Seeing in the Dark: Revealing the Relationships, Goals, and Harms of Dark Patterns

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Abstract

The issue of Dark Patterns or "Deceptive Design" is becoming more apparent, and more widely acknowledged in literature. However, their ubiquity across domains has complicated interdisciplinary communication and collaborative efforts concerning their nature and effects. Existing taxonomies describing these patterns contain a considerable amount of overlap and address patterns at varying levels of abstraction further complicating the matter of cross-domain discourse. This becomes problematic given the growing evidence supporting the adverse effects such design can have on users. Further complicating the issue of Dark Patterns is the thin line that separates their implementations from those of intuitive, protective, and defensive interface design patterns. Existing taxonomies focus primarily on pattern definition and it is challenging to make this distinction when applying them in specific contexts. This work proposes a method of discerning manipulative, from benevolent applications of similar design principles by analyzing previously identified patterns for their *properties*, *consequences*, and *contexts* of application. This paper represents the progress we have made thus far to the creation of a taxonomy-independent evaluation process for the identification and description of Dark Patterns.

Keywords

Dark Patterns, Manipulative Design, Taxonomy

1. Introduction

In the realm of user interface design, dark design patterns represent a critical yet underexplored frontier that necessitates a comprehensive and unified approach. Much as the Globally Harmonized System (GHS) for the Classification and Labelling of Chemicals revolutionized the safety and handling of hazardous materials through a standardized taxonomy, the digital ecosystem stands at a pivotal juncture where the implementation of a unified taxonomy for dark design patterns could significantly enhance transparency, ethics, and user protection. The GHS provides an international standard for categorizing chemicals based on their health, physical, and environmental hazards, fostering global consistency in communication and management practices. The unintended harms of increasingly sophisticated digital platforms employing covert techniques that compromise user privacy and autonomy in order to acquire user data, money, or attention mirrors those associated with hazardous chemicals like DDT, Asbestos, and Thalidomide.

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While this paper advocates for a UI/UX equivalent of such a system, it seeks not to define a new taxonomy but rather to introduce a method by which *any* taxonomy can describe user manipulation resulting in the forfeit of the resources they hold (i.e. Money, data, attention). Using Straussian Grounded Theory (SGT), we have identified common properties held by Dark Patterns as well as the consequences of their use in certain contexts. The overarching goal of our research is to create a less rigid evaluation process similar to Heuristic Evaluation[1], which can be communicated using the rigid language of taxonomies from *any* domain. Just as the GHS for hazardous materials was accompanied by glyphs depicting the consequences of careless use, and datasheets explaining the properties and cautionary measures surrounding a material's usage, a similar system for UI/UX could have glyphs tied to violated heuristics substantiated by concepts pulled from one or more taxonomies.

Before proceeding, the authors would like to address the controversy surrounding the usage of the term "Dark" Patterns to denote a pattern in user interface design that can deceive, exploit, coerce, and/or *manipulate* users into behaving in ways which they otherwise would not. Recently, the ambiguity and negative racial connotations of the word "Dark" have made the term a rightfully contentious issue. In search for a more specific qualifier several candidates have emerged. In our opinion, deceptive, coercive, exploitative, only describe parts of what these patterns entail. This is why the authors have settled on the more general term "Manipulative" design patterns. The root word (manipulate) has origins in tool usage. If UI designers are *manipulating* users as they would a *thing* to achieve some objective, they would be using them as *means to an end*. This is normatively understood as *unethical* according to deontological (Kantian) ethical principles. In the spirit of highlighting and discussing unethical design practices, we will refer from now on to "Dark Patterns" as "Manipulative Design Patterns" (MDPs).

2. Related Works

The first taxonomy of MDPs by **Brignull (2010)** [2] was derived through personal observations and reporting, without a documented methodology of its creation. Although Brignull's work lacks scientific rigour, it captures the essence of MDPs and is considered a seminal work in the area. The taxonomy of **Conti & Sobiesk (2010)** [3] focused on MDPs across domains. A year-long study involving 22 undergraduate students gathering MDPs was combined with input from roughly 75 participants of the "Hackers of Planet Earth" Conference to create a multi-dimensional taxonomy of MDPs. **Zagal et al. (2013)** [4] focused on the domain of games. It was constructed by considering system interaction as a contract from which ethical boundaries could be derived between users and designers. **Greenberg et al. (2014)** [5], using the "affinity diagramming" practice, clustered and speculated upon examples of potential MDP utilization within the context of Proxemic Interactions. Rooted in the domain of user privacy, **Bosch et al. (2016)** [6] constructed their taxonomy by considering established privacy design patterns and deriving MDPs from their antithesis. These derived patterns were then evaluated against the known MDPs at the time (i.e. Brignull's). **Grey et al. (2018)**'s taxonomy [7] was constructed from examples across domains. Examples of MDPs were collected, catalogued, and sourced iterativly over 2 months. The constant comparative method[8] was then applied along with document analysis to describe the nature of the MDPs found, categorized according to

Brignull's[2] taxonomy before being re-categorized via open coding. The resulting taxonomy is thus structured around dark strategies and designer motivation rather than around context and content as Brignull's[2]. The **Norwegian Consumer Council (NCC) (2018)** analyzed the design and wording of update prompts from Facebook, Google, and Microsoft from a data protection standpoint after GMDPR regulations were enacted[9]. Situated in the domain of "Home Robots", **Lacey & Caudwell (2019)** [10] did not explicitly propose a taxonomy, but their work was flagged as such by Ahuja et al.[11] for its proposal that "Cuteness" can be a MDP because a robot's "cuteness" encourages users to overlook or completely miss their devices' data-collecting capabilities. By crawling and scraping image samples from various e-commerce sites, **Mathur et al. (2019)** [12] used a set of five *attributes* grounded in the literature surrounding online manipulation to describe dark patterns, which were then applied to 15 MDPs within 7 super-categories, some of which have direct counterparts in Brignull's taxonomy [2]. The **National Commission for Informatics and Liberty (CNIL) (2020)** [13] built their taxonomy with the goal of consumer protection, though no formal methodology was documented in the document. Many of its items tie directly to Brignull's original set (i.e. "Trick Question"[2, 13]) while others simply go by another name (i.e. Brignull's "Bait and Switch"[2] and CNIL's "Bait and Change"[13]). **Grey et. al (2020)**'s work [14] focused on "Asshole Design" as flagged by users of the Social Media platform Reddit. Posts on Reddit were analyzed and open coded through several rounds of iterative content analysis. This process rendered six MDPs. **Bongard-Blanchy et al. (2021)** administered an online survey to participants with the aim of gauging user awareness of MDPs. The patterns used to measure user awareness constitute Bongard-Blancey's contribution to the area of MDP taxonomies[15]. Using techniques inspired by Value Sensitive Design and scenario construction, **Mhaidli & Schaub (2021)** [16] critically examined some potential advances in virtual/augmented/mixed reality (XR) technology regarding their ethical implications. Scenarios and narratives were constructed and used to generate a set of five MDPs that could operate in this space. **Petrovskaya & Zendle (2021)** [17] focus on the issue of Predatory Monetization in the domain of games. By using the United Kingdom's unfair trading regulations, researchers released a survey requesting reports of unfair/aggressive monetary encounters online. The results were transformed into a two-tiered collection of 36 MDPs in eight super categories. **Westin & Chiasson (2021)** [18] focused on a single MDP - "Fear of Missing Out (FoMO) centric design" - in the context of user privacy. By utilizing inductive grounded theory, researchers dimensionalized and categorized design interactions to pose the idea that the core issue is not with individual patterns but with their aggregated effects within "dark digital infrastructure". **Wu et al. (2021)** generated their taxonomy by observing and coding live-stream shopping interactions on Taobao and TikTok. This taxonomy is interesting, but focuses more on the habits of the *streamers* than on interface design[19]. **Mathur et Al. (2021)** Make the case for *themes* as the binding agent between MDPs and provide normative perspectives for analyzing MDPs and their effects based on literature across various domains. The work of **Ahuja et al. (2022)**[11] unifies existing taxonomies with respect to their relation to user agency. This recent taxonomy describes and categorizes many existing taxonomies. Because of its different epistemological perspective that centres on the motives rather than the features of MDPs, we selected it as the basis for developing a new integrated taxonomy [20] which is used as a basis for examples illustrating the methods proposed in this paper. We believe, however, that the method proposed in this paper can be applied to any taxonomy, for

example, one we recently became aware of, created by **Gray et al., 2023** [21].

In summary, there have been numerous taxonomies defined within the Dark Pattern space, each providing valuable perspectives and observations in their respective domains. However, in order to utilize their insights for MDP identification and classification, something must be done to distinguish them from non manipulative designs which may hold similar properties. Our proposed method aims to help UX design practitioners, regulators, or lawyers to recognize and discern MDPs in their specific context, based on their manipulative intent targeting user resources.

3. Methodology

Building on our previous work utilizing network analysis tools to unify MDP taxonomies as a graph[20], we sought a method of more accurately describing the relationships between the patterns (adding *types* to the edges of our graph). Using the pattern space itself as the first generation of *phenomena*, we used Straussian Grounded Theory (SGT) [22] to explore these relations. Our choice of Straussian grounded theory over Classic Grounded theory[8] stems from the former's acceptance of a literature review *prior* to the coding process. Because we had already reviewed literature defining the taxonomies, our choice seemed appropriate. The choice of grounded theory in general reflects the first authors familiarity with the method as well as the bias that only humans should be describing and interpreting how humans interact with MDPs when the goal is human safety. Delegating the complexity of our experience of patterns to a machine running a host of text analysis algorithms may produce numbers to look at, but through SGT, the underlying phenomenon can be explained and qualified in parallel from a *human* perspective. Additionally, its context awareness and ability to reveal the innate relations between complex concepts met our need to discover not only the *properties* of MDPs, but the situations in which they combined to manipulate users and the ends to which they manipulate users as means to.

Using SGT, 155 patterns were labeled as either a *Category*, *Phenomenon*, *Property*, or *Dimension* (of property) as a part of the open coding process[22]. Next, properties and dimensions were assigned to patterns using the *Questioning*[22] technique. How does one question an interface? Well, when we experience an interface, we enter a sort of dialog with it. It makes claims in the information it presents that we interpret and respond to based on how we have understood them. With a collection of literature-supported edges waiting to be elaborated on, we have commenced the axial coding stage of SGT to reveal and create consequential, causal, supportive, and hindering type relations amongst the patterns. This will be discussed further in our Future Work.

Consider the interface in figure 1. This is what users are met with when they attempt to connect to the WiFi in a local Starbucks. When connecting to some networks, it is normal to type in information like a username and a password, and the UI has communicated to us that if we "log on" once, it will automatically connect. So it would seem it is asking us to log on. We can also see that there is a continue button at the bottom of the screen which cannot be pressed until information has been entered. We know this because we *understand* the language of UI. It is a button because it is a coloured, rounded rectangle containing text with a recognized command

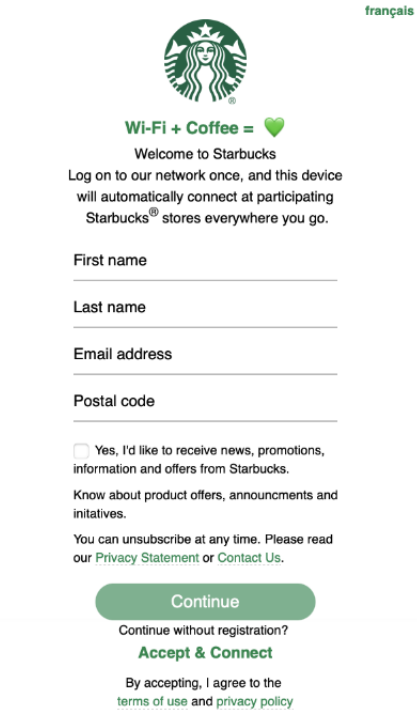

Figure 1: WiFi connection page at a local Starbucks

("Continue"). We understand that it is presently un-clickable because it is dull compared to the other vibrant and green elements on the page. Of course, if one was following the UI as intended until now, the button would be highlighted, the information filled out, and we would only now stumble upon the “continue without registration" message tucked under the now filled, green, clickable "Continue" button. There is nothing (obvious) on the page that communicates to us that we can continue without pressing the “Continue" button. The text “Accept & Connect" is visually similar to the text "Wi-Fi + Coffee = ♥" on the top under the Starbucks logo, which is non-clickable and not a button. However, “Accept & Connect" is actually a button. It is not like the other green clickable text on the page (i.e. "Privacy Statement" and “Contact Us"), we know those are clickable because they are commonly occurring across sites, but also because they have a faint underline which suggests they are clickable links. So as demonstrated, more information is being communicated between the viewer and the page than some may realize. In the process of this communication, we can ask questions like “Why is the ‘Accept & Connect’ button not presented as the other button is?" or “Why do you need my Postal Code in order to log me in?" or “Why have you made the text ‘Continue without registration?’ considerably smaller relative to its surrounding elements?". The page has utilized patterns like Wrong Signal[13] to miscommunicate buttons, Aesthetic Manipulation [7] and False Hierarchy[15] to join the concepts of “registration" and "WiFi connection", all culminating to the unnecessary and hidden forfeit of user data (Privacy Zukering[2] & Disguised Data Collection[5]).

4. Results

The SGT coding processes resulted in the encoding of 111 Phenomena divided between 16 Categories , and 11 Properties holding various dimensions. Though the properties are not finalized (as axial coding is still in progress), the 11 we have identified emerged from and/or *represent* the patterns sampled. See Table 1 for detailed descriptions. An interesting finding that emerged from the coding process is the theme surrounding the consequences MDPs seem to create. If we are to call these patterns manipulative, what are they manipulating us into doing? Our findings suggest that there were 3 different goals that MDPs were combined to bring about. They were: forfeit of money, data, and/or attention/time. Examples of patterns representative of those outcomes (respectively) include Price Comparison Prevention[2], Pay or Grind [17], and In-game Currency[17]; Default Sharing[13], Address Book Leeching[6], and Privacy Zukering[2]; Nagging[7], and Playing by Appointment [4]. What is also made clear from our analysis is that while some patterns are overtly manipulative (i.e. Complicating Confidential Setting Adjustment[13]), others are highly contextual. For example, Obstruction[7] is a dimension of the *friction* property. In the context of cancelling a subscription, this can be Asymmetric Effort[11] or Safety Blackmail[13] in account creation interactions. However, friction applied in interactions like the branch deletion process in web hosted version control systems (i.e. GitLab) or online financial transcations acts as a vital protective measure. Patterns like False Hierarchy[15] are similarly slippery. If the aesthetic and organization of an interface are not conducive to *some* goal, then users may struggle to understand how to interact with it. The key to identifying the manipulative application of UI design lies in critically evaluating the purpose of an interface, the outcomes it seeks, and the *resources* that we as users have that an interface may be interested in harvesting. In the following section, we will demonstrate this idea by comparing two applications of *friction* in differing contexts.

5. Discussion / Application

Context is a vital component in discerning manipulative applications of design patterns from designs that protect users, and constitute good design standards. SGT's axial coding stage has proven to have the context-awareness requisite of clarifying this distinction by revealing the *ends* that manipulative design attempts to make users a *means* to. Following our dangerous chemical elements analogy, many compounds can be completely harmless, or even helpful when combined (i.e. NaCl or *table salt*), while others (i.e. NaOCl or *bleach*) will cause harm when applied in similar contexts. Both compounds utilize the same elements, but differ in appropriate application contexts. The same can be said of design patterns. When we are making important decisions in our interactions (i.e. a financial transactions, submitting job applications, etc.) frictive patterns can save us from making catastrophic errors. Similar patterns applied in subscription cancellation processes or privacy setting management only save corporations lost revenue/data. Our work with SGT and the refining of our taxonomy is ongoing. However, even thus far in the process our work is showing its ability to aid in the identification of manipulative patterns in context. The following are examples of cases where our process identifies MDPs by assessing the goals of their respective interfaces.

The example in figure 3 has been included to showcase the importance of context in discerning manipulative design from defensive design that seeks to minimize user error. Specifically in the application of friction and obstruction. In scenarios where a user of the GitLab software would like to delete a branch from their repository, they are met with an Obstruction[7]. The application of friction *halts* the users task-flow and offers them two options: "Cancel, keep branch" or "Yes, delete branch". In other contexts this could be seen as a "Lack of Options"[11], or an infringement on user agency. From a technical standpoint, this may be true, but what do GitLab and users stand to gain or lose from either option? If this friction was not in place, it would be very easy for users to permanently delete branches of code that cannot be recovered, and the user may suffer loss. GitLab does not charge for the creation or deletion of branches; there is no benefit for it in creating adding friction to this process; it is not after the user's money, data, time, or attention. The "obstruction" pattern is used entirely for the benefit of the user, so it is not manipulating users as a means to an end. Similar applications of these patterns however, are often considered manipulative. For example, in a subscription cancellation context, this could be considered Asymmetric Effort[11], Forced Work[3], or Hard to Cancel[12]. Similar critiques have been made in privacy setting adjustment contexts[13][6].

The example in figure 2 comes from the Hinge dating app. In scenarios where users choose to send a "like" (initial message) to another user,they are sometimes met with an Obstruction[7] suggesting they instead send a "rose". Roses accomplish the same task as a like, but are framed as having a greater value. The text inside of the obstruction (i.e. "seen first" & "increase your chance of a match" could be considered as set on inducing "Fear of Missing Out"[18] and reinforces the value of a rose over a like via False Hierarchy[7]. The option to send a rose is available to users in the initial messaging interface, had they wanted to send one, they could have hence asking once again is an example of Confirmshaming [2]. Finally, because likes and roses are both resources that can be purchased from hinge to unlock functionality, they are essentially In-game Currencies[17] whose multiplicity can cause Confusion[17, 3]. Unlike the case of the branch deletion in git, the user is not in danger of losing some functionality should they send a like over a rose, so why introduce an obstruction at all if not to up sell the user into spending a more valuable resource which hinge distributes?

6. Threats & Limitations

The first threat to the validity of this work is the lack of multiple parties involved in the coding process. However, because we utilized the patterns themselves as first generation codes, and they came from multiple authors across disciplines this threat is somewhat mitigated. Of course, the entire concept of using the patterns as phenomena could itself be a threat to validity. However, because Mathur et al.[23, 12]'s attribute categories were excluded from our work which, the similarities between our categories somewhat validate each other (i.e. Mathur et al.'s Choice Architecture categories "Manipulating the information space" & "Modifying the decision space"[12] correspond with our information validity/availability/comprehension and frictive/agency-manipulating properties respectively)

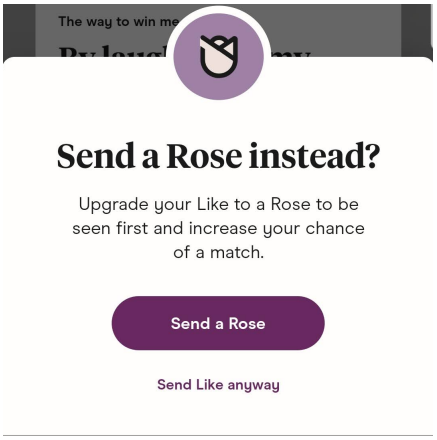

Figure 2: Obstruction after sending a "like" on Hinge

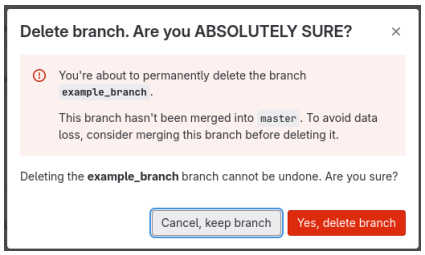

Figure 3: Obstruction when deleting a branch on GitLab

Another threat is the fact that grounded research is innately locked to its source domain. This too we believe to be somewhat inconsequential as literature often acknowledges that even in vastly different domains, patterns still hold relevance. For example, “gamification"[24] is the idea that game concepts can be utilized in non-game contexts and has been identified by some as a dark pattern[7]. If we think of the sample space of patterns as simply *Manipulative design patterns*, they are domain independent. They exist to manipulate users in whichever context they are employed and hold similar properties.

A final threat to validity is that the community detection run in the early stages of our work may have biased the emergence of themes in the SGT process. Though the graph produced in our earlier work[20] was not consulted during any of the coding processes, only the nodes it contained, some of the categories surrounding information relate directly to the major patterns revealed by the graph (i.e. Hiding Information[11], Misleading Information [11], etc.). This could also simply be a consequence of our selection of Ahuja & Kumar’s work as a basis in the aforementioned work, or that the patterns they describe are actually among the most widely utilized. In any case, our future work would benefit from independent review and categorization.

7. Conclusion & Future Work

As was alluded to, the axial coding process is ongoing. Using a subset of the edges revealed in our network analysis[20] as prompts/starting points we have narrowed down 81 of the 308 original edges as potentially higher order relations (i.e. Causal/consequential/has property, as opposed to simply related/utilizes). As this process continues, we will refine our identified properties and categories and seek to display *all* of the relationships discovered through SGT in another version of our graph. With this achieved, we are able to shift to the matter of how best to communicate our findings to users or designers. Ultimately, we plan on using this groundwork to create both a unified taxonomy and a set of heuristics for the evaluation of user harms which we plan on evaluating in a qualitative study with stakeholders (lawyers and UX

designers)

In conclusion, existing taxonomies have served to add depth to our understanding of Dark Patterns. They remain, however, highly coupled and locked in their respective domains. Furthermore, many of the patterns they describe are considered benign in different applications. We have utilized Straussian grounded theory to reveal the properties of patterns and the user-held resources that they seek to harvest when applied in certain contexts. Though the project has yet to complete the axial coding stage of our SGT analysis, it demonstrates the ability to discern the manipulative application of patterns from well-intended design. Future work on this project will involve the definition of heuristics to accompany our existing taxonomy[20] before moving towards conducting a qualitative study regarding the effectiveness of these tools in identifying user harm and manipulation with stakeholders from legislative and HCI backgrounds.

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References

[1] J. Nielsen, R. Molich, Heuristic evaluation of user interfaces, in: Proceedings of the SIGCHI conference on Human factors in computing systems, 1990, pp. 249–256.

[2] H. Bringnull, What are darkpatterns?, 2010. URL: https://www.darkpatterns.org.

[3] G. Conti, E. Sobiesk, Malicious interface design: Exploiting the user, in: Proceedings of the 19th International Conference on World Wide Web, WWW '10, Association for Computing Machinery, New York, NY, USA, 2010, p. 271–280. URL: https://doi.org/10.1145/1772690.1772719. doi:10.1145/1772690.1772719.

[4] J. P. Zagal, S. Björk, C. Lewis, Dark patterns in the design of games, ????

[5] S. Greenberg, S. Boring, J. Vermeulen, J. Dostal, Dark patterns in proxemic interactions: A critical perspective, Association for Computing Machinery, 2014, pp. 523–532. doi:10.1145/2598510.2598541.

[6] C. Bösch, B. Erb, F. Kargl, H. Kopp, S. Pfattheicher, Tales from the dark side: Privacy dark strategies and privacy dark patterns, Proceedings on Privacy Enhancing Technologies 2016 (2016) 237–254. doi:10.1515/popets-2016-0038.

[7] C. M. Gray, Y. Kou, B. Battles, J. Hoggatt, A. L. Toombs, The dark (patterns) side of ux design, volume 2018-April, Association for Computing Machinery, 2018. doi:10.1145/3173574.3174108.

[8] H. R. Wagner, Social Forces 46 (1968) 555–555. URL: http://www.jstor.org/stable/2575405.

[9] N. C. Comission, Deceived by design, ????

[10] I. Robotics, A. Society, S. G. . U.S.), A. SIGAI, I. of Electrical, E. Engineers, HRI'19 : the 14th ACM/IEEE International Conference on Human-Robot Interaction : March 11-14, 2019, Daegu, South Korea, ????

[11] S. Ahuja, J. Kumar, Conceptualizations of user autonomy within the normative eval-

uation of dark patterns, Ethics and Information Technology 24 (2022). doi:10.1007/s10676-022-09672-9.

[12] A. Mathur, G. Acar, M. J. Friedman, E. Lucherini, J. Mayer, M. Chetty, A. Narayanan, Dark patterns at scale: Findings from a crawl of 11k shopping websites, volume 3, Association for Computing Machinery, 2019. doi:10.1145/3359183.

[13] CNIL, Shaping choices in the digital world ip reports innovation and foresight n°06 from dark patterns to data protection: the influence of ux/ui design on user empowerment, 2019. URL: www.cnil.fr.

[14] C. M. Gray, S. S. Chivukula, A. Lee, What kind of work do "asshole designers" create? describing properties of ethical concern on reddit, Association for Computing Machinery, Inc, 2020, pp. 61–73. doi:10.1145/3357236.3395486.

[15] K. Bongard-Blanchy, A. Rossi, S. Rivas, S. Doublet, V. Koenig, G. Lenzini, I am definitely manipulated, even when i am aware of it. it's ridiculous! - dark patterns from the end-user perspective, DIS 2021 - Proceedings of the 2021 ACM Designing Interactive Systems Conference: Nowhere and Everywhere (2021) 763–776. doi:10.1145/3461778.3462086.

[16] A. Mhaidli, F. Schaub, Identifying manipulative advertising techniques in xr through scenario construction (????) 18. URL: https://doi.org/10.1145/3411764.3445253. doi:10.1145/3411764.3445253.

[17] E. Petrovskaya, D. Zendle, Predatory monetisation? a categorisation of unfair, misleading and aggressive monetisation techniques in digital games from the player perspective, Journal of Business Ethics 181 (2022) 1065–1081. doi:10.1007/s10551-021-04970-6.

[18] F. Westin, S. Chiasson, It's so dificult to sever that connection: The role of fomo in users' reluctant privacy behaviours, Association for Computing Machinery, 2021. doi:10.1145/3411764.3445104.

[19] Q. Wu, Y. Sang, D. Wang, Z. Lu, Malicious selling strategies in e-commerce livestream: A case study of alibaba's taobao and bytedance's tiktok (2021). URL: http://arxiv.org/abs/2111.10491.

[20] F. Lewis, J. Vassileva, Integrating dark pattern taxonomies (2024). URL: http://arxiv.org/abs/2402.16760.

[21] C. M. Gray, C. Santos, N. Bielova, Towards a preliminary ontology of dark patterns knowledge, in: Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems, CHI EA '23, Association for Computing Machinery, New York, NY, USA, 2023. URL: https://doi.org/10.1145/3544549.3585676. doi:10.1145/3544549.3585676.

[22] A. Strauss, J. Corbin, Basics of qualitative research, Sage publications, 1990.

[23] A. Mathur, J. Mayer, What makes a dark pattern... dark? design attributes, normative considerations, and measurement methods, Association for Computing Machinery, 2021. doi:10.1145/3411764.3445610.

[24] S. Deterding, D. Dixon, R. Khaled, L. Nacke, From game design elements to gamefulness: Defining "gamification", in: Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, MindTrek '11, Association for Computing Machinery, New York, NY, USA, 2011, p. 9–15. URL: https://doi.org/10.1145/2181037.2181040. doi:10.1145/2181037.2181040.

Table 1
Identified Properties and Dimensions of Manipulative Patterns

Property	Dimensions	Description
Agency-Manipulating	Forced[7], Coerced[3], ...,Forbidden	Agency-Manipulating patterns describe the users situation after interfacing with patterns. Usually *frictive* patterns.
Monetized	Predatory[17],Parasitic, Aggressive[17], Abundant	describes how a pattern gains money. Setting up inequalities to be remedied by payment (predatory), Setting up a dependency (parasitic), badgering (aggressive), or just being overly available (i.e. microtransactions).
Frictive	Forbids task, ..., Obstructs[7], ..., Assumes task	the fricitve property describes a pattern's relation to task-flow. It can slow, stop, expedite, or assume user tasks.
Plays with Emotions	Manipulates, Induces[16], Appeals to	This property represents the degree to which a pattern seeks to exploit the targets emotions.
Temporal	Permanent, Frequent, ..., Temporary, Never	Represents a patterns lifetime. For example, a *frequent* Activity Message[12] could be called nagging[7]
Pressurized	Urgent, Timely, ..., laissez-faire	Describes a patterns ability to inspire urgency in users, to force them into or out of a decision. Often a result of friction.
Avarice	Maximizes[6], Prefers, Suggests, ... Minimizes	describes the lengths to which a system has gone to ensure user behaves as system desires.
Info Comprehension	Contradictory, obfuscated, confusing, ..., clear	describes a patterns effect on how presented information is understood.
Info Validity	False, Deceptive, Misleading, ..., True	patterns that play with the validity of information (i.e. Bend the truth).
Info Availability	Absent, Hidden[11],...,Available, Focused	describes the property some patterns to remove or otherwise curtail users ability to find information.
Creates Dependency		Applies to patterns or pattern configurations that foster user dependence.
	... = removed for brevity	