Designing Child-Centered Interfaces in a World of Dark Patterns

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Introduction

Creating positive and accessible user experiences has become common practice for today's digital interfaces, especially as the population of computing device users increases year over year and technology becomes essentially necessary in everyday lives. However, within these experiences also exist manipulative designs used to help companies collect data and money from their users, more often than not discreetly. These designs are known as "dark" or "deceptive" patterns, and they manipulate people towards making decisions that they didn't intend on apps and websites (Brignull et al., 2023). A 2022 European Commission's report shows that almost all the most popular apps in the EU have at least one dark pattern, taking advantage of the power and information that dark patterns bring (Rossi et al., 2024). Dr. Harry Brignull, the UX designer who coined the term, identifies 16 types of dark patterns: comparison prevention, confirmshaming, disguised ads, fake scarcity, fake social proof, fake urgency, forced action, hard to cancel, hidden costs, hidden subscription, nagging, obstruction, preselection, sneaking, trick wording, and visual interference. These patterns involve emotionally-manipulative and misleading language, intentionally-engineered barriers, fake indicators, and more (Brignull et al., 2023).

Due to their pervasiveness and subtlety, everyone faces and falls prey to dark patterns in their lives, even the most technologically-skilled. However, based on personal traits and even situational circumstances, certain groups of people tend to be more vulnerable to these patterns' intended effects. For example, the fake scarcity and fake urgency dark patterns often present in ecommerce websites target people who are susceptible to the bandwagon effect or experience loss aversion. The preselection and obstruction dark patterns found on privacy preferences forms make it difficult for LGBTQ+ members who may want to switch between identities to conceal or separate parts of their lives (Rossi et al., 2024). A specific group that this paper will be focusing on is children. Children are especially vulnerable to dark patterns because of multiple factors including susceptibility to attention-grabbing features, inability to recognize commercial intent, and difficulty navigating through interface constraints (Radesky et al., 2022). They also struggle to maintain control of their own information, as they are quick to disclose information when experiencing challenging emotions or when expecting something in return. Still, there is a lack of federal regulation surrounding aspects of dark patterns and privacy protections for children in the United States (Kumar et al. 2023). While the field of human-computer interaction (HCI) has done much research surrounding the implications of dark patterns on adult users, there is a gap in knowledge about how such manipulative design practices manifest in children's digital environments or how they shape children. This paper will explore how children interact with and perceive dark patterns. It will also attempt to understand why dark patterns are prevalent in technologies aimed for children and what user experience designers and HCI researchers need to do to combat them and their negative effects.

Children and dark patterns

Children are avid users of mobile and tablet devices and often use apps and websites on these devices to play, learn, and socialize with others. These apps and websites, even if intended for a positive and educational experience, typically contain dark patterns in multiple forms. For instance, *Todo Math*, an app containing math games for children, shows their character with a tear in their eye with a prompt to sign up for a free trial of the paid version. Other apps use similar parasocial relationships and characters to guilt and pressure children into making purchases or continuing gameplay (Radesky et al., 2022). Nagging is another way that apps will force children to do a certain action, by interrupting the user with a request to do something over and over, depleting their time and attention. In *Nuts and Bolts*, a puzzle game advertised for all ages, gameplay is frequently interrupted with ads that users are forced to watch or interact with to continue (Valença et al., 2024). Fake urgency or scarcity of in-game items and disguised ads sprinkled throughout gameplay are further ways that children are enticed into making a purchase or spending more time on the app (Radesky et al., 2022). As a result of these dark patterns, children are left addicted and frustrated, despite the impression that these apps are supposed to be educational and kid-friendly.

Along with affecting children emotionally and mentally, dark patterns also impede on children's privacy and data rights. UNICEF created a children's rights-by-design standard with recommendations for designers and developers to uphold children's rights, and these were the basis for 18 legal requirements for tech companies to protect children's well-being online. Some of these requirements include: provide commercial-free and digital spaces, enable children's full control of their data, and conduct due diligence of platform policies. Overall, the requirements relate to platform governance, development and well-being, privacy and security, and data management. When relating dark patterns and the requirements, it was found that each type of dark pattern affects ten requirements on average (Valença et al., 2024). Every dark pattern violates the platform governance requirements, as such unethical design practices neither show the adoption of best available technologies and policies nor ensure risk reduction with regard to well-being online. In relation to development and well being requirements, many dark patterns offer minimal benefit to children and encourage poor behaviors instead. Dark patterns do not follow privacy and security requirements, with their ability to block users from having full control over their data. Lastly, dark patterns such as obstruction, preselection, and disguised ads violate data management requirements by allowing a product to collect large amounts of data, without explicit permissions, to share with advertisers. Despite the obvious negative implications of dark patterns on children's privacy and data rights in digital environments, tech companies continue to implement them in their products. The question arises, then, why are there so many dark patterns in apps and websites aimed at children?

Challenges when designing for children

User experience designers are responsible for creating positive and accessible user experiences in apps and websites, which often involves advocating for the user. Unfortunately, they find themselves struggling to advocate for children as they attempt to balance ethics and business values in their design. Even when they try to negotiate with organizational pressures from institutionalized design cultures and practices, they tend to look towards their own priorities and familiar practices, which do not always necessarily align with child-centered principles. There are instances of some designing with the intention of being supportive for autistic children, but instead they focus on changing children's behaviors to match with neurotypical expectations. Or, they struggle integrating privacy into the interfaces they build, as privacy tends to involve abstract concepts that are hard to find solutions for (Kumar et al. 2023). This lack of understanding could lead to designers inadvertently implementing dark patterns in their work. Another obstacle that designers encounter is trying to alleviate tension between adult-led values, which are often educational and safety-related, and child-led values, which are more imaginative and experimental (Pothing et al., 2024). By implementing safeguards that block children's intended actions, dark patterns could be accidentally implemented in this way as well. Designers have to find a way to create products that encompass child-centered values and principles, while somehow aligning with their company's and their own practices. Else, their designs can lead to adverse consequences, such as: harm to the safety and wellbeing of children; practices that infringe privacy, safety, and data protection regulations; and inefficient business models that harm a company's reputation and undermine consumer confidence (Pothing et al., 2024).

Along similar lines, HCI researchers, as well as child-computer interaction (CCI) researchers, have more to do in terms of designing around child-led values. CCI itself is a small and growing community, especially when concerning ethical practice. Although steadily increasing every year, there have only been found to be 51 papers in total by 2024 that describe processes or approaches that inform ethical practice with children in HCI (Read et al., 2025). Working with children tends to present challenges for researchers, as it requires expertises in theories and methods for working with children, more steps to obtain research ethics approval, and even more steps when thinking through recruitment and logistics. Thus, much research in the communities are centered around adult-led values and practices that are found in existing studies and frameworks, which can be seen as problematic. Even when first starting out research, when completing an ethics/Institutional Review Board form, researchers encounter difficulties due to their tendency to position children as vulnerable and thus erase children from the process. Then, when children are involved in research, there tend to be few instances of dialogue and elaboration and more instances of feedback (Kumar et al. 2023). Even in participatory design sessions, children rarely influence the final outcome, as they are left out of decision-making processes and instead are only engaging in isolated, short-term design sessions (Iversen et al., 2017). There is a need for more frameworks and research involving children and their values within the HCI and CCI communities.

Next steps to combat the prevalence of dark patterns in child-centered interfaces

As vulnerable as they are to dark patterns, children are able to recognize and describe their manipulative intents to some extent. Children seek transparency, finding it ‘creepy’ if technology withdraws information to help them understand it (Kumar et. al, 2023). In a study conducted by René Schäfer et al. (2024), children were asked to rate interfaces with differing amounts of dark patterns and see if they could understand their malicious intentions. Then, they were asked to design their own deceptive interfaces and to spot dark patterns after being educated on the topic. After these series of exercises, it was found that most children did view deceptive designs less favorably than designs free of dark patterns, and they were somewhat able to understand manipulative intents. They could also generally know how to include dark patterns in their own designs, based on what they learned from the study and from previous experiences. They could name a few patterns after education, but had trouble recognizing more subtle ones, such as confirmshaming. This study highlights that children are capable of identifying and understanding dark patterns and their effects, but require more opportunities for education, especially when it comes to those that are more ambiguous. This can be achieved via lessons in school or learning with parents, in addition to better regulation.

Recognizing their abilities, it is recommended that children play a greater role in research, with emphasis on participatory design sessions. Within these sessions, which can also act as a medium for education on dark patterns, children have the ability to play multiple roles: user, tester, informant, design partner, co-researcher, and protagonist (Iversen et al., 2017). By having children act as users or testers, researchers can gain knowledge about their use and learning habits. Children acting as informants or co-researchers can lead to a greater exchange of knowledge, and children acting as design partners can lead to greater empowerment and development of more meaningful designs. Then, by specifically framing children as the protagonist and having them be the main agents in driving design sessions, this allows them to take ownership of their work and encourages participation, which leads to them gaining skills and knowledge. They can help researchers identify what may be perceived as a dark pattern in the eyes of a child and what can be done to make an interface more amicable towards their skills and values. Thus, when completing participatory design sessions with children, two specific effects can be seen: creating designs with child-led values and greater knowledge exchange, which will help lessen the amount of dark patterns found in child-centered design and their impacts on children.

On top of involving children more in research, it is imperative to further CCI research and develop frameworks and theories for child-centered experiences. A literature review conducted by Janet Read et al. (2025) of existing literature on ethics and children led to the creation of a Child Centred Ethics (CCE) framework for CCI researchers to reference. This framework outlines various steps throughout a child-centered study and lists concerns, questions, tools, and ideas to reference for each step. By introducing this framework into their practice, researchers have multiple touchpoints that remind them to bring children and their values to the forefront of their research. However, it is admitted that papers on topics such as privacy, security, diversity, equity, and inclusions may have been missed in the review due to the narrow search parameters, which might pose gaps in the framework. Thus, researchers have to also refer to other existing theories and frameworks that relate to their work when using the CCE framework. Bridging the gaps in CCI research will eventually lead to stronger advocacy for children's digital rights and child-led values, as well as the reduction of harmful dark patterns that may have intentionally or unintentionally been included in child-centered technology. Stricter laws and regulations surrounding this topic will also follow a more solid CCI field.

As these frameworks are being developed for research, designers should also implement child-centered practices and tools into their own work as they build out digital interfaces. In Pothong et al.'s study (2024), designers from different companies used principle and prompt cards to identify design priorities and challenges during workshop activities, as well as to reflect and discuss. These principle and prompt cards were based on 'Playful by Design' principles developed by the authors: be welcoming, enhance imagination, enable open-ended play, adopt ethical commercial models, ensure safety, allow for experimentation, and be age appropriate. During the activities, the designers were able to fine-tune elements in their designs, finding value in the fact that the prompt cards turned abstract principles into something more tangible and practical. The cards also encouraged greater reflection on the impact of design choices on children's experiences and opened their minds to alternative design solutions that protect children's rights. Additionally, by being flexible in applying the principles, they were able to more easily negotiate between these child-led principles and their priorities within the constraints of their products and company settings. This study highlights the importance of having practical tools in the design process to help designers build a child-friendly design, devoid of harmful dark patterns that encroach on the 'Playful by Design' principles.

Similar to how researchers should implement more participatory design sessions with a protagonist perspective, designers should pause to recognize the abilities of children and adopt an asset-based approach when designing. It is easy to see children as very vulnerable and ignorant, especially when it comes to privacy, security, and information. However, by focusing on the skills and resources children have, designers can avoid implementing dark patterns that take advantage of the idea that children don't understand what they interact with. For instance, it is found that children want to focus on developing their own skills, which can involve the help of their parents, rather than simply transmitting information to parents who want to completely protect them (Kumar et al., 2023). They want systems that allow them to learn individually before sharing their work, give them advice and suggestions, and balance parental control and independence. Recognizing this should force designers to implement designs that children can easily navigate and understand, while giving them room to breathe and reflect. Dark patterns that add barriers to action, such as obstruction or visual interference, and create complicated language, such as trick wording, can be circumvented by designers as they think about what assets children do possess.

Conclusion

Dark patterns play a devious role in today's technologies. They help companies collect money from unsuspecting customers, take mountains of data without explicit agreements, and encourage addictive behaviors. Unfortunately, they also affect everyone without discrimination – those who are going through tough times, the elderly, and the technologically-literate. Children are an especially vulnerable group to dark patterns. They have the ability to recognize them and occasionally name them, but many haven't completely developed and mastered the skills to safely navigate through such confusing and manipulative languages and interfaces. Still, websites and apps targeted towards children are crawling with dark patterns. This can be seen in the 'cute and innocent' game characters that beg their users to keep playing or to spend money towards items, ads that users are forced to sit through, and timers that pressure users into buying an ‘exclusive’ item. The privacy and data rights of children are completely ignored and violated in technologies that are supposed to be ‘kid-friendly.’

Today, there is a lack of regulation in the United States to combat the effects of dark patterns in technology aimed at children. In the meanwhile, it is imperative that user experience designers and HCI/CCI researchers take action as they build out such interactions and interfaces. It is recognized that there are many challenges that they face. Designers have to navigate through tensions between their own priorities and practices, their companies’, and those that keep children’s values and rights at the forefront. Researchers have to jump through hurdles to conduct research involving children, and there is a lack of mature frameworks and theories, especially within CCI. Despite this, there are ways to overcome these obstacles. This includes advancing the field of CCI, especially through furthering frameworks and theories such as the CCE framework, which will lead to better laws and regulation. Researchers should also make greater effort to capture the knowledge and opinions of children in their studies through participatory design sessions where the child can play the role of protagonist. Designers should reference child-centered tools and practices in their own design processes, pausing to reflect on their designs and expanding their practices. They should also design with child-led values in mind, taking on an asset-based approach, even when they create with privacy and security in mind. These steps are only the beginning and will bring about more questions, especially as AI and other increasingly pervasive technologies arise. In the end though, when it comes to eliminating the presence of dark patterns in children’s technological spaces, the single question should always remain for both researchers and designers: How can I keep children, their values, and their rights at the forefront of what I do?

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