, 2022). Furthermore, they prioritize business goals over user needs and preferences. These types of patterns are designed to benefit the company or organization behind the interface, often at the expense of the user's time, privacy, or financial well-being. By manipulating users into taking actions that serve the interests of the business, dark patterns undermine the principles of user-centered design and weaken user's trust in online spaces.

"The Dark (Patterns) Side of UX Design," proposed five distinct categories of dark patterns, covering a wide variety of design aspects: nagging, sneaking, obstruction, interface inference, and forced action (Gray et al., 2018).

The first of the five dark pattern categories introduced in the study is "nagging." Nagging involves repeatedly redirecting users from their current task to pressure them into taking a desired action. This can take place as persistent pop-ups, intrusive

notifications, or repeated prompts that interrupt the user's workflow and create a sense of urgency or annoyance. A popular example of nagging can be found on the social media app Instagram, in which the application asks the user if they would like to turn on notifications. This message is considered nagging because the only two options presented are "Not Now" and "OK." With just these two options, the user is not given the ability to cancel the prompts, making it a repeated redirection (Gray et al., 2018). This example also sheds light on how commonplace many dark patterns are. If Instagram, a platform owned by Meta and considered one of the most widely used social media apps, can openly use nagging tactics without much opposition, many other platforms are likely to be putting these practices into use.

The next category is "sneaking," which involves attempting to hide, disguise, or delay the reveal of relevant information to the user (Gray et al., 2018). This term is not to be confused with "basket sneaking," another dark pattern where unwanted items or products are placed into the user's cart. Sneaking can include actions such as forced continuity and hidden costs, terms that will be explored while looking at the anatomy of dark patterns. One popular example of sneaking is when a website hides the "unsubscribe" button in a hard-to-find location or uses deceptive language to make it difficult for users to opt out of email communications. Figure 2 depicts an example of sneaking, where the option to unsubscribe from an email is intentionally obscured and made less noticeable, making it more likely for users to overlook or struggle to find it. Both designs include the option to "update preferences" or "unsubscribe" at the bottom of an email. However, the presentation of these options differs. The left-hand screen, which resembles a typical email footer, displays the options in a low-contrast color scheme,

with only an underline indicating an option to click. In contrast, the screen on the right maintains the placement of the two options at the bottom but emphasizes them using blue buttons that visually stand out against the white background.

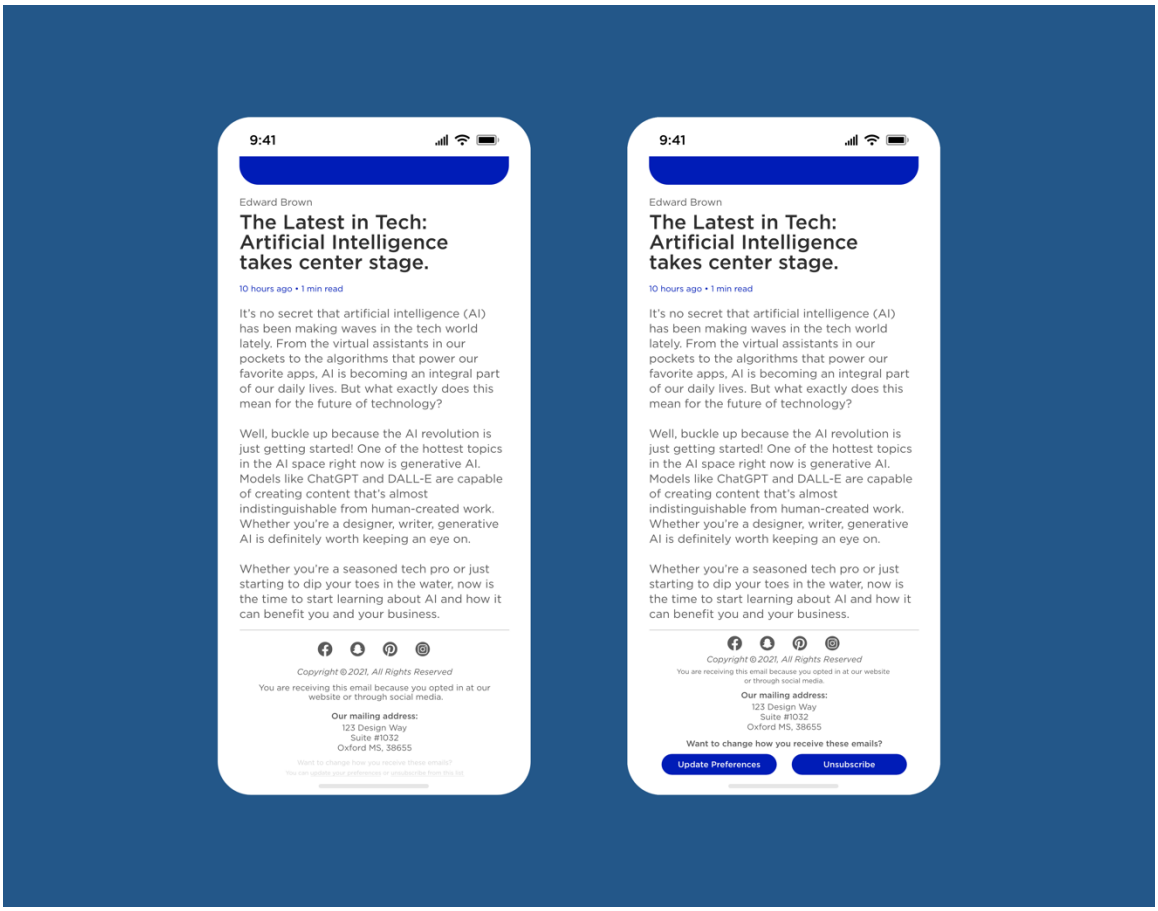

Figure 2: Sneaking Dark Pattern Design

"Obstruction" is the next category of dark patterns that intentionally makes it harder for users than need be to perform a desired task or access certain features. This can include adding unnecessary friction to the user journey, such as requiring users to navigate through multiple pages or fill out extensive forms to complete a simple action. By making the process more cumbersome or time-consuming, obstruction patterns

discourage users from pursuing their intended goals. Some of the methods that fall under the umbrella of obstruction include “price comparison prevention,” “roach motel” and “intermediate currency” (Gray et al., 2018). Price comparison prevention is a form of obstruction that makes it hard for users to compare prices or options across different websites or services. Visually, designers can incorporate this by omitting pricing information on product pages or using complex pricing structures. A roach motel takes place when a designer makes it easy to get into a situation, but hard to get out of. This is most often seen with subscriptions where it is made difficult or nearly impossible to terminate the service (Gray et al., 2018).

“Interface interference” encompasses a range of tactics that manipulate the UI itself to bias users towards certain elements or actions. This can be done by using visual cues, placement, or contrast to draw attention to desired buttons while de-emphasizing less preferable options. Some tactics of interface inference include hidden information, preselection aesthetic manipulation, and false hierarchy (Gray et al., 2018). By subtly guiding users’ attention and interactions, interface interferences can influence decision-making without the user’s conscious awareness. Figure 3 shows an example of interface inference, where the left-hand design deliberately employs visual cues, color contrast, and placement to emphasize the “Accept” button while making the “Decline” option less prominent. This potentially influences users to select “Accept” and make the choice that aligns with the interface’s goals rather than their own preferences. Ethical design is included in the design on the right, where there is no distinction or hierarchy between the buttons.

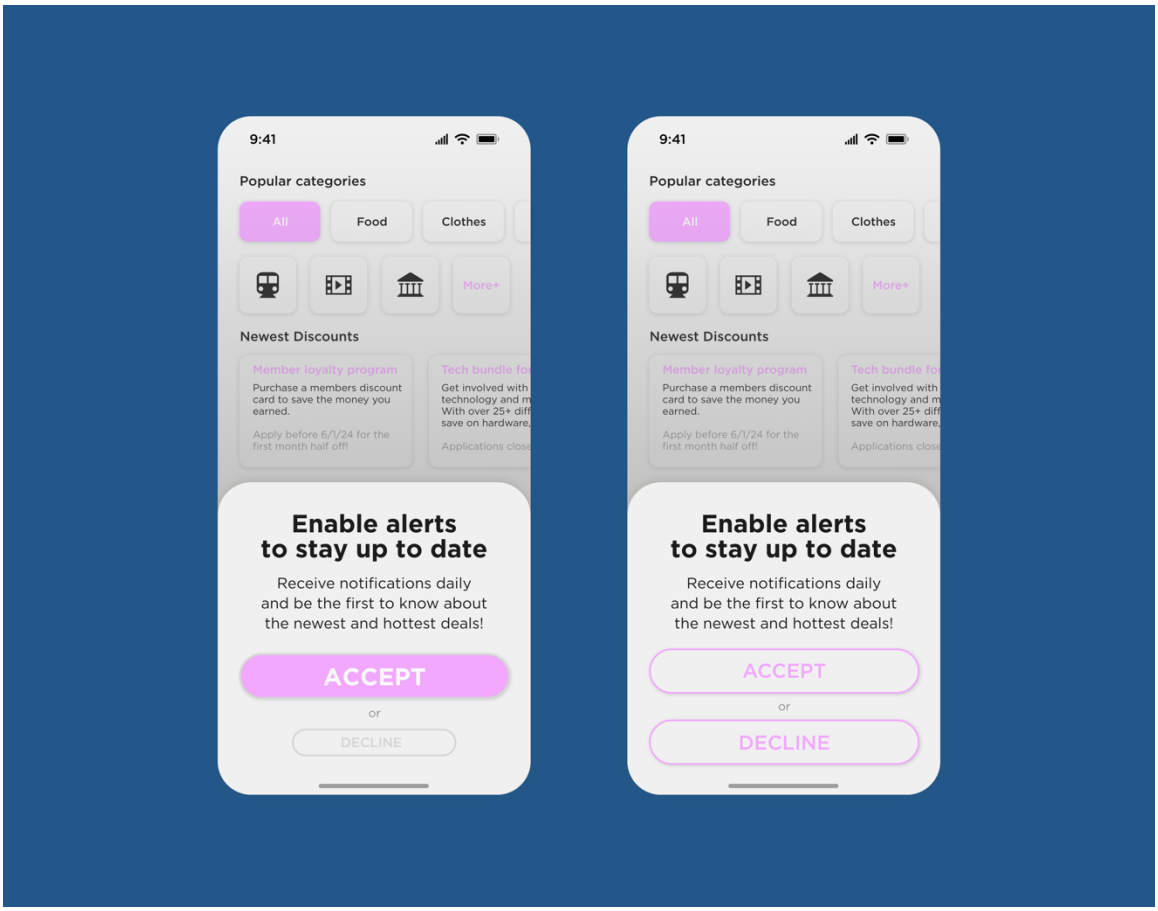

Figure 3: Interface Inference Dark Pattern Design

Finally, "forced action" refers to patterns that require users to perform a specific action to access content or features. This can take the form of mandatory registration, forced social media sharing, "privacy zuckering", or requiring users to provide personal information before allowing them to proceed. By making certain actions compulsory, forced action patterns limit user choice and freedom. One notable branch of forced action is called "gamification." Gamification describes situations in which specific aspects of a service can only be received through repeated use of aspects of the service. For example, the mobile app Candy Crush incorporates levels that are impossible to pass in order to force users into buying extra lives or power-ups (Gray et al., 2018).

iii. Anatomy of Dark Patterns

Building upon the broad categories of dark patterns discussed in the previous section, it is important to look deeper into specific tactics and examples that illustrate how these practices manifest in digital interfaces. By examining specific patterns, UI/UX designers and developers can gain a more nuanced understanding of the mechanisms and design choices that establish dark patterns. While there is a myriad of distinct dark patterns, one specific tactic within the broader category of nagging is called "confirmshaming." Confirmshaming involves using guilt or social pressure to manipulate users into taking a desired action (Singh et al., 2023). An example of this is when attempting to unsubscribe from an email newsletter, a user may encounter a message that reads, "No I don't want to save money," or "I don't care about staying up to date." By framing the choice in this way, confirmshaming exploits the user's desire to avoid negative self-perception and social judgement, pressuring them to reconsider their decision. Figure 4 shows an example of confirmshaming where the user is presented with emotionally charged language and guilt-inducing options, potentially manipulating them into reconsidering their decision. The design uses confirmshaming to manipulate users into accepting the discount offer. By framing the acceptance option in a visually appealing manner while presenting the refusal option as less desirable with negative wording, the interface works to guilt users into accepting the promoted action. The contrasting button colors and font size also draw attention to the "Yes" option, making it a more visually dominant choice. This approach pressures users into accepting the offer, even if they might not need or want the discount.

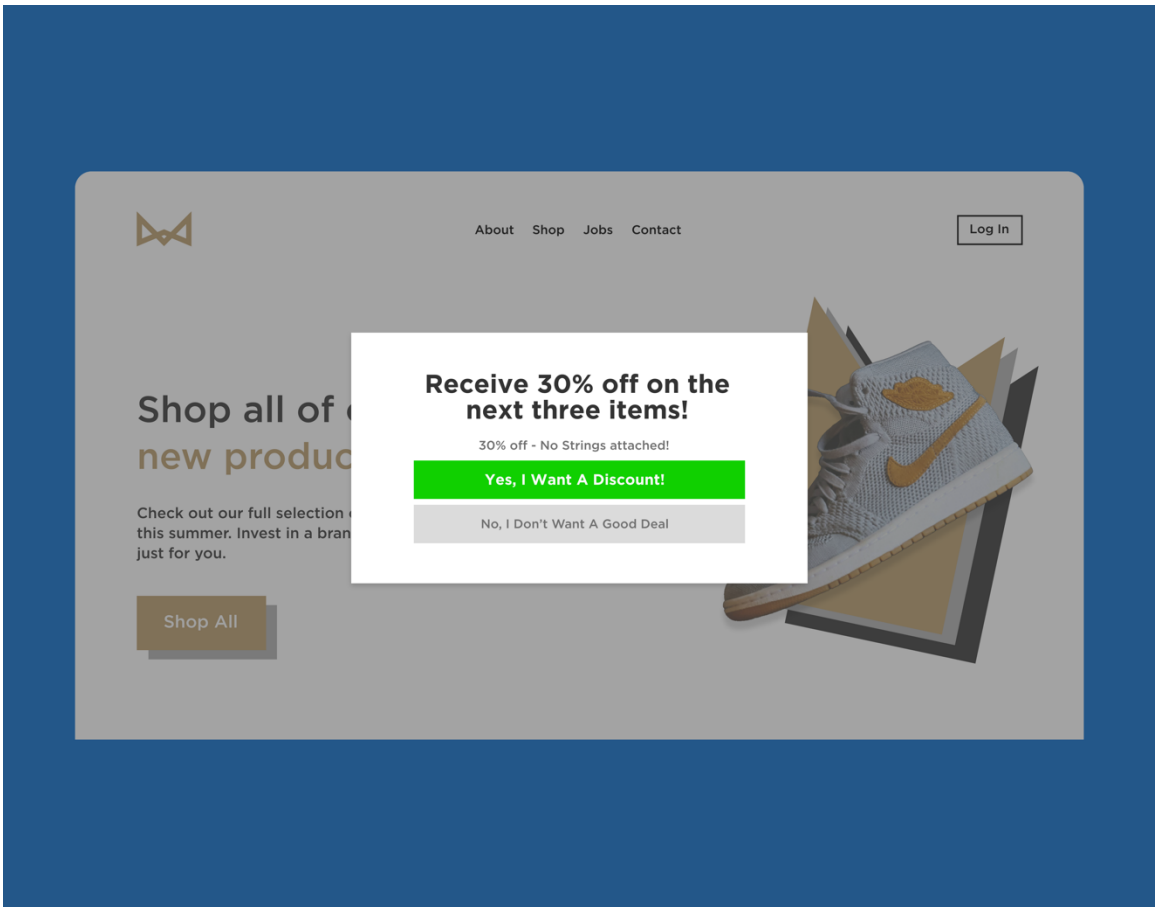

Figure 4: Confirmshaming Dark Pattern Design

Another tactic, often falling under the category of sneaking, is the use of "hidden costs." The term, named by Brignull at the same time as dark patterns, defines the action of advertising a good or service at a certain price, only to later change due to added taxes and fees, limited time conditions, or high shipping costs (Gray et al., 2018). The pattern obscures or delays the disclosure of these additional fees, charges, or subscriptions until late in the user journey, often just before the point of purchase. Similar to the price comparison prevention method, designers can omit the true pricing information on the product page, only to reveal it later on. By hiding these costs, businesses can manipulate users into making purchasing decisions based on incomplete information, only to reveal

the true cost at a point when the user may feel committed to the transaction. This tactic weakens trust and can lead to both frustration and financial harm for users.

"Forced continuity," another Brignull term, is a tactic that makes it difficult for users to cancel subscriptions or services. This typically involves hiding cancellation options deep within account settings or requiring users to navigate through multiple pages or contact customer support to terminate service. By creating difficulties and obstacles in the cancellation process, businesses exploit users' failure to check up on service expiration dates and forgetfulness, hoping that users will give up and continue paying for services they no longer want or need (Gray et al., 2018).

Lastly, a notable tactic within the category of sneaking is "privacy zuckering," named after Facebook's founder and majority shareholder of Meta, Mark Zuckerberg. Privacy zuckering involves tricking users into sharing more personal information than they intend to. Often done by using deceptive or confusing interface design, it also includes selling the user's information to separate parties, which is included in the Terms and Conditions or Privacy Policies of sites (Gray et al., 2018). An apt example of privacy zuckering would be when a social media platform uses pre-selected checkboxes or ambiguous language to encourage users to share their data with third-party advertisers, hiding the opt-out options in complex privacy settings. By exploiting users' trust and lack of understanding, privacy zuckering threatens both data and the privacy and security of users.

These specific examples demonstrate how dark patterns can take many different forms, each exploiting different psychological vulnerabilities and employing specific design tactics to manipulate user behavior. The survey results confirm that a considerable

portion of users have fallen victim to these tactics, with many reporting that they have felt tricked into purchasing something or sharing personal information due to deceptive design elements. It is worth noting that the tactics discussed here are just a few examples within the broad domain of dark patterns. As technology evolves and new design trends emerge, new variations and manifestations of dark patterns will likely continue to emerge.

iv. The Spectrum of Dark Patterns

While the common characteristics and anatomy of dark patterns have been explored, it is still important to recognize that these practices exist on a spectrum of severity and harm. Some dark patterns may be relatively mild, causing minor inconveniences or annoyances, while others can be highly unethical or aggressive, leading to severe financial, privacy, or emotional consequences for users (Di Geronimo et al., 2020).

At one end of the spectrum are mild dark patterns. These are design practices that, while still manipulative or deceptive, may not cause significant harm to users. Examples of mild dark patterns could include small interface annoyances like pop-ups that are easily dismissed or subtle visual cues that encourage a particular action without substantially impeding the user's choices. While these may be frustrating, they are less likely to have severe consequences for users and have low impacts on users' experiences (Di Geronimo et al., 2020). It is important to note, however, that even mild dark patterns can have a cumulative effect on user experience and trust. When users encounter multiple

instances of minor dark patterns over time, their trust in apps and services may decline, leaving them frustrated and skeptical of the platforms they interact with.

At the opposite end of the spectrum are highly unethical dark patterns, or aggressive dark patterns. These are design practices that employ overtly deceptive or manipulative tactics, often causing significant harm to users. Examples of highly unethical dark patterns include those that trick users into making unwanted purchases, sharing sensitive personal information, or signing up for services with hidden fees or long-term commitments. Privacy zuckering, forced continuity, and roach motel all fall under aggressive dark patterns. These practices exploit users' trust and vulnerabilities, putting business goals over user well-being (Singh et al., 2023). Highly unethical dark patterns can have severe consequences for users, both financially and emotionally. They may lead to unauthorized charges, data breaches, or the exposure of sensitive information. Additionally, these practices can cause emotional distress, particularly for vulnerable populations such as the elderly, who may be less equipped to recognize dark patterns.

Within the spectrum of dark patterns, there is also a gray area that can be referred to as "consensual deception." Consensual deception refers to instances where users may be aware of the manipulative nature of a design practice but still choose to engage with it. According to the survey results, 89% of respondents answered that they noticed examples of dark patterns like clickbait headlines and misleading ads when on websites and apps. Even though these users are aware to some extent of manipulative patterns online, they still consent and engage with the sites. These are examples of users who knowingly accept the terms of a service that includes hidden fees or data-sharing provisions,

prioritizing the perceived benefits of the service over any potential risks. This concept of consensual deception highlights the exchange between user agency and the persuasive power of design. It raises questions about the extent to which users can truly consent to these practices, especially when faced with limited choices or when the consequences of their decisions are not fully transparent (Richards & Hartzog, 2019).

The findings from the survey highlight the presence of both mild and severe dark patterns, with a high portion of participants answering that they have been exposed to deceptive design techniques. This highlights the necessity for a nuanced strategy in assessing and evaluating dark patterns, acknowledging the spectrum of impact and damage they can cause. When looking at this range, it is important to factor in user awareness and consent in determining the acceptability of many design methods. Although some individuals are inclined to accept subtle dark patterns in exchange for advantages, overly unethical methods that result in real harm should be condemned and discouraged.

v. Combating Dark Patterns

Whether mild or aggressive, dark patterns can have far-reaching consequences for those impacted by them. By manipulating users into taking actions that may not be in their best interests, dark patterns ruin trust, subvert informed decision-making, and contribute to a range of negative outcomes.

One of the most consequential impacts of dark patterns is a decline in user trust and satisfaction. When users repeatedly encounter manipulative or deceptive practices across digital interfaces, mild or aggressive, they may become frustrated and lose faith in

the companies and services they interact with. This loss of trust can lead to increased skepticism, reduced engagement, and a general sense of frustration or disillusionment online (Richards & Hartzog, 2019). The findings from the survey confirm this, with 87% of respondents expressing that the design choices of a website or app have an impact on their experience using it (Q2).

Dark patterns can also have financial and privacy consequences for users. Hidden costs, forced continuity, and privacy zuckering can all lead to unauthorized charges, unwanted subscriptions, and the exposure of sensitive personal information. These practices not only cause financial harm but also contribute to a sense of vulnerability and insecurity among users. 33% of all respondents to the survey have felt tricked into purchasing an item due to design elements (Q6), and 78% have felt tricked into spending more time on an app than intended due to the same reasons (Q7). These findings show the need for more transparency and user protection in digital interfaces, as the consequences of dark patterns can have a real and lasting effect on users' sense of privacy and financial stability.

Similar to digital accessibility, the impact is particularly concerning when it comes to populations such as elderly individuals, children, or people with cognitive impairments. These users may not be able to recognize or resist dark pattern tactics, making them more susceptible to the consequences. As a result, there is a heightened ethical responsibility for designers and businesses to consider the potential impact of their design on these vulnerable groups (Gray et al., 2018).

Opposing the influence and impacts of dark patterns requires an approach that involves raising awareness, advocating for stronger regulations, promoting ethical design

principles in education, and encouraging transparency and accountability in the industry. A big part of combating dark patterns is integrating ethical design principles and awareness of manipulative tactics into the education and training of designers and developers. By incorporating comprehensive ethics education in UX/UI, future generations of designers and developers may be better equipped to take their role as creators of the future seriously (Gray et al., 2018). Similarly, another important aspect of combating dark patterns is raising awareness among users. Educating individuals about common tactics and characteristics of manipulative design can empower them to recognize and resist these practices. This could involve initiatives such as public awareness campaigns, educational resources, and user advocacy groups that provide guidance on identifying and dealing with dark patterns, as well as a stronger push for mass digital media literacy.

vi. Conclusion

This chapter explored the pervasive and problematic circumstances of dark patterns in digital interfaces. By examining the origins, meanings, characteristics, and specific tactics of dark patterns, light can be shed on these manipulative patterns that undermine user freedom, break down trust, and prioritize business goals over user well-being.

The spectrum, ranging from mild annoyances to highly unethical and aggressive practices, highlights the need for a nuanced and context-dependent evaluation of design choices. While some users may tolerate minor manipulations, the consequences of aggressive dark patterns, such as financial harm, privacy violations, and emotional

distress, cannot be ignored. The impact and consequences of dark patterns extend beyond just individual users as well, affecting the technology-dependent society as a whole. Methods to prevent these negative impacts and consequences can include raising awareness, promoting ethical design principles, and encouraging transparency in the design process. The prevalence of dark patterns in digital spaces is an issue that should not be overlooked. It is an issue that demands the attention and action of all stakeholders involved. By confronting the dark patterns and combating the influence of dark patterns through these ways, work can be made toward proper and ethical digital interfaces. Methods to prevent this include raising awareness, promoting ethical design principles, and encouraging transparency in the design process.

IV. POLARIZATION

i. Introduction

The growing concern over online polarization and its impact has become increasingly apparent in recent times. Social media platforms and digital spaces have transformed the way people absorb and share information, while also contributing to the creation of situations like echo chambers and filter bubbles. Central to this is the role of UI/UX design on these platforms, as well as the algorithms that power content recommendation systems. The design choices made by digital platforms and their designers, from the layout of content feeds to the algorithms that determine which posts are promoted, can significantly influence both the information users are exposed to and the opinions they form. When these design elements put engagement and user retention over diversity and accuracy, they can contribute to polarized online communities, leading to the possibility of political fragmentation and the spread of misinformation. Recommendation algorithms, in particular, have come under scrutiny for their role in creating echo chambers in digital spaces. By analyzing user behavior and preferences, these algorithms provide personalized content that keeps users engaged and coming back to the platform. However, this personalization is a double-edged sword that narrows the information users are exposed to, reinforces beliefs, and reduces encounters with challenging viewpoints.

The results that stem from online polarization can extend beyond just social platforms, impacting a number of things such as political discourse, public opinion, as

well as social relationships. As users become increasingly rooted in these echo chambers, they may become more susceptible to misinformation or conspiracy theories. As a result, the divide between different groups is exacerbated and the common ground necessary for beneficial dialogue may diminish. The spread of COVID-19 conspiracy theories and the January 6 incident in the U.S. Capital following the 2020 presidential election are just two examples of how online polarization can have severe real-world consequences (Lieneck et al., 2022).

Reducing polarization online takes an approach involving designing for diversity, enhancing transparency and user control, implementing friction to encourage critical thinking, promoting digital media literacy, and more emphasis on training ethical design. Platforms and designers alike must recognize their role in implementing a healthier online environment and support ethical design practices that put the user first. However, the responsibility for addressing online polarization goes beyond digital design and requires the collaboration of all constituents involved, including policymakers, organizations, and educational institutions.

ii. The Phenomenon of Echo Chambers

An echo chamber refers to a social network that shares a set of opinions while not interacting with opinions and viewpoints that would contradict them (Figà Talamanca & Arfini, 2021). In terms of online platforms, echo chambers are typically the formation of homogenous communities where users are primarily exposed to information and opinions that align with their existing beliefs. These digital environments create a feedback loop that reinforces users' preexisting ideas and limits their exposure to contradictory

viewpoints. The formation of echo chambers is tied to the algorithmic curation of content and the personalization of user experiences on digital platforms, as well as the actions of users themselves (Figà Talamanca & Arfini, 2021). Survey respondents noticed this as well, with one-third of respondents indicating that they mostly see content and ads that align with their beliefs and interests when online (Q11).

Recommendation algorithms play a big role in the creation and perpetuation of echo chambers. These algorithms employ techniques like collaborative filtering and content-based filtering to suggest content to users likely to appeal to them based on their past behaviors and preferences. Collaborative filtering analyzes the behavior of similar users and relies on data about other users to make recommendations, while content-based filtering examines the characteristics of the content itself to determine its relevance to a user's interests. Content-based filtering is based on the belief that users who have shown interest in a type of content are likely to be interested in similar content in the future (Hashim & Waden, 2023). Recommendation algorithms, or systems, are not the exclusive cause of echo chambers, however. Echo chambers, as well as filter bubbles, are not solely related to algorithms, but more to how users interact with and react to the information presented (Figà Talamanca & Arfini, 2021).

While these algorithmic approaches are designed to enhance user engagement and provide a personalized experience, they can also have unintended results. Filter bubbles may inadvertently be created when optimizing for engagement and user preferences, limiting exposure to perspectives outside of their norm. As users interact with content in line with their existing beliefs, the algorithms learn to prioritize similar content in the future, creating a self-reinforcing cycle that repeats and narrows the range of information

users come across. For example, an algorithm may interpret a user's "like" on something as an accurate match or favorable content (Haim et al., 2017). In turn, the algorithm will show more of that type of content to the user over time.

The impacts and effects of echo chambers on differing beliefs and opinions are vast. When users are primarily exposed to information that confirms their beliefs and biases, they may become more fixed in these opinions and less receptive to alternative perspectives. This reinforcement of preexisting notions can lead to a polarization of attitudes and a hardening of ideological divisions. Likewise, by limiting encounters with contradictory information, echo chambers can create a distorted sense of reality for users where they may overestimate the validity of their beliefs.

The psychological appeal of echo chambers can be understood by looking at cognitive biases and social influences. Confirmation bias, the tendency to seek out and interpret information in a way that confirms one's preexisting beliefs, plays a big role in the formation and maintenance of echo chambers (Cinelli et al., 2021). Users are naturally drawn to information that supports their opinions, as it provides a sense of consistency and reduces any discomfort associated with conflicting viewpoints. Furthermore, when users are surrounded by others who share the same thoughts, they may overestimate the extent to which their opinions are validated or widely held. This perception of consensus can create a powerful sense of belonging and leads users towards preferring information that adheres to their worldviews and ignoring dissenting information, even in the absence of objective evidence (Cinelli et al., 2021).

Addressing these challenges and effects takes both technological and social interventions. From a design perspective, platforms and designers can explore ways to

introduce variety and diversity into content recommendation algorithms, driving users to encounter a wider range of perspectives. Training and education, for both users and designers, is another approach that can be taken to reduce the effect of echo chambers, as well as the implementation of media literacy policies. These methods would go far in supporting users' understanding of how platforms work and, more importantly, how they fit into the equation (Figà Talamanca & Arfini, 2021).

iii. UI/UX Design and the Reinforcement of Filter Bubbles

UI/UX design forms the way individuals interact with digital platforms and the content they consume. Personalization and customization have become central tenets of current UI/UX design, with the goal of providing users with experiences that cater to their individual preferences. While personalization can enhance user satisfaction and engagement, it also has the potential to reinforce filter bubbles and limit exposure to different perspectives. The survey data shows that a majority of users, 69%, frequently find themselves clicking on tabs, carousels, or menus to explore more content on a webpage (Q12). This behavior shows how UI/UX design and designers can reinforce filter bubbles by encouraging users to engage with similar content.

Personalization in UI/UX design often manifests in the form of tailored content feeds and recommendations. This personalization can be explicit, based on information knowingly provided by the user, or implicit, based on information collected from observing the user's online behavior (Haim et al., 2017). With implicit personalization, algorithms analyze user behavior, such as clicks, likes, and search history to curate content that fits the user's demonstrated interests. Customized search results and targeted

advertising attempt to present users with information and products deemed relevant based on these online activities. Even though these experiences can be convenient and engaging for users, they can also create a narrow and homogenous filter bubble.

A prominent example of UI/UX design and personalization impacting user exposure to content is the infinite scroll feature, which presents users with a continuous stream of content without natural breaking points (Ferrer, 2022). As users scroll through their feeds, they are exposed to a seemingly endless flow of information and content, often similar to what they have previously engaged with. This design choice creates a sense of immersion and keeps users engaged for longer periods. But it also limits opportunities for random and unique encounters with diverse or challenging perspectives.

The infinite scroll feature can be found on most major social platforms, such as Netflix, TikTok, Spotify, Instagram, and X, previously known as Twitter. First devised and developed by Aza Raskin in 2006, the infinite scroll replaced pagination. Pagination is a traditional design approach that breaks down large lists or content into several smaller, numbered pages (Ferrer, 2022). While Raskin intended to enhance the UX by making content more accessible, the infinite scroll has become a successful tool in retaining users' attention, as it encourages them to consume more and more content without realizing how much they have already consumed. This exploits the unit bias, a mental shortcut where humans are motivated to complete a given unit of something, believing that the amount offered is the correct amount. The endless nature of the infinite scroll keeps users hooked on the continuous flow of content, similar to addictive behaviors like gambling or substance abuse (Ferrer, 2022). Figure 5 shows how the infinite scroll feature compares to other methods of loading new items on a site such as

pagination or a “load more” button. Figure 5 portrays three mobile screens resembling a social media app. The left screen demonstrates the infinite scroll, where the content is continuously loading at the bottom as the user scrolls down. The middle screen shows a “load more” button at the bottom, which users can interact with to find additional content. Lastly, the right screen shows the interface using pagination, where content is divided into numbered pages that users can navigate between.

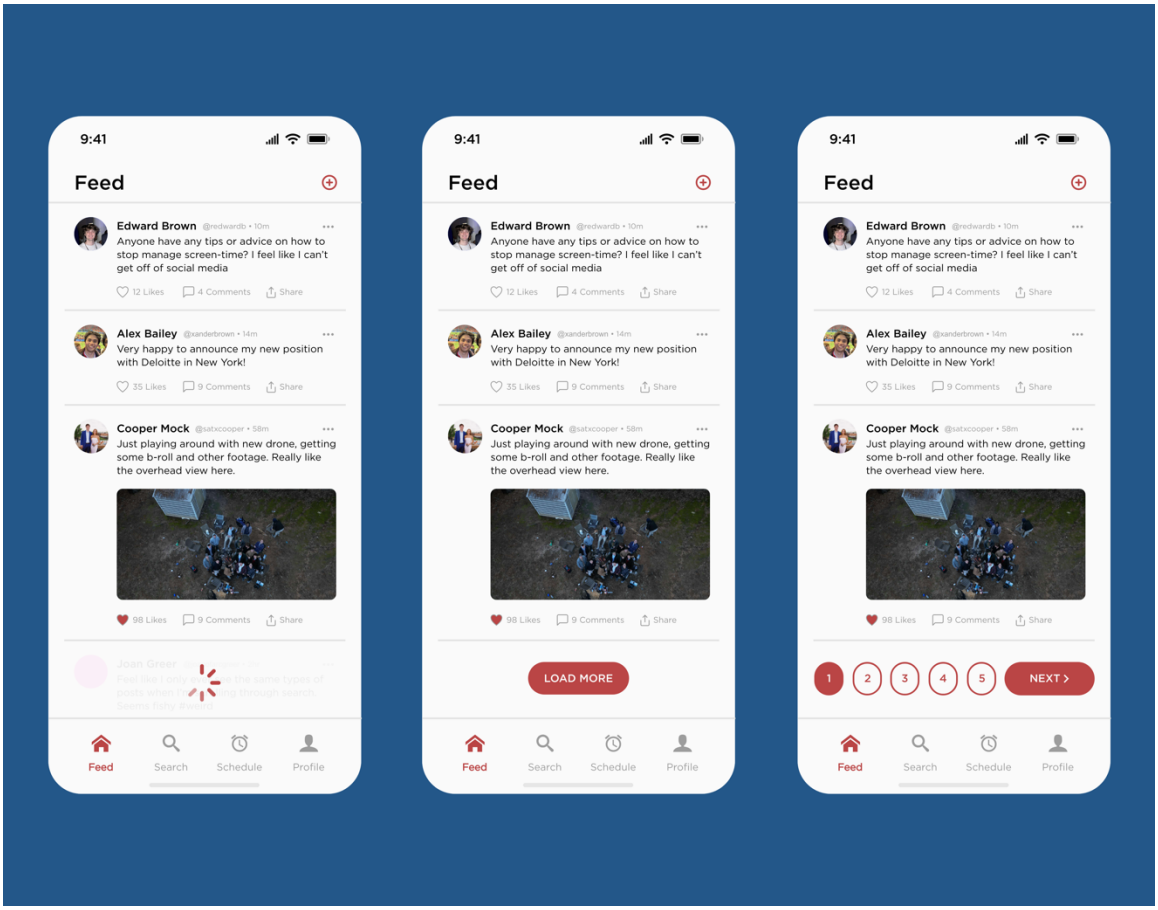

Figure 5: Scroll Design

Bursting the filter bubbles through UI/UX interventions presents a challenge for designers, platforms, and organizations. On one hand, personalization and user

satisfaction are key, as they drive engagement and keep users coming back to the platform. On the other hand, promoting diverse viewpoints and encouraging users to explore beyond their comfort zones helps promote a more inclusive digital environment. Striking a balance between these competing goals requires planning and differing design approaches, as well as more of an emphasis on media literacy training.

Similar to echo chambers, one potential strategy for bursting filter bubbles is to incorporate elements of randomness and diversity into content recommendation algorithms. By occasionally showing users content that falls outside their typical preferences, platforms can introduce opportunities for new discoveries and exposure to new ideas. This approach must be implemented carefully to avoid alienating users or ruining the overall user experience. Another approach is to actively design for exploration or curiosity, pushing users to go beyond their interests and engage with a wider range of content. This approach can be done through features such as "explore" sections, which highlight trending topics or different viewpoints, or through gamification elements that incentivize users to engage with content outside their usual preferences. However, even a well-intentioned use of gamification can lead to and be considered forced action, as mentioned previously.

iv. The Spread of Misinformation and Conspiracy Theories

With the continued usage of the internet and digital services, the rise of misinformation and conspiracy theories on digital interfaces and platforms has become an issue as well. The design of these platforms, particularly the recommendation algorithms and UI/UX choices, can contribute to the spread of false or misleading information. As

users increasingly rely on online sources for their news and information, the role of digital platforms in facilitating the circulation of misinformation has come under scrutiny. Furthermore, individuals who gathered their news from social media were much more likely to believe in conspiracy theories about COVID-19 and the vaccine than those who use traditional news outlets (Lieneck et al., 2022).

Recommendation algorithms play a big role in promoting misinformation online (Hashim & Waden, 2023). These algorithms often prioritize engagement metrics and popularity signals, such as likes, shares, and comments, when determining which content to deliver to users (Haim et al., 2017). This approach can unwittingly amplify sensational and emotionally charged content, which can be more likely to be shared and go viral, regardless of its accuracy. Misinformation and conspiracies, which often evoke strong emotional responses, can exploit these engagement-driven algorithms to gain visibility and reach a wider audience.

The impact of echo chambers on the acceptance of misinformation is also particularly concerning. Within echo chambers, users are predominantly exposed to information and opinions similar to their existing beliefs, limiting exposure to fact-checking and counter-narratives. This can create a false sense of consensus and lead to the normalization of fringe beliefs in these communities. If misinformation is repeatedly reinforced within a chamber, users may become more susceptive to accepting it as true, even in the face of contradictory evidence. The lack of diverse perspectives and the absence of challenges to false information can allow these narratives to take hold and spread unchecked.

Other UI/UX design choices made by designers and developers can further facilitate the spread of misinformation on digital platforms. The lack of obvious fact-checking labels or disclaimers on content makes it difficult for users to distinguish between reliable information and false or misleading claims. When misinformation is presented alongside legitimate news sources without a clear indicator of credibility, users may be more likely to accept it as true. Additionally, the ease of sharing and re-sharing content without verification contributes greatly to the pace at which misinformation spreads. When users can quickly share content with a single click, without being prompted to consider its accuracy or source, false narratives can spread. Thus, when polarization is high, misinformation can spread virally and influence many users before being effectively discredited (Cinelli et al., 2021).

X, formerly known as Twitter, introduced a feature in 2021 called Community Notes to address this issue. Community Notes allows users to add context to tweets they believe might be misleading, providing additional information or clarification. These notes are then made visible to other users, helping them make a more informed decision regarding the credibility of the content they encounter. While this feature is a step in the right direction, its effectiveness relies on the active participation and accuracy of the user community, and it may not fully prevent the spread of misinformation on the platform. Figure 6 provides a visual representation of a context feature, similar to Community Notes, and how it allows users to participate in providing clarification and context to content. Figure 6 depicts a computer screen displaying a social media interface, resembling a platform such as X or Facebook. The top post on the screen shows a user claiming they witnessed a protest, fights, and arrests on their college campus. However,

beneath the post, there is a red highlighted box refuting the user's statement. The additional context, provided by other users or moderators, helps to fight against misinformation by directly addressing and correcting false claims on the platform.

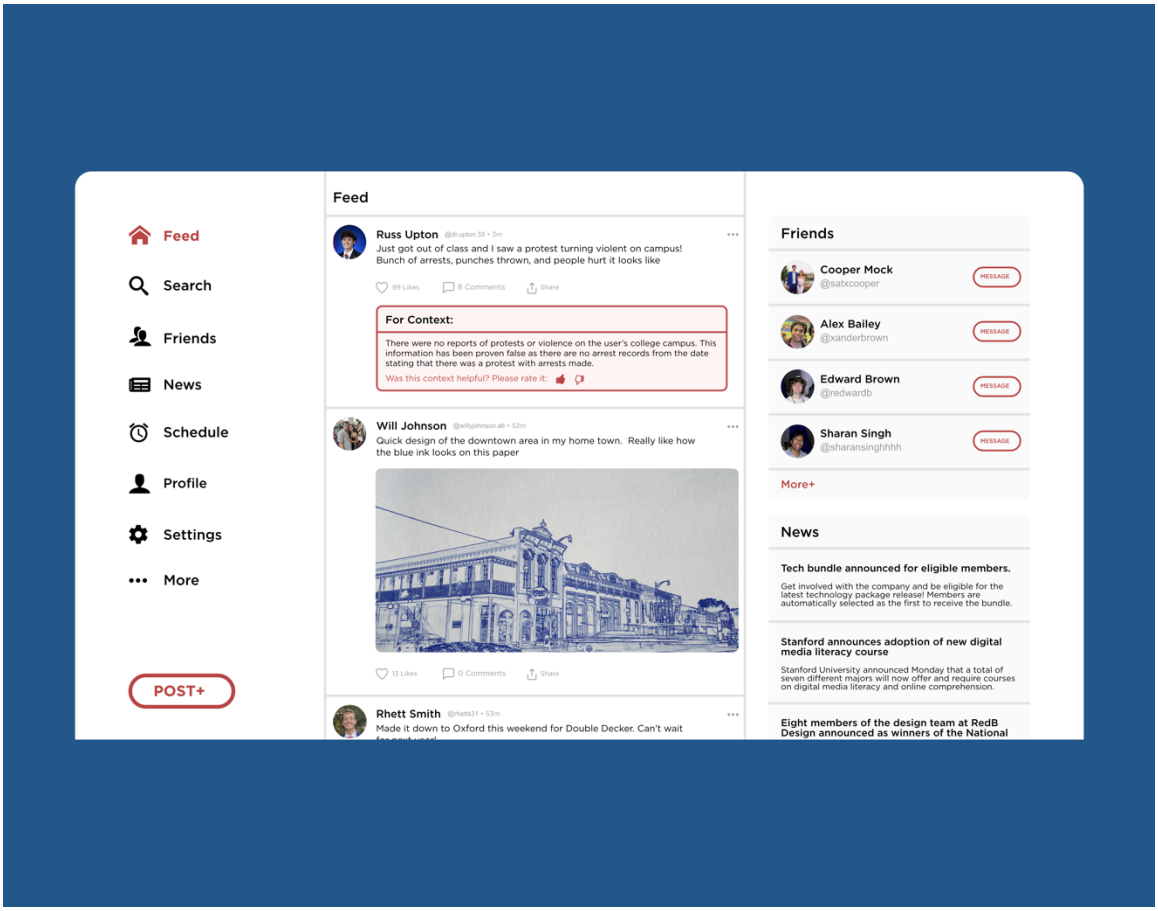

Figure 6: Context Feature Design

To combat the spread of misinformation and conspiracies, digital platforms should consider the role of their recommendation algorithms and design choices. This may involve a combination of algorithmic adjustments, design interventions, and user literacy education initiatives, rather than solely optimizing for engagement. As the role of digital platforms in shaping public discourse continues to grow, it is important that the

integrity of provided content is prioritized and active measures are enacted to combat the spread of misinformation.

v. Real-World Consequences and Specific Examples

Digital platforms and online environments are not the only things affected by polarization and the spread of misinformation. Political discourse, public opinion, and social relationships are all affected as well. As filter bubbles and echo chambers become more rooted in digital spaces, the common ground necessary for productive discussion and consensus-building talks diminishes. 89% of respondents reported experiencing feelings of addiction to sites and apps because of features like infinite scrolling or auto-playing media (Q13). Additionally, as stated before, 33% indicated that they mostly encounter content aligning with their existing beliefs (Q11). The combination of these two factors sheds light on how users can quickly become polarized and fall for misinformation, and conspiracies.

One of the most significant ramifications of online polarization is the fragmentation of political discourse and common ground. Filter bubbles can lead to the formation of isolated ideological communities where users are primarily exposed to perspectives that align with their existing beliefs. This can create a distorted sense of political reality, where users may overestimate the popularity or validity of their own views all the while becoming increasingly opposed to contradicting perspectives. Recommendation algorithms can further exacerbate these dividing views by promoting content that generates high levels of engagement, even if it is divisive.

The radicalization of users through content recommendation is one of the most concerning consequences of online polarization. Platforms like YouTube have faced criticism in the past for their role in promoting extremist content through their recommendation systems, as users who initially view mainstream political content can quickly find themselves in a filter bubble of increasingly extreme and conspiratorial content. Similarly, X's challenges with echo chambers and misinformation have been well-documented, with the platform struggling to contain the spread of false or misleading content during times like the COVID-19 pandemic (Lieneck et al., 2022). The combination of content-filtering recommendation algorithms and the nature of echo chambers can create the perfect space for the spread of more extremist beliefs.

Online polarization and misinformation's effects aren't limited to just politics as they affect public health and social cohesion as well. The rise and spread of medical misinformation on digital platforms such as anti-vaccination movements is one example of this. Echo chambers can raise skepticism towards established medical science, leading to the spread of false claims about the safety and efficacy of vaccines. This can and has resulted in more people opting out of vaccinations, the resurgence of preventable diseases, and vaccination rates far below target (Lieneck et al., 2022). Similarly, conspiracy theories can ruin faith in institutions and weaken social unity. For instance, some of the theories and misinformation that were spread during the COVID-19 pandemic about vaccines led to distrust in public health authorities, the democratic processes, and the media (Lieneck et al., 2022).

vi. Strategies for Mitigating Polarization through Design

Abating polarization and promoting more diversity and inclusivity online requires an intentional approach to UI/UX design. Putting design strategies first that encourage randomness, transparency, and critical thinking are all ways to help digital platforms create safer and more effective spaces.

One key strategy for reducing polarization is designing for diversity in content discovery. This involves using elements of randomness and cross-cutting exposure into recommendation algorithms, ensuring that users are exposed to a wider range of perspectives and ideas (Hashim & Waden, 2023). By highlighting diverse viewpoints and promoting content from outside users' echo chambers, platforms can help to burst filter bubbles and encourage users to engage with challenging information. This can be achieved through features like "explore" sections that spotlight content from different sources or by including diversity metrics in content ranking algorithms.

Promoting digital media literacy and media competence is another strategy that can be utilized through design. Platforms or services can play a role in teaching users how to evaluate the quality and credibility of information they encounter online. This could include in-platform resources and tutorials on how to identify reliable sources or spot potential misinformation.

Restoring transparency and user control over recommendation and feed systems is an additional method used to reduce online polarization. Digital interfaces and platforms should provide clear communication about the factors influencing content recommendations, allowing users to understand why they are seeing certain types of content. Additionally, providing options for users to adjust, give feedback on, or opt out

of personalized content can give them more control over the consumption of information and help lessen the effects of filter bubbles (Elahi et al., 2022). This can include features like customizable content feeds where users can select the topics or sources they want to see, or options to turn off personalized recommendations altogether.

Implementing friction and encouraging critical thinking through UI/UX design is another approach. Similar to the approach taken by X in labeling disputed or misleading content, ethical designers can introduce prompts or warnings for potentially misleading information. Encouraging users to read articles before sharing them, a major proponent of news media literacy, can also help to slow the spread of misinformation and promote more thoughtful engagement with content.

vii. Conclusion

Fueled by recommendation algorithms and UI/UX design choices, online polarization has consequences ranging from political fragmentation to the spread of misinformation. Echo chambers and filter bubbles are major proponents of these consequences, limiting exposure to different perspectives, reinforcing biases, and prioritizing engagement over content quality. The real-world impact of these polarized digital spaces, like the spread of COVID-19 conspiracy theories and January 6, stresses a need for action.

The findings from the survey throughout this chapter demonstrate the need to address online polarization, with users and respondents reporting experiences of echo chambers, filter bubbles, and addictive design features that contribute to the reinforcement of existing beliefs and the spread of misinformation. Addressing this takes

a well-rounded approach that involves designing for diversity, enhancing transparency and user control, implementing friction to encourage critical thinking, promoting digital media literacy, and more emphasis on training ethical design. Platforms and designers alike must recognize their role in implementing a healthier online environment and embrace ethical design practices that put the user first. It is important to note that solving online polarization takes an effort that goes beyond just platform design. Lawmakers, organizations, and educational institutions must also play a big role in addressing this issue. Empowering users with media literacy skills is crucial for building resilience against polarization, misinformation, and conspiracies. The goal of these algorithms should be to create spaces digitally that balance user engagement with exposure to varying beliefs, creating a culture of curiosity, critical thinking, and beneficial dialogue. The challenges posed by online polarization are complex, but the potential solutions offer a path for progress toward a healthier digital public sphere.

V. CONCLUSION

The power and influence of UI/UX design on users' daily lives, behaviors, and access to essential services cannot be overlooked. Digital platforms are becoming increasingly intertwined into nearly every aspect of an individual's life. Because of this, the design choices made by developers and designers hold sway over user behavior, emotion, and access to opportunities. While many design practices aim to create user-friendly and engaging experiences, a large portion of the design is manipulative and puts business goals and profit over user needs.

Accessibility barriers, dark patterns, and polarizing interfaces take up an important and large part of these detrimental UI/UX design methods. Supported by the findings from the user survey and literature review, this research shed light on the real-world consequences of these design practices.

Examining digital accessibility revealed how a failure to follow accessibility guidelines and standards creates unnecessary barriers for users with visual, auditory, motor, and cognitive impairments. This hinders the users' ability to fully participate online and access essential services. A more in-depth look at dark patterns and their categories exposed many of the deceptive and popular tactics employed by designers to manipulate users. This involves manipulating the user into taking actions that aren't in their best interests but in the interest of business or profit goals. Oftentimes dark patterns result in users losing trust in businesses and financial or privacy harms. The last facet of unethical UI/UX design methods, polarization, showed how recommendation algorithms

and visual design choices created echo chambers, reinforced biases, and contributed to the spread of misinformation and political fragmentation.

Throughout the research and thesis, the importance of digital media literacy and design education emerged as critical factors in addressing these challenges. As many of the sources from the literature review demonstrate, giving users the knowledge and skills to navigate online critically and responsibly is essential for building resistance against manipulative design practices, polarization, and the spread of misinformation (Figá Talamanca & Arfini, 2021; Elahi et al., 2022). Digital media literacy allows users to recognize and resist deceptive design methods, evaluate the information they encounter, and make better decisions about their interactions online. Digital media literacy can be promoted through educational initiatives, public awareness campaigns, and user advocacy groups. This, in turn, can lead to a more discerning and adept user base that will expect ethical design and hold platforms accountable.

Equally important is the need for a shift in design education and training. Integrating ethical design principles, accessibility best practices, and an understanding of potential harms into the curricula of UI/UX design programs is important for creating a generation of designers who focus on user-centered design (Cederberg, 2022). This shift should be guided by ongoing professional development and a greater emphasis on adhering to guidelines and standards such as WCAG and Section 508 of the ADA. By equipping designers with the knowledge and skills to create transparent, inclusive, and ethical digital experiences, it can be assured that the future of UI/UX design is driven by a commitment to user well-being rather than just business goals.

In summary, the key to creating a more inclusive, transparent, and user-centered digital world lies in the power of digital media literacy and design education. Focusing efforts on training users and transforming design practices can lead to a digital landscape that promotes equity, informed decision-making, and better UX. This shift will take the collective effort from everyone involved, including researchers, designers, lawmakers, and users themselves. The survey results, literature review, and recommendations presented here offer a path for designers and developers to follow in pursuit of a user-centric digital society. Embracing these two facets, digital media literacy and ethical design education, as the cornerstones of this transformation will lead to a future where UI/UX design serves as a positive tool for enhancing user well-being rather than a negative one.

APPENDIX:

USER SURVEY QUESTIONS AND RESULTS

1. Are you at least 18 years of age?
    a. Yes: 100% (76)
    b. No: 0% (0)

2. Does a website or app's visual design have an impact on your trust, engagement, or enjoyment using it?
    a. Yes: 87% (66)
    b. No: 4% (3)
    c. Maybe: 8% (6)
    d. Don't Know: 1% (1)

3. Do you pay attention to how color schemes, sounds, or other design aspects influence your emotions/behaviors on a site?
    a. Yes: 62% (47)
    b. No: 18% (14)
    c. Maybe: 18% (14)
    d. Don't Know: 1% (1)

4. Do you notice things like clickbait headlines, misleading ads, or attempts to keep you engaged on apps/sites you use?
    a. Yes: 89% (68)
    b. No: 7% (5)
    c. Maybe: 4% (3)
    d. Don't Know: 0% (0)

5. Do you often find yourself getting distracted or spending more time than planned on certain apps or sites?
    a. Yes: 82% (62)
    b. No: 7% (5)
    c. Maybe: 12% (9)
    d. Don't Know: 0% (0)

6. Have you ever felt tricked into purchasing something due to certain design elements?
    a. Yes: 33% (25)
    b. No: 46% (35)
    c. Maybe: 20% (15)
    d. Don't Know: 1% (1)

7. Have you ever felt tricked into spending more time on an app than intended due to certain design elements?
    a. Yes: 78% (59)
    b. No: 13% (10)
    c. Maybe: 8% (6)
    d. Don't Know: 1% (1)

8. Do you believe that apps and websites should be designed in users' best interests, not just for profit?
    a. Yes: 68% (52)
    b. No: 12% (9)
    c. Maybe: 20% (15)
    d. Don't Know: 0% (0)

9. Do you think design choices on apps and sites impacts your mood and how you feel?
    a. Yes: 67% (51)
    b. No: 9% (7)
    c. Maybe: 20% (15)
    d. Don't Know: 4% (3)

10. Does a website or app's visual design and what it looks like have an impact on whether or not you use it?
    a. Yes: 84% (64)
    b. No: 5% (4)
    c. Maybe: 11% (8)
    d. Don't Know: 0% (0)

11. When using apps or sites, do you feel like you only see content and ads that align with your beliefs and interests?
    a. Yes: 33% (25)
    b. No: 53% (40)
    c. Maybe: 13% (10)
    d. Don't Know: 0% (0)

12. Do you find yourself clicking on tabs, carousels, or menus to explore more content on a webpage?
    a. Yes: 69% (52)
    b. No: 12% (9)
    c. Maybe: 19% (14)
    d. Don't Know: 0% (0)

13. Do sites and apps ever feel addictive to you due to infinite scrolling or auto-playing media features?
    a. Yes: 89% (67)
    b. No: 7% (5)
    c. Maybe: 3% (2)
    d. Don’t Know: 1% (1)

14. When using a smartphone, have you ever found yourself repeating the same finger motions on different sites? For example, swiping down to refresh, swiping left to change pictures, etc.
    a. Yes: 92% (69)
    b. No: 5% (4)
    c. Maybe: 3% (2)
    d. Don’t Know: 0% (0)

REFERENCES

Center for Disease Control and Prevention. (2023). *Disability Impacts All of Us*. https://www.cdc.gov/ncbddd/disabilityandhealth/infographic-disability-impacts-all.html#:~:text=Up%20to%201%20in%204,have%20some%20type%20of%20disability

Cederberg, P. (2022). Accessibility in Design Education. *Carnegie Mellon University*. https://doi.org/10.1184/R1/20123000.v1

Cinelli, M., Morales, G., Galeazzi, A., & Starnini, M. (2021). The echo chamber effect on social media. *Proceedings of the National Academy of Sciences*, *118*(9). https://doi.org/10.1073/pnas.2023301118

Di Geronimo, L., Braz, L., Fregnan, E., Palomba, F., & Bacchelli, A. (2020). UI Dark Patterns and Where to Find Them: A Study on Mobile Applications and User Perception. *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems.* https://doi.org/10.1145/3313831.3376600

Dodson, R. (2018). What is accessibility? *web.dev.* https://web.dev/articles/what-is-accessibility

Elahi, M., Jannach, D., Skjærven, L., Knudsen, E., Sjøvaag, H., Tolonen, K., Holmstad, Ø., Pipkin, I., Throndsen, E., Stenbom, A., Fiskerud, E., Oesch, A., Vredenberg, L., & Trattner, C. (2022). Towards responsible media recommendation. *AI Ethics*,. *2*, 103-114. https://doi.org/10.1007/s43681-021-00107-7

Federal Communications Commission. (2024). Accessibility. https://www.fcc.gov/accessibility/program#:~:text=Section%20508%20of%20the%20Rehabilitation,accessible%20to%20people%20with%20disabilities

Ferrer, J. (2022, March 26). The Infinite Scroll effect – How design can hack your brain. *UX Collective.* http://uxdesign.cc/the-infinite-scroll-effect-how-design-can-hack-your-brain-996a9b8129d9

Figá Talamanca, G., & Arfini, S. (2022). Through the Newsfeed Glass: Rethinking Filter Bubbles and Echo Chambers. *Philosophy & Technology*, *35*(20). https://doi.org/10.1007/s13347-021-00494-z

Gray, Colin., Kou, Y., Battles, B., Hoggatt, J., & Toombs, A. (2018). The Dark (Patterns) Side of UX Design. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems,* 1-14. https://doi.org/10.1145/3173574.3174108

Haim, M., Graefe, A., & Brosius, H. (2017). Burst of the Filter Bubble? *Digital Journalism, 6*(3), 330-343. https://doi.org/10.1080/21670811.2017.1338145

Hashim, S., & Waden, J. (2023). Content-based filtering algorithm in social media. *Wasit Journal of Computer and Mathematics Science*, *2*(1), 14-17. https://doi.org/10.31185/wjcm.112

Ioane, J., Knibbs, C., & Tudor, K. (2021). The challenge of security and accessibility: Critical perspectives on the rapid move to online therapies in the age of COVID-19. *Psychother Politics Int.* https://doi.org/10.1002/ppi.1581

Lieneck, C., Heinemann, K., Patel, J., Huynh, H., Leafblad, A., Moreno, E., & Wingfield, C. (2022). Facilitators and Barriers of COVID-19 Vaccine Promotion on Social Media in the United States: A Systematic Review. *Healthcare*, *10*(2), 321. https://doi.org/10.3390/healthcare10020321

Miquel-Ribè, M. (2022). Dark User Experience: From Manipulation to Deception. https://www.researchgate.net/publication/358603299_Dark_User_Experience_From_Manipulation_to_Deception

Olalere, A., & Lazar, J. (2011). Accessibility of U.S. federal government home pages: Section 508 compliance and site accessibility statements. *Government Information Quarterly*, *28*(3), 303-309. https://doi.org/10.1016/j.giq.2011.02.002

Richards, N., & Hartzog, W. (2019). The Pathologies of Digital Consent. *Washington University Law Review*, *96*(6), 1461-1503. https://journals.library.wustl.edu/lawreview/article/id/6218/

Singh, D., Yadav, B., & Singh, S. (2023). Who is Responsible for the Prolonged Use of Dark Patterns? *SCRS Proceedings of International Conference of Undergraduate Students,* 185-192. https://doi.org/10.52458/978-81-95502-01-1-21

U.S. General Services Administration. (2020). Accessibility Statement. https://www.regulations.gov/accessibility

Web Content Accessibility Guidelines. (2023). World Wide Web Consortium (W3C). https://www.w3.org/TR/WCAG