RWTH AACHEN UNIVERSITY

Exploring Dark Pattern Research within CHI: A Systematic Literature Review and Meta-Analysis

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Contents

List of Figures

List of Tables

Abstract

This study aims to deepen the understanding of dark pattern research, through mapping the evolution of *dark pattern* publications within CHI conferences that have been made from 2010 up to 2023. Additionally, it was analysed what kind of research contributions have been made and how thoroughly various dark pattern types have been researched. A semi-systematic approach was used, with the guidance of the PRISMA Statement to conduct a literature review and the following meta-analysis. The reviewed literature set includes 47 conference papers in total, found through the *Association for Computing Machinery* (ACM) library and published within a *Conference on Human Factors in Computer Systems* (CHI) and their *Extended Abstract* (CHI EA). Among all the 47 papers, more than half were comprehensive research papers presented at CHI and underwent a thorough peer review process. The remaining 19 papers were featured in CHI EA. Our meta-analysis reveals that the dark pattern publications have been rising exponentialy throughout the years and various types of dark patterns have been studied, predominantly within the realms of digital well-being and interaction-focused domains, like social media and games. Also, we investigated a rise of theoretical contributions since 2021, probably indicating a need of shared definitions and languages within the field of dark patterns, and a rise of survey contributions since 2021, indicating a matured research field with a need of summarised and analysed knowledge. Furthermore, research gaps, such as missing ontologies, terminologies, methodologies and the motives and mechanisms behind dark patterns, were identified.

Überblick

Diese Studie soll das Verständnis der *Dark-Pattern*-Forschung vertiefen, indem sie die Entwicklung von Dark-Patterns in der *Conference on Human Factors in Computer Systems* (CHI)-Konferenz und ihrem *Extended Abstract* (CHI EA) analysiert, die von 2010 bis 2023 publiziert wurden. Es wurde ein halb-systematischer Ansatz verwendet, mit der Hilfe von dem PRISMA Statement, um eine Literaturrecherche und eine anschließende Meta-Analyse durchzuführen. Es wurden insgesamt 47 Konferenzbeiträge von CHI und CHI EA untersucht. Von allen 47 Studien waren mehr als die Hälfte Forschungsarbeiten die in CHI präsentiert und einem gründlichen Peer-Review-Prozess unterzogen wurden. Die restlichen Beiträge wurden in CHI EA vorgestellt. Unsere Meta-analyse zeigt, dass die Zahl der Dark-Pattern-Publikationen im Laufe der Jahre exponentiell zugenommen hat und verschiedene Kategorien von Dark-Patterns vor allem im Bereich des digitalen Wohlbefindens und interaktionsorientierte Bereiche wie soziale Medien und Spiele untersucht wurden. Außerdem haben wir einen Anstieg theoretischer Beiträge seit 2021 entdeckt, der wahrscheinlich auf einen Bedarf an gemeinsamen Definitionen und Sprachen im Bereich der Dark Patterns hinweist, und einen Anstieg von Review Beiträgen, seit 2021, die auf ein ausgereiftes Forschungsfeld mit Bedarf an zusammengefasstem und analysiertem Wissen hinweist. Weiterhin sind wissenslücken durch fehlende Ontologien, Terminologien, Methoden und den Motiven und Mechanismen hinter Dark Patterns aufgefallen.

Acknowledgements

First of all i would like to thank Prof. Dr. Jan Borchers and Prof. Dr. Ulrik Schroeder for examining my thesis.

Also, I want to thank my supervisor Rene Schäfer for his dedicated time and motivation throughout my thesis and providing me with feedback and guidance.

I would especially like to thank my family and friends who have supported me during my Bachelor's thesis.

Conventions

Throughout this thesis, we use the following conventions.

Text conventions

Definitions of technical terms or short excursus are set off in coloured boxes.

> **EXCURSUS:**
> Excursus are detailed discussions of a particular point in a book, usually in an appendix, or digressions in a written text.

Definition:
Excursus

The codes for the literature review are written in typewriter-style text.

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dark patterns
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The whole thesis is written in British English. And instead of the first person, the plural form is used.

Chapter 1

Introduction

Deception and trickery have been a major part of humankind throughout history [Hanson and Kysar, 1999]. Especially economists have long been described as a *Homo economicus*, a person who 'does not worry about morality, ethics, or other people' [Zak, 2010], utilising deceptive methods in legal ways. Now, with the invention of the Internet, there are even more ways of manipulating people. Deceitful tactics can be found in many services, such as online shops, where, for example, items can be put into a basket unknowingly, and through fake websites that could steal personal information. Internet users risk losing their money, their privacy, or their attention [Narayanan et al., 2020], in favour of companies and impostors. The Internet, being a main contributor to communication and connectivity throughout the world, connects people who could not communicate as easily before [Wellman et al., 2003]. The mass of information that Internet users have access to is becoming increasingly bigger [Leiner et al., 2009]. The available and easy access to information and products [Leiner et al., 2009], makes the world wide web a global platform where users can be easily manipulated [Kollnig et al., 2021, Wellman et al., 2003, Shklovski et al., 2014]. Companies do not have to wait for consumers to arrive at their stores, but can contact them themselves by email advertisements or other techniques, anywhere and anytime [Calo, 2013]. Some of these modern deceptive methods can be found in *user interfaces* (UI) and are called *dark patterns* (DP).

Deception has been a part of humankind before the invention of the Internet

Through the Internet, even more techniques to manipulate and deceive people have been arising

<div style="border: 2px solid; background: #f0a500; padding: 10px;">

DARK PATTERNS:
Dark Patterns are practices in "interfaces that steer, deceive, coerce, or manipulate consumers into making choices that often are not in their best interests" [Lupiáñez-Villanueva et al., 2022].

</div>

Definition:
Dark Patterns

Dark patterns are often against the law and the interest of users

Dark patterns are often difficult for users to notice [Di Geronimo et al., 2020] and trick them into doing things they do not want, for example, doing things without noticing if they have hidden costs [Brignull, 2023]. In fact, with every click and every scroll on a website, companies can extract data from users without their knowledge [Brignull, 2023]. Although these techniques may be considered profitable from a business point of view, they are often morally [Kim et al., 2023] and legally [Lupiáñez-Villanueva et al., 2022] questionable, frequently conflicting with the desires of users [Shklovski et al., 2014]. The emotional impact of user interfaces on individuals during online interactions is significant, as users often do not know what happens to their personal data [Kim et al., 2023]. Furthermore, the influence on user behaviour is also noteworthy, as especially less severe dark patterns appear to alter the online actions of users [Luguri and Strahilevitz, 2021]. Most users are aware of the underlying design patterns that are intentionally employed by companies to direct attention towards certain elements or divert attention away from hidden aspects [Kollnig et al., 2021]. Interface design is meant to be persuasive and can positively influence user behaviour [Fogg, 2003], but can also harm user interest [Fogg, 2003]. This makes it very difficult to distinguish if a harmful interface design was created on purpose or by accident [Gray et al., 2018]. Therefore, all dark patterns can intentionally or unintentionally harm or impact users negatively [Gray et al., 2018, Monge Roffarello et al., 2023].

It is difficult to distinguish, if a harmful design in interfaces is done on purpose or happened as an accident

Since the invention of the Internet, dark patterns have been a part of websites, but started gaining research interest, first under the name of dark patterns in 2010, after Harry Brignull shamed companies using these techniques on his website[1]. Dark pattern research attracted contri-

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[1]https://www.deceptive.design, formerly known as https://www.darkpatterns.org, Accessed: January 28, 2024

butions from various fields, including from the field of *Human-Computer Interaction* (HCI) [Greenberg et al., 2014, Fansher et al., 2018] and law [Lupiáñez-Villanueva et al., 2022]. Subsequently, researchers have since then started to study dark patterns, aiming to categorise them [Mathur et al., 2019, Gray et al., 2018], determine the extent to which they affect users [Sergeeva et al., 2023], design automatic detection devices [Chen et al., 2023], and investigate countermeasures [Schäfer et al., 2023, Purohit et al., 2023]. However, since then, there have only been a few literature research papers on dark patterns, with the aim of comparing previously found dark patterns [Monge Roffarello et al., 2023], comparing objectives in various taxonomies [Mathur et al., 2021] or mapping out the dark pattern research field [Gray et al., 2023b]. There has been no or very few research, focusing on the evolution of the dark pattern research field over the years and analysing how thouroughly dark patterns have been researched.

There has been prior research on dark patterns, within various research fields

This thesis aims to deepen the understanding of dark pattern research and identify research gaps, through mapping the evolution of dark pattern publications in the *Conference on Human Factors in Computer Systems* (CHI) that have been made from 2010 up to 2023. The CHI conference is the leading conference for the HCI field with the most publications on dark patterns [Gray et al., 2023b]. The conference papers will then be analysed and discussed with guidance of the *Preferred Reporting Items of Systematic reviews and Meta-Analyses Statement* (PRISMA) [Page et al., 2021]. We will further investigate the following research questions:

This thesis conducts a literature review and meta-analysis to map the evolution of dark pattern research

RQ1 How thoroughly have different dark pattern types been researched?

RQ2 What kind of research contributions have been made for dark patterns?

RQ3 How has dark pattern research evolved over time?

RQ4 What are current topics of interest for dark pattern scholars within the SIGCHI community?

Following this initial chapter, we move forward with Chapter 2 on related work in order to acquire insight into prior research on dark patterns. This includes existing taxonomies and existing literature reviews within the dark pattern research. Chapter 3 of this work outlines the methodology employed to identify and choose the papers for the literature review. Additionally, it provides an explanation of the process used to conduct the literature analysis and shows the results of the review. In Chapter 4, we evaluate our findings in detail and engage in a comprehensive discussion of the results from Chapter 3. Finally, we conclude this thesis with a summary and a section on future work in Chapter 5.

Chapter 2

Related Work

This chapter provides an overview of related work in the field of dark patterns. The first section starts by introducing the research area of dark patterns, covering different taxonomies, the impact of dark patterns on user behaviour, and different countermeasures against dark patterns. Moreover, the last section introduces prior literature reviews on dark patterns.

2.1 Dark Patterns

> *"Deceptive patterns (also known as "dark patterns") are tricks used in websites and apps that make you do things that you didn't mean to, like buying or signing up for something."*
>
> —*[Brignull, 2023]*

Dark patterns are design practices on user interfaces that manipulate the behaviour of users. They can be anything from malicious tricks, such as, unknowingly adding items into a shopping basket, to more harmless techniques, like hiding advertisement between other content [Mathur et al., 2021]. Figure 2.1 illustrates a more aggressive dark pattern, called *Sneak into Basket*, and a less harmful one, called *Hid-*

Dark patterns can have many different appearances
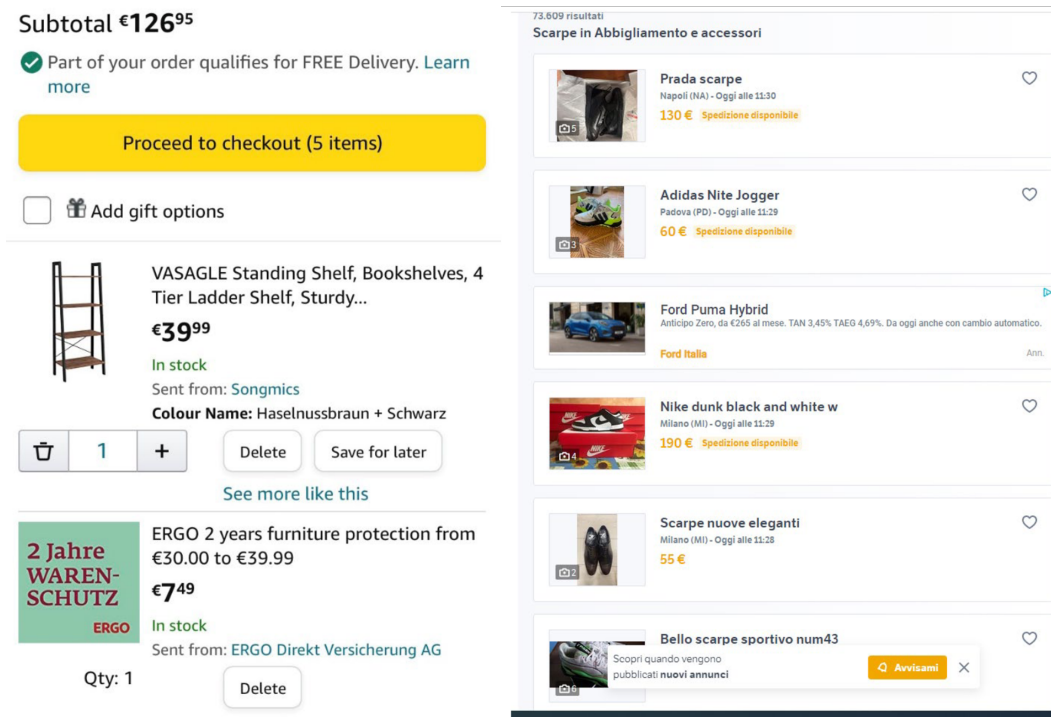
Figure 2.1: These screenshots, taken from Lupiáñez-Villanueva et al. [2022], show two dark patterns found on websites. The screenshot on the left is called *Sneak into Basket* and was found on the website *https://amazon.com*. In this screenshot, the second item in the basket, "ERGO", was secretly added into the basket, without the user's consent. The right screenshot is called *Hidden Ad* and was found on the website *https://www.subito.it*. In this screenshot, an advertisement is shown on the website that is not easily identified as an advertisement. The two dark pattern types are also described in Table 2.1.

den Ads. Dark patterns can use language, emotions, colours, style and cognitive biases, to reduce the agency of a user [Mathur et al., 2021, 2019] and manipulate them into doing things, they do not want to do[1].

The dark pattern research field is barely a decade old

Dark patterns were named in 2010 by Harry Brignull on his website[2], where he started to identify deceptive techniques and openly name and shame companies that have been using them on their websites. But even before Harry Brignull introduced dark patterns and put them in the spotlight, malicious interface design was discovered and stud-

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[1]https://www.deceptive.design, Accessed: January 28, 2024
[2]https://old.deceptive.design, Accessed: March 20, 2024

ied. Fogg [2003] discovered "persuasive design" on websites, which persuades users to change their behaviour, such as revealing their personal information or purchasing items through recommendations. Conti and Sobiesk [2009] also noticed malicious design on websites, which coerces users into undesired actions such as disclosing private information or unknowingly signing up for e-mail advertisements [Conti and Sobiesk, 2009, 2010]. Since then, various researchers have contributed to the dark pattern research and have built a fast-growing dark pattern community. However, having many different researchers investigating the same phenomena on different interfaces brings its own challenges, as the number of definitions of dark patterns has been growing and changing[Brignull, 2023].

Most researchers describe dark patterns as malicious interface designs, which are intentionally employed by designers [Brignull, 2023, Gray et al., 2018, Mathur et al., 2019]. However, since interfaces are meant to be persuasive, they can influence users positively or negatively [Fogg, 2003], and therefore, it is very difficult to distinguish if a potentially harmful interface design is created by accident or on purpose [Gray et al., 2018]. All dark patterns have one thing in common, they change the interface and restrict the agency of users [Mathur et al., 2021].

Interface design is meant to persuade users

In recent years, there has been a shift in society, moving toward a more morally and politically correct term of the word "dark pattern" [Hupe, 2022, Todd, 2023]. Harry Brignull has since changed his website name from darkpattern.org to deceptive.design[3] and also adapted a new term *deceptive or manipulative pattern* in his new book "Deceptive Patterns" [2023].

The term *dark patterns* is changing into a more politically correct term

2.1.1 Taxonomies

With the increasing identification of dark patterns on interfaces, researchers have begun creating taxonomies to classify dark patterns based on common characteristics. These classifications have been instrumental in comprehending

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[3]https://www.deceptive.design, Accessed: March 20, 2024

There are many
different dark pattern
taxonomies

dark patterns, facilitating research comparisons, pinpointing unresolved issues, and sharing a common language. The variations of these taxonomies depend on the interfaces where they were studied and the foundational definition upon which the taxonomy is constructed [Mathur et al., 2021]. Certain taxonomies consider the responsibility of designers, while others assess the advantages to the service or the harm to the user [Mathur et al., 2021].

Brignull introduced
the first dark pattern
taxonomy

Brignull presented a taxonomy of dark patterns on his website[4], which is continuously changing. Originally he outlined fourteen distinct dark patterns and offered examples of those found on various applications and websites. Table 2.1 displays the original descriptions of the fourteen types of dark pattern types, published on his old website[5].

Gray et al. [2018]
created a broader
taxonomy, built on
Brignull's original
dark pattern types

Brignull's website influenced other researchers to create different taxonomies, such as Gray et al. [2018], who used the dark pattern types of Brignull to create their own taxonomy. They clustered the types from Brignull and their own findings into five broad categories. *Nagging* describes continuous redirections to tasks that disrupt the current action of a user, such as a pop-ups that stops the action of a user and asks to rate their services. *Obstruction* are dark patterns that make certain tasks impossible or very difficult to accomplish, like, on shopping websites, returning money in form of vouchers instead of real money. *Sneaking* patterns attempt to hide and disguise actions, that may be undesirable for the site, and important information, for example, adding additional costs for services only at the checkout. *Interface Interference* are manipulations in user interfaces that favour certain actions over others, such as hiding an advertisement between other content or visually alter one button to look more appealing, than another button. *Forced Action* are patterns that require a user to do things in order to access a service, like giving access to websites, only if the user accepts their privacy conditions. The five categories and the dark patterns they include are shown in Figure 2.2.

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[4]https://www.deceptive.design/types, Accessed: March 20, 2024
[5]https://www.old.deceptive.design, Accessed: March 20, 2024

Dark Pattern Types	Description
Bait and Switch	A user ends up doing something different, then intended.
Disguised Ads	Ads that are disguised as other content or navigation.
Faraway Bill	Monthly online bills, that are easily forgotten.
Forced Continuity	The user signs up for a free trial, but at the end of the trial, they automatically get billed for the paid service.
Forced Disclosure	In return for free service, the user has to disclose personal information.
Friend Spam	A site asks for an e-mail or social media account and sends spam messages to the user's contacts.
Hidden Costs	A user gets to the last step of a checkout process, and discovers unexpected charges.
Misdirection	The attention of a user gets distracted by something else.
Price Comparison	Price information is hidden, to prevent a user to compare items based on their price.
Privacy Zuckering	Deliberately confusing user interfaces, which trick users into sharing more information.
Roach Motel	A user can easily get into a situation, but finds it difficult to get out of the situation
Road Block	A user is restricted in completing a task.
Sneak into Basket	While purchasing items the site sneaks an additional item into the user's basket.
Trick Questions	The user is required to respond to a question, which appears to be something else, than it actually is.

Table 2.1: Brignull's original taxonomy of fourteen dark pattern types, derived from his old website[a].

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[a]https://old.deceptive.design, Accessed: March 20, 2024

Five years later, Gray et al. [2023c, 2024] built upon the previous taxonomy and incorporated insights from Brignull and other scholars, as well as input from stakeholders and regulators, to develop an ontology encompassing these taxonomies. This ongoing project aims to establish a standardised terminology for the study of dark patterns and to classify them across different platforms. The ontology introduces three tiers of dark pattern types. There are high-level dark patterns, representing fundamental types of deceptive strategies that are prevalent across various devices and technologies. Meso-level patterns focus on specific methods that restrict a user's decision-making and actions. Low-level patterns are dependent on specific situations and con-

An Ontology, that compromises many prior taxonomies of dark patterns and categorises them into different tier-levels
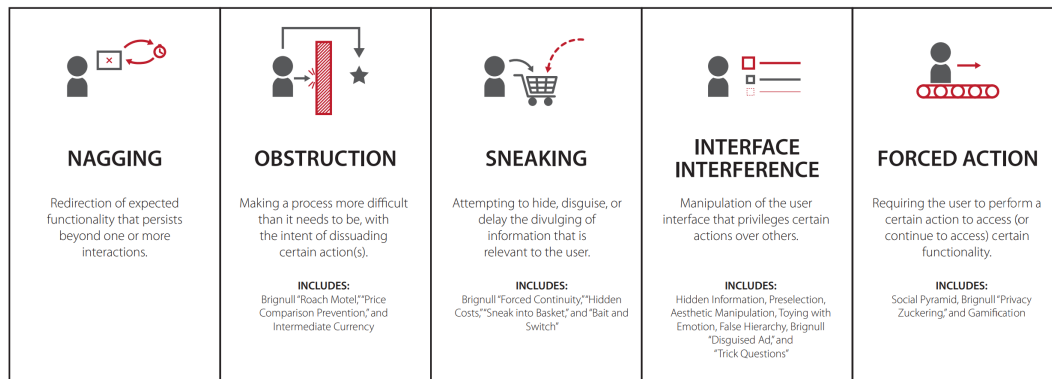
Figure 2.2: This Figure, taken from Gray et al. [2018], shows a taxonomy for various dark patterns. It consists of five categories of dark patterns: *Nagging, Obstruction, Sneaking, Interface Interference and Forced Action*. The examples in quotation marks are derived from Brignull et al.'s original taxonomy[a] and are further shown in Table 2.1.

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[a]https://old.deceptive.design

texts, detailing the precise execution of manipulative techniques. The six high-level patterns are almost identical to the original five types by Gray et al. [2018], with an addition of the category *Social Engineering*, which describes techniques utilising social psychology and behavioural economics, such as employing a feeling of scarcity, through a limited amount of products.

Some dark patterns aim to capture the attention of a user

An additional type of deceptive design practices has been identified due to their ability to attract and keep user's attention [Lukoff et al., 2021b]. These manipulative tactics, known as *Attention-Capture Damaging Patterns*, were categorised in a taxonomy by Roffarello et al. [2023]. Attention-grabbing dark patterns are frequently employed in social media platforms and websites with the aim of retaining users on their platforms to increase revenue. Strategies like *Infinite Scroll* nudges users to keep scrolling through never ending content, and *Recapture Notifications* repeatedly notify users to use an application again. These techniques significantly diminish the user's sense of agency.

2.1.2 Impact on Users

Dark patterns have the ability to significantly influence user behaviour [Luguri and Strahilevitz, 2021, Nouwens et al., 2020, Conti and Sobiesk, 2010], prompting them to part with their money, personal information, and attention [Narayanan et al., 2020]. They can be particularly harmful to users due to their manipulative tactics and widespread presence.

Mathur et al. [2021] investigated the effects of dark patterns from a normative standpoint that can influence individuals and society. They explain that individual welfare, collective welfare, and individual autonomy may be compromised through dark patterns. Individual welfare refers to any form of harm that can be inflicted on a user, such as financial loss, invasion of privacy, and cognitive burden. Collective welfare pertains to any adverse impacts on a group of individuals, including decreased competition, reduced price transparency, distrust in the market, and unanticipated consequences. Individual autonomy, which denotes a user's freedom to make independent choices, can also be influenced by dark patterns. Chordia et al. [2023] suggest incorporating additional factors that may impact individual and collective welfare. An increase of emotional load could lead to a decline in individual welfare, while an increase of social injustice could diminish collective welfare.

The individual and collective welfare and the individual autonomy can be compromised through dark patterns

The results of studies on user behaviour with deceptive design strategies suggest that people view deceptive design as a common aspect of their digital interactions. In addition, they may not always recognise the associated risks, and even if they do, they tend to be lenient towards well-known websites [Lupiáñez-Villanueva et al., 2022]. According to Di Geronimo et al. [2020], the majority of users are unable to identify deceptive design practices, but once they become familiar with them, they can more easily recognise such tactics. Contradictory, some studies find, that even when users are aware of the potential risks, they often struggle to identify them [Lupiáñez-Villanueva et al., 2022]. However, the study of Bongard-Blanchy et al. [2021] describes that users are usually aware of potential risks, but

There are contradicting studies on how aware user's are of deceptive techniques

User react differently,
to milder and more
aggressive dark
patterns

can not withstand them. A study of Luguri and Strahilevitz [2021] with almost 2000 individuals suggests that users are twice as inclined to subscribe to a service when exposed to subtle deceptive design tactics and four times more likely to do so when faced with aggressive deceptive design strategies. However, aggressive dark patterns received more negative reviews than mild dark patterns. Also, less educated individuals are more likely to be influenced by dark patterns, especially with milder dark patterns. An example of milder and more aggressive dark patterns is shown in Figure 2.1.

Dark patterns are
prevalent across
various devices

Dark patterns are prevalent across various devices and applications, including shopping websites [Mathur et al., 2019, Birk et al., 2023], social media platforms [Bhargava and Velasquez, 2020, Giraldo-Luque et al., 2020], games [Zagal et al., 2013, Di Geronimo et al., 2020], IoT devices [Kowalczyk et al., 2023], and even e-mails [Mathur et al., 2023]. Research indicates that approximately 95% of popular apps on the Google Play Store[6] incorporate at least seven dark patterns [Di Geronimo et al., 2020]. Similarly, widely used apps in Japan feature an average of nearly four dark patterns [Hidaka et al., 2023]. Mathur et al. [2019] demonstrated that out of 11,000 analysed websites, 1200 employed dark patterns, with more prominent websites tending to utilise more of these deceptive design elements. In addition, 40% of political e-mails originating from the United States were found to include dark patterns [Mathur, 2021], and only 10% of advertising content on YouTube videos and Pinterest pins were correctly labelled as advertisements [Mathur et al., 2018].

Many countries do
research about dark
patterns

Dark patterns, which are widely present in interfaces, are the subject of research in various countries, for example, in European countries [Lupiáñez-Villanueva et al., 2022], such as Germany [Bösch et al., 2016] or the United Kingdom [Bongard-Blanchy et al., 2021, Fitton and Read, 2019], in the United States [Di Geronimo et al., 2020, Gray et al., 2018], in Japan [Hidaka et al., 2023], and in India [M. Bhoot et al., 2021].

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[6]https://play.google.com/store/games?hl=engl=USpli=1, Accessed: 27.03.2024

	Educational	Design	Technical	Regulatory
DP Awareness		WARNINGS		
DP Detection	TRAINING ON PRIVACY SCENARIOS FACEBOOK GAME (SPOT THE DP)		AUTOMATED DETECTION TOOLS	
DP Resisting	LONG-TERM BOOSTS	REFRAMING COSTS FRICTION DESIGN		
DP Elimination		TRANSPARENCY IMPACT ASSESSMENT BRIGHT PATTERNS DESIGN GUIDELINES	PLUG-INS ADD-ON EXTENSIONS	REGULATIONS HEFTY SANCTIONS

general

intervention scope

specific

user-directed   *intervention measure*   *environment-directed*

Figure 2.3: This figure, taken from Bongard-Blanchy et al. [2021], shows intervention spaces for countermeasures against dark patterns.

2.1.3   Countermeasures

Due to the harmful impact of dark patterns on users, it is crucial to implement preventive measures [Bongard-Blanchy et al., 2021]. Bongard-Blanchy et al [2021] explored a range of strategies proposed by themselves and other researchers to combat dark patterns. They outlined the diverse objectives and contexts in which these strategies can be applied. These measures aim to increase awareness about the presence of dark patterns, detect them, enhance resistance against them, or eliminate them altogether. They can be implemented in educational contexts, incorporated into design practices, developed as technological innovations, or enforced through regulatory actions.

Various solutions and strategies have been proposed to address dark patterns, which can be classified within Bongard-Blauchy [2021]'s intervention spaces for countermeasures, as shown in Figure 2.3. Raising awareness is

Bongard-Blanchy et al. [2021] investigated different countermeasures

Raising awareness,
as a countermeasure

a commonly discussed approach in combating dark pat-
terns. One method to raise awareness as a countermea-
sure involves the use of warnings, which serve to alert
users about the risks present in interfaces. These warnings
can steer user behaviour towards more favourable actions
[Graßl et al., 2021]. Another approach is through the publi-
cation of press articles that users may come across [Morri-
son, 2021, Ravenscraft, Lomas, 2022].

Countermeasures
can help users to
detect dark patterns

Enabling users to identify deceptive design practices can be
done by educating them with scenario-based training or us-
ing gamification methods, like educational games focused
on deceptive design [Bongard-Blanchy et al., 2021]. Fur-
thermore, technological interventions such as automated
detection tools can spot visual [Schäfer et al., 2023, Chen
et al., 2017] or text-based [Mathur et al., 2019] deceptive de-
sign elements and alert users of possible deceitful tactics.

Some
countermeasures
enable users to resist
the effects of dark
patterns

Some countermeasures can help users to resist the effects
of dark patterns. Long-term strategies are a technique that
individuals can employ to establish individual rules when
interacting with platforms, such as always carefully read-
ing consent banners before accepting them [Graßl et al.,
2021]. Additional tactics to resist deceptive design prac-
tices have been proposed by Moser et al. [2019], includ-
ing the concept of reframing costs and friction design. Re-
framing costs allows users to assess what they have lost
due to a potential dark pattern, for instance, by compar-
ing the cost of an item to the equivalent amount of coffee
that could have been purchased. Friction design involves
creating obstacles or barriers to prevent engaging in harm-
ful actions, such as making the process of purchasing an
item more challenging. Various interventions exist to resist
dark patterns through design, with one approach being to
enhance transparency in the service, such as by indicating
the remaining stock of an item.

Bright and fair
patterns as a
countermeasure

Moreover, integrating *bright patterns* or *fair patterns* can be
a successful approach to eliminate deceitful design strate-
gies. Bright patterns are strategic techniques, similar to
dark patterns, designed to influence users for their own
benefit, for instance, using pop-ups to remind users to
save their progress [Graßl et al., 2021]. Fair patterns refer

to design strategies that prioritise user fairness and avoid manipulations in design [Potel-Saville, 2023]. Bongard-Blanchy et al. [2021] also discussed design principles that can help designers minimise unwanted dark patterns. Practical solutions include utilising plug-ins and browser extensions, like the Mindful Shopping extension [Liu et al., 2017], which encourages users to pause and reflect on their purchase decisions, possibly through meditation. Authorities and policy makers can combat dark patterns by enforcing regulations and penalties. Existing regulations such as the Digital Services Act [DSA, 2022], the General Data Protection Regulation [GDPR, 2016], and the California Consumer Privacy Act [CPA, 2018] already address issues related to dark patterns.

Some
Countermeasures
aim to eliminate dark
patterns

2.1.4   Literature Reviews of Dark Patterns

Literature reviews are papers that evaluate the research conducted by other scholars and summarise their findings, often followed by a discussion. Given the rising volume of studies and the expanding knowledge base in the field of HCI, literature reviews can contribute to a deeper understanding of a specific field [Stefanidi et al., 2023]. However, within the field of HCI, literature reviews that concentrate on dark patterns are not widely employed, as this area of research is still considered relatively novel.

Literature reviews
can deepen the
understanding of a
research field

In 2021, Mathur et al. [2021] conducted a review on definitions and taxonomies related to dark patterns to explore the similarities and differences among them. It was noted that multiple factors play a role in classifying an interface as a harmful and intentionally employed design. Additionally, they highlighted reasons why dark patterns can be problematic for users, which is further elaborated in Section 2.1.2. Another study focusing on psychological harm proposed a new taxonomy by examining attentional and psychological harm in other taxonomies, introducing the concept of *Attention Capture Dark Patterns* [Monge Roffarello et al., 2023]. This taxonomy is discussed further in Section 2.1.1. Gray et al. introduced a work-in-progress ontology that evaluates existing taxonomies from various re-

Some taxonomies
are build upon prior
research

searchers, drawing connections between them and suggesting a unified terminology [Gray et al., 2023c]. The details of this work can be found in Section 2.1.1.

Gray et al. [2023b] published a work-in-progress review that centers on 76 empirical studies concerning dark patterns. Their review examines the typical approaches of publications, research methods and settings involved in the research of dark patterns. By conducting this analysis, they pinpoint potential areas for future research, as well as any existing gaps and obstacles. The review analysed the most relevant papers on dark patterns that were found on Google Scholar[7] and the *Association for Computing Machinery* (ACM) library[8] with the guidance of the PRISMA Statement [2009]. Their research results indicate a predominant emphasis on platforms where interactions take place, such as social media or gaming sites and a prevalent utilisation of the method content analysis. Most of their literature had a descriptive framing, such as showcasing the influence or effectiveness of dark patterns.

A literature review of dark patterns, was conducted to get a deeper understanding of the research field

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[7]https://scholar.google.de, Accessed: March 20, 2024
[8]https://dl.acm.org, Accessed: March 20, 2024

Chapter 3

Meta-Analysis

This chapter outlines the steps of this meta-analysis of dark pattern literature within CHI. First, a literature review was conducted, according to the PRISMA Statement [Page et al., 2021], which will be explained. Afterwards, the results of the review are presented.

3.1 Literature Review

We used a semi-systematic [Snyder, 2019] approach to conduct this literature review. This strategy is in particular useful for answering research questions that aim to get an overview of a research area and to track the development over time. Semi-structured reviews are for topics with many various research fields, a broad research question, or analysing quantitative or qualitative data. Typically, this strategy reviews a sample of related literature [Snyder, 2019], such as analysing literature from CHI conferences. The papers were then analysed with a content analysis, and simultaneously a *codebook* [Neuendorf, 2010] was created. A codebook is used to analyse data and label them with a code that describes the paper within a category. These methods match the semi-structured strategy and are used for qualitative analyses. The PRISMA guideline was used to identify literature [Page et al., 2021].

A semi-systematic approach was used, to review the literature

3.1.1   The PRISMA Statement

The PRISMA
Statement is rising in
popularity within the
HCI research field

Although literature reviews have always been a crucial part
within HCI research, the majority of these reviews did not
employ structured methods to assist and direct the review
process [Stefanidi et al., 2023]. One of the earliest methods
used in HCI reviews is the *QUality Of Reporting Of Meta-*
analyses Statement (QUOROM) [Moher et al., 1999], which
was updated and renamed to PRISMA Statement [Moher
et al., 2009]. Over the past three years, there has been a 30%
increase of reviews, using the PRISMA Statement, specifi-
cally from 2020 to 2023, compared to the previous five-year
period (2015-2019) [Stefanidi et al., 2023]. We decided to
follow the PRISMA Statement [Page et al., 2021], which is
an updated version of the PRISMA Statement [Moher et al.,
2009], because of its newly rising popularity within the field
of HCI.

The PRISMA Statement assists in writing a complete liter-
ature review, without missing important details. It con-
sists of three parts, a statement paper, a flow diagramm,
to showcase the database search and the selection process,
and a checklist. The checklist consists of seven parts with 27
items, that specify important details and information that
is recommended to be included in a literature review and
meta-analysis. The flow diagramm for this literature re-
view is shown in Figure 3.1 and the checklist can be found
in Appendix E.

PRISMA can be
used for other
research fields

The PRISMA Statement is a guideline for all kinds of lit-
erature reviews and meta-analyses, which was originally
developed for the medical research field. However, the au-
thors explicitly specify that their guideline can be used for
other research fields, where systematic reviews or meta-
analyses are used. However, not all the items on the check-
list were adhered to, as it comprises recommendations that
were not always relevant or helpful for this thesis. Some
items were specifically intended for the medical research
field, such as registration numbers, and therefore not fol-
lowed in this thesis.

3.1.2 Corpus Collection

This section describes the process of creating the corpus for the literature review. It defines the scope of the selected corpus, the method employed to select the literature, and the criteria used to ensure their quality and relevance to the dark pattern research. The PRISMA flow chart, which describes the whole process of constructing the literature corpus, can be found in Figure 3.1.

Choosing the Scope of the Literature

This thesis aims to find a research gap within dark pattern literature and to deepen the understanding of the dark pattern research field. Hence, a comprehensive examination of existing literature was performed in order to address the research questions introduced in the Introduction. As to not exceed the time and resource limit of a bachelor thesis, specifying the scope of this work was substantial.

There were two notable ideas to limit this review. The first was to limit the time frame and only analyse recent published papers. However, we would not be able to find out how dark pattern research has evolved over time. There was also the risk of leaving out research topics, that were studied a lot in the beginning, but have not been studied in the last years anymore. This could falsify the analysis and the findings of possible research gaps. The second idea was to limit the thesis to only review conference papers. However, as there are still too many conferences in the HCI community, we decided to limit this work to the *Special Interest Group on Computer-Human Interaction* (SIGCHI) conferences, as one of the leading communities for the HCI field. SIGCHI[1] is the world's largest association of professionals who contribute to the research of the HCI field. They sponsor 26 different conferences, including the *Conference on Human Factors in Computer Systems* (CHI), the *Conference on Designing Interactive Systems* (DIS) and the *Conference on Mobile Human-Computer Interaction* (MobileHCI).

Limiting the meta-analysis to include literature from SIGCHI conferences

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[1]https://sigchi.org Accessed: 14.03.2024

Nevertheless, due to the extensive volume of existing dark pattern literature in SIGCHI conferences, a decision was made, to focus on the largest conference within SIGCHI. The CHI conference is a prominent event in the HCI field and features a significant number of publications on dark patterns [Gray et al., 2023b]. The review only considered conference papers published between 2010 and 2023, as the concept of dark patterns was initially introduced in 2010, and it was not feasible to look further back in time, within the scope of this bachelor thesis.

The final dataset was limited to include only CHI conference papers

Identifying Literature

The data collection for the review was conducted through the *Association for Computing Machinery* (ACM) library[2], which serves as the publication platform for all SIGCHI conference papers. The search for dark pattern literature began by initially identifying papers presented at SIGCHI conferences. Subsequently, a refinement was made to focus solely on CHI conferences, resulting in the exclusion of all non-CHI conference papers at the end of the screening process. This literature search took place in December 2023.

Finding paper through the ACM library search engine

In the beginning, to get an overview of how much dark pattern literature was published in different conferences within SIGCHI, keywords such as "dark patterns" or "deceptive patterns" were used, in order to find literature within the ACM library. However, while scanning the results, it became clear that some relevant papers about dark patterns were not found through the search. Therefore, a broader amount of keywords was used for the first search, identified through prior identified literature on dark patterns and through ideas of possible descriptions for dark patterns:

Keywords, such as "dark patterns" and "deceptive patterns" did not include all published dark pattern literature

"dark pattern"	OR	"dark design"
"deceptive pattern"	OR	"deceptive design"
"malicious pattern"	OR	"malicious design"
"manipulative pattern"	OR	"manipulative design"

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[2]https://dl.acm.org

All keywords were enclosed in quotation marks, which ensures an exact match with the search term. Also, all keywords were separated with the boolean operator OR. We applied the filter "SIGCHI", which is found under the section sponsors, and limited the search from 2010 to 2023. Through this method we found 104 records.

To make sure that no relevant literature was missing, that could not be found through the search engine, we screened through all references of the 104 papers. In this process we first screened the title, and if the title seemed to be dark pattern related, we then screened the abstract. Through this method, 13 additional research papers were found that were related to dark patterns and published in a SIGCHI conference, that the initial search could not find.

All references of already identified dark pattern literature was screened

Analysing the found literature, we added more keywords to the database search, in hopes of identifying even more dark pattern related literature:

"dark pattern"	OR	"dark design"
"deceptive pattern"	OR	"deceptive design"
"malicious pattern"	OR	"malicious design"
"manipulative pattern"	OR	"manipulative design"
"unethical pattern"	OR	"unethical design"
"asshole design"	OR	"evil design"
"dark user interface"	OR	"dark UI"

The second search found 113 papers. However, out of the 13 papers identified through the references, only two were found in the second search. Despite using words mentioned in the written text of the papers as keywords, not all SIGCHI conference papers related to dark patterns could be identified through the database search. Therefore, we decided to include the eleven remaining records to the dataset, concluding 124 papers found through the second database search and through the screening of the references.

Not all dark pattern literature could be found through the ACM search engine

Screening and Assessing for Eligibility

Before the screening process started, all records, that were duplicates, published in the wrong conference, or not a paper were sorted out. In total, there were eleven records sorted out. One was a duplicate, called "The dark side of interaction design" [Rogers et al., 2020], which was published in CHI EA 2020 and 2021. We kept the earlier version from 2020, as both papers looked identical and there was no real difference between them. Two papers were published in the wrong conferences, such as the *Conference on Advanced Visual Interfaces* (AVI) and the *Conference on Multimodal Interfaces and Machine Learning for Multimodal Interaction* (ICMI-MLMI). Eight of the "papers" were not papers, but conferences, such as CHI '21 and CHI EA '23, which were falsely marked as a conference paper.

<div style="text-align: right">11 records were sorted out before the screening process started</div>

We proceeded to screen the remaining 113 conference papers obtained by searching the ACM library. The eleven papers, discovered through the references of the papers from the first search, were not screened again since they were already screened and recognised as literature that concentrates on dark patterns, during the screening of the references. For the screening process, we carefully read the titles and abstracts of each literature. We identified and excluded 38 papers that did not meet at least one of the inclusion criteria mentioned below:

<div style="text-align: right">38 records were sorted out while screening the title and the abstract</div>

1. The emphasis of the abstract or title is on dark patterns, whether they are addressed directly or indirectly.

2. The topic concerns deceiving the user or engaging in malicious behaviour through design choices.

In the next step, we assessed the full text for eligibility of the remaining 64 papers, retrieved through the database search and of the 11 reports found through the references. In this process, we excluded literature based on the following criteria:
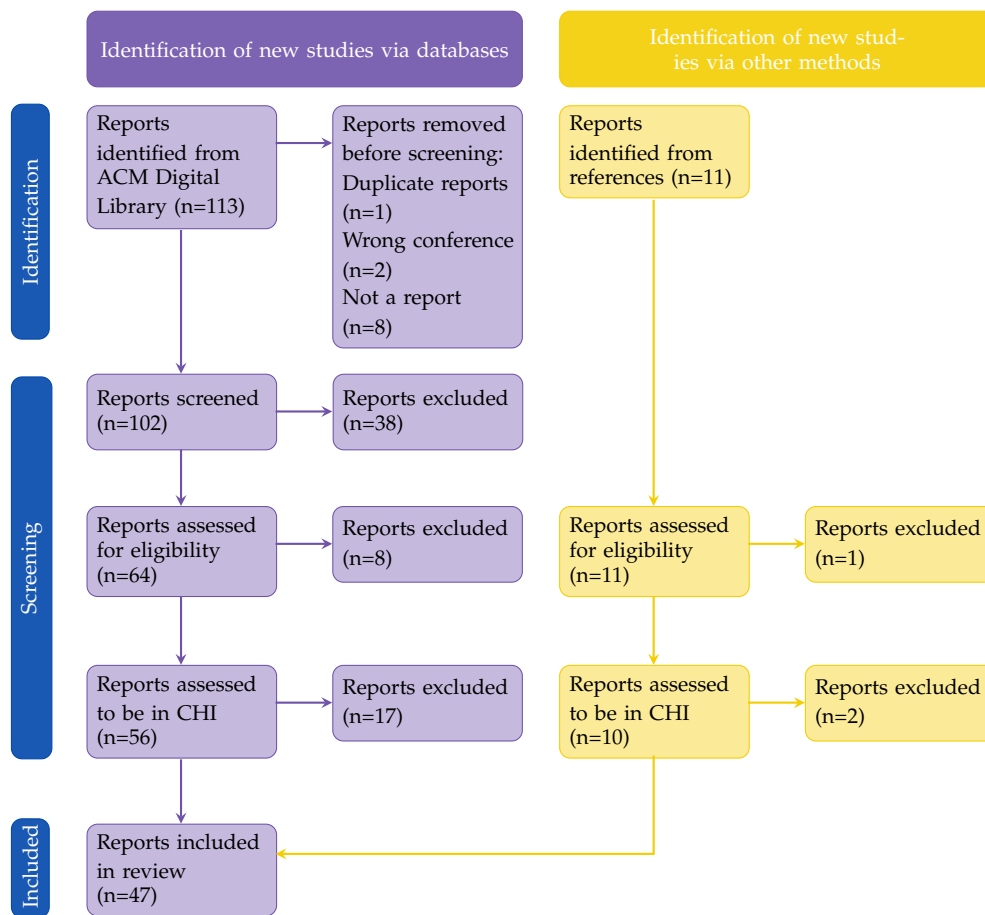
Figure 3.1: This flow chart, derived from the PRISMA Statement [Page et al., 2021] visualises the process of identifying and screening literature, identified through the ACM library[a] and through the screening of references of prior identified literature. The step "Reports assessed to be in CHI" is an additional step, not included in the PRISMA Statement. This step shows, that at the end of the screening process, the literature was filtered to only include papers from CHI conferences.

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[a]https://dl.acm.org, Accessed: March 20, 2024

1. Dark patterns, or similar terms, must be included in the full text.

2. The introduction, results, or conclusion should mention design practices in UI or UX, that harm the users interest.

While the papers only had to meet one of the above criteria we also made sure, that dark patterns or a description of harmful design practices were not only mentioned on the site, but in fact a key factor of the paper. With these exclusion criteria in mind, we excluded nine additional papers, eight found through the database search and one found as a reference. These nine papers included two panels which we excluded, as these aim to start a discussion at conferences and did not publish the results of the panel. At the end, we were left with 66 papers of dark pattern research within SIGCHI conferences.

After the corpus was identified, we decided to limit the corpus even more and to include only literature published in CHI and CHI EA, as the corpus size was too big to analyse within the scope of a bachelor thesis. 19 papers were excluded, as these were not published within a CHI conference. The final database set included 47 conference papers in total from CHI conferences.

3.1.3 Analysing the Corpus

This section outlines the approach used to examine the body of literature on dark patterns. Initially, it discusses the process of the content analysis and the creation of the codebook. Subsequently, it elaborates on the various sections of the codebook.

Content Analysis and developing a Codebook

The process of collecting data played a vital role in this review. The research questions, outlined in the Introduction, could only be tackled by retrieving data from our dark pattern literature dataset. To locate the data necessary to address our research questions, we scrutinised our collection of literature, bearing in mind the following inquiries:

1. Which dark patterns have been studied?

2. What kind of contributions have been made?

3. What is the purpose of the paper?

4. What topic does the paper cover?

5. How was data for the research project collected? And in which country was the data gathered?

For the first and second inquiries, we referred to existing literature that has already delved into these aspects. We adopted established research contribution types commonly found in HCI literature [Wobbrock and Kientz, 2016] and a fusion of the ontology proposed by Gray et al. [2023c] along with dark patterns that attract user attention [Monge Roffarello et al., 2023]. Since the study of dark patterns is relatively novel, there were limited predefined codes available for us to utilise in analysing our dataset. Consequently, we opted to employ a blend of conventional content analysis and directed content analysis techniques to extract qualitative data [Hsieh and Shannon, 2005], and created our own categories to answer the last three questions.

The first two questions were answered, through using already established categories within the HCI

Extracting data from the dataset involved a two-step process of analysing key categories and then coding these categories to form a qualitative set of data. Initially, the questions mentioned above were used to guide the categorisation and coding for each paper, and aimed to gather data to answer the researech questions. The first research question (RQ1) can be addressed by examining the types of dark patterns that have been explored in existing literature. By considering the contribution, the topic, and the data collection methods, we were able to assess the variety of dark pattern classifications within CHI. The second research question (RQ2) will be resolved by identifying the objectives of each paper. The evolution of dark pattern scholarship (RQ3) will be elucidated through an analysis of all data gathered in correlation to the year they were published. The final research question (RQ4) will be tackled in the same manner.

Establishing categories to find answers for the research questions

Through answering the above questions and reviewing each research paper, we identified and labeled six categories:

- *Dark Pattern Type*: The dark pattern types derived from Gray et al. [2023c] and Monge-Roffarello et al. [2023].

- *Data-Gathering Method*: The method used to gather data for research.

- *Country*: The country from which the data was derived of.

- *Research Contribution Type*: The research contribution types, introduced by Wobbrock and Kientz [2016], which categorises all HCI literature contributions into seven basic contribution types.

- *Main Achievement*: The main contributions in dark pattern papers.

- *Domain*: The topic of the research paper.

To ensure the accuracy of the code, the dataset was evaluated and coded twice

Subsequently, all gathered responses were clustered, and then used to create a codebook. The codebook serves as a reference for understanding the codes used to label the research papers. However, since the knowledge of the reviewing process was clustered to form a codebook, there was a risk that the codes no longer aligned with each paper. Therefore, to ensure the quality and the accuracy of the coded data , we reviewed the dataset again and made adjustments by adding or removing codes that were no longer appropriate. If a paper did not fit any possible code within a category, we did not code the paper within this category. The final codebook, explaining and giving an overview of all categories and codes, is provided in Appendix C.

Dark Pattern Types

The category *dark pattern types* was derived from existing literature

The first category, to code the research papers, was *dark pattern types*. In order to analyse the different types, that were studied in the research papers, a combination of the ontology from Gray et al. [2023c] and the *attention capture damaging patterns* by Monge-Roffarello et al. [2023], were used, to derive our seven dark pattern types from.

We followed Gray et al. [2023c]'s ontology, because their introduced high-level dark patterns are more likely to appear across different interfaces. This allows us to distinguish between very basic forms of dark patterns without taking into account which interface is studied. However, not all dark patterns can be categorised into one of the high-level dark patterns, as this paper is a work-in-progress, like dark patterns that capture the user's attention. Therefore we decided to add a seventh category, which includes all kinds of attention-grabbing patterns [Monge Roffarello et al., 2023].

> Gray et al. [2023c] defined high-level dark pattern types, which can be found across devices

`Nagging` describes a dark pattern which, continuously reminds and nags users to do something they might not want to do. A very common example of `Nagging` is a prompt that interrupts an actions and asks to rate their app.

> `Nagging` redirects user behaviour

`Obstruction` is a dark pattern that actively hinders a user to to an action. This dark pattern usually makes it very difficult for users to do specific tasks. This category includes Brignull 's Roach Motel[3] or adding unnecessary steps to hinder a user to achieve their goal.

> `Obstruction` hinders users to do an action

`Sneaking` is a way to secretly harm a user through hiding or disguising information. `Sneaking` patterns can, for example, add things to a shopping basket, hide information, disguise advertisement or, in general, sneakily harm a user, which might not be noticed.

> `Sneaking` can hide or disguise information

`Interface Interference` is a dark pattern that changes and uses parts of interfaces to manipulate users. This dark pattern includes techniques, such as different sized or coloured buttons, cute pictures or different languages.

> `Interface Interference` manipulates the interface

`Forced Action` types force a user to do an action. This method restricts users actions in order to force them to do another action. This can include pay-to-win methods, restricting content or gamification.

> `Forced Action` forces user's to do an action

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[3]https://www.deceptive.design, Accessed: 27.02.2024

`Social Engineering` uses social psychology to manipulate users

`Social Engineering` describes dark patterns that manipulates users through social psychology. These dark patterns include, notifications of other user's behaviour, or a sense of urgency, like pretending a product is limited.

`Attention Capture` distracts user's attention

`Attention Capture` dark patterns harm a user through stealing their time. These dark patterns capture the users attention and often uses addictive strategies to keep users on their application.

Data-Gathering Methods

Data-gathering methods explain, how data was gathered in research papers

The category *data-gathering methods* codes research papers with the method that was used to gain knowledge and data. The method that is used to gather data can explain how dark patterns have been researched, and was therefore analysed for each paper. In our dataset, we distinguished between five types of data-gathering methods and three, more detailed, subcategories.

`Questions` gather knowledge through interviews and surveys

The first method is to ask `Questions` without instructing the actions of a user. The exact methods to ask these `Questions` are categorised further into `Surveys` and `Interviews`. `Surveys` typically have a bigger group of participants and more quantitative data, whereas `Interviews` tend to be with a smaller group of participants but yield qualitative data .

A `User Study` observes participants

A `User Study` is a method that studies participants while they interact with artifacts or follow instructions. While the actions of participants are often observed in lab and online studies, their actions and thinking processes can also be analysed through methods, like surveys, logging or protocols. We introduced a subcategory dedicated to `User Study` to elaborate on the methods employed for observing users, whether the study was carried out in a controlled laboratory setting or in the natural environment of the users. The subcategory codes encompass `Field Study`, `Lab Study`, `Survey`, `Rating`, `Think-Aloud-Protocol`, `Interview`, `Logging`, `Protocol`, and `Sketching`.

Similarly to the study, an `Experiment` can be performed in the laboratory or in the normal environment of the users. `Experiments` are methods to identify the cause and effect of a situation. An experiment is controlled by almost all influencing factors to get research data, that is almost 100% accurate. `Experiments` can further be accompanied by all kinds of empirical data gathering methods, like surveys and protocols.

`Experiments` want to study cause and effect

Another effective method is the `Content Analysis` as an approach to analyse content, and is used mainly to identify dark patterns in websites, apps, and other interfaces.This approach examines the content by observing and testing it.

`Content Analysis` analyses content, such as websites

The last method is the `Brainstorming` method, which nudges participants to identify data through some sort of `Brainstorming`. This method is further clustered into a subcategory, which include `Focus Groups`, `Scenario Construction` and `Discussion`. `Brainstorming` can be conducted with only one participant or with bigger groups.

`Brainstorming` gathers and creates ideas

Research Contribution Types

The category *research contribution type* describes the most basic contribution of a publication. As every research paper has a purpose and seeks to add to the existing body of knowledge. These contribution types were introduced by Wobbrock and Kientz [2016], who classified and reduced literature in the field of HCI into seven distinct, basic categories.

The *research contribution types* were derived from Wobbrock and Kientz [2016]

The `Empirical` research contributions contribute new knowledge through observations and data collection. `Empirical` contributions can gather information through studies, surveys, experiments, focus groups, and many more different methods.

`Empirical` research aims to gather new knowledge

Artifact
contributions create
new things, such as
countermeasures

An `Artifact` research contribution introduces a novel creation in the form of fresh systems, tools, techniques, prototypes, or other innovations. These `Artifacts` can unveil new opportunities, facilitate new investigations or perspectives, or envision future potential developments. Such contributions typically include empirical investigations.

Methodological
contributions
introduce new
research methods

`Methodological` research contributions present a new approach that outlines the process of conducting research. They provide guidance on conducting research, such as content analysis techniques or how to measure variables. `Methodological` contributions improve the ways, research is conducted.

Theoretical
research contributes
new or enhanced
concepts

Another type of research contributions are `Theoretical` contributions. These papers present novel or enhanced concepts, such as definitions, models, or frameworks, typically explaining the what and why of phenomena. Theoretical contributions are characterised by their descriptive and predictive qualities.

Dataset research
contributes often
analysed datasets

A `Dataset` research contribution presents a fresh collection of data which is usually analysed as well. This `Dataset` contribution facilitates the evaluation of novel algorithms, systems, or methodologies.

Survey papers
analyse prior work

`Survey` research contributions synthesise and analyse the work of other contributions. They are often accompanied by a meta-analysis and their goal is to expose trends and gaps in existing literature. Surveys usually only appear if a research topic is mature and has many different contributions.

Opinion papers
explain their opinion
regarding a topic

The final type of research contribution is the `Opinion` contribution, typically presented in the form of essays, arguments, reflections, discussions, or debates. These papers aim to influence the perspectives of their audience through persuasion and other means.

Main Achievements

While analysing our dataset through the lens of dark pattern research, we observed multiple papers emphasising on contributions that are more practical focused and were not explained enough, through Wobbrock and Kientz [2016]'s researech contribution types. They are to be distinguished from the seven contribution types, as they apply to dark pattern research only and can be found within all research contribution types. These describe what the authors have been doing in their studies in more detail. We call these kinds of practical contributions the main achievement of a paper, to distinguish between the prior described contribution types. We also further clustered them into subcategories.

The *main achievements* are more practical contributions, than the research contribution types

`Improving DP Research` is one of the main achievement that was identified in dark pattern literature. Papers with this focus aim to improve the dark pattern research. Their subcategory describe in more detail, how the dark pattern researched can be improved, through the codes `Defining DPs`, `Research Method`, `Terminology` and `Ontology`.

`Improving DP Research` aims to improve how research is conducted

`Studying DPs` is the second main achievement, which focuses in gathering knowledge of dark patterns through research studies. These papers study dark patterns through `Identifying DPs`, `Prevalence of DPs`, `DP Effects` on users, `DP Motives` of designers and `How DPs Work`.

`Studying DPs` focuses on understanding dark patterns

`Proposing a Solution` is a main achievement, which creates or describes countermeasures against the influence of dark patterns. The solutions can be either directed towards designers, such as ideas and recommendations to design interfaces without dark patterns. Or the solutions propose methods and artifacts for users, to avoid and identify dark patterns. This main achievement has therefore a subcategory which points this out, through the codes `Solution for Users` and `Solution for Designers`.

`Proposing a Solution` contributes countermeasures

Some papers took it as their purpose to discuss the given challenges that seem to have no proper solution yet, which we classified as `Discussing Challenges`. The identified papers aim to identify challenges occurring through dark patterns, analyse if dark pattern-related laws are followed and their implications, and discuss the matter of who is responsible for malicious manipulations in interfaces. This category was further described through the codes `Identifying Challenges`, `Law Abiding` and `Responsibility`.

`Discussing Challenges` focuses on the issues, that do not have a solution yet

Domains

The category *domain* is the topic of a paper, and describes where research has been conducted or describes the theme, where it appears most often. As dark patterns can be found in any interface, the amount of different domains is also very broad. We discovered twelve different domains, which could not be further clustered.

There is a broad amount of different *domains*

The identified domain were `Extended Reality`, `Apps`, `Advertisement`, `Social Media`, `Digital Well-being`, `Games`, `Privacy`, `European Law`, `E-Commerce`, `IoT Devices`, `E-Mails` and `Safety Technologies`.

3.2   Results

In this section, the results of the qualitative content analysis are shown. The coded dark pattern literature was analysed with *Microsoft Excel*[4], in combination with *Power Query*[5] to identify the distributions and correlations of the coded data. The majority of the examined papers were coded with multiple instances of code per category.

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[4]https://www.microsoft.com/en-us/microsoft-365/excel?market=de, Accessed: March 20, 2024

[5]https://powerquery.microsoft.com/en-us, Accessed: March 20, 2024

3.2.1 General Information of the Dataset

In total, our dataset consists of 47 research papers published between 2013 and 2023. All these papers were presented at the CHI conference or in its Extended Abstract. Among all 47 papers, more than half (n=28) were comprehensive research papers presented at CHI and underwent a thorough peer review process. The remaining 19 papers were featured in CHI EA, comprising 13 late-breaking works, two workshops, two alt.chi papers, one outstanding dissertation award, and one special-interest-group paper.

More than half of the research papers are peer-reviewed conference papers

We identified 14 synonyms of dark patterns that were used primarily instead of dark patterns or deceptive patterns within research papers. Six of these synonyms were used in papers that did not identify their research as dark pattern research. The 16 different dark pattern synonyms can be found in Appendix D.

Not every author of the research papers, identified their research as dark pattern research

3.2.2 Distribution and Correlation

All codes of the five categories examined in this meta-analysis were assessed for their frequency in the dataset and the correlations they exhibit with each other within the same category.

Distribution of Dark Pattern Types

Among our seven distinct dark pattern types, 34 studies delved into one or more of them (72%). All seven types, `Interface Interference`, `Forced Action`, `Sneaking`, `Obstruction`, `Social Engineering`, `Nagging` and `Attention Capture` are explained in detail in Section 3.1.3

72% of the studies were coded with a dark pattern type
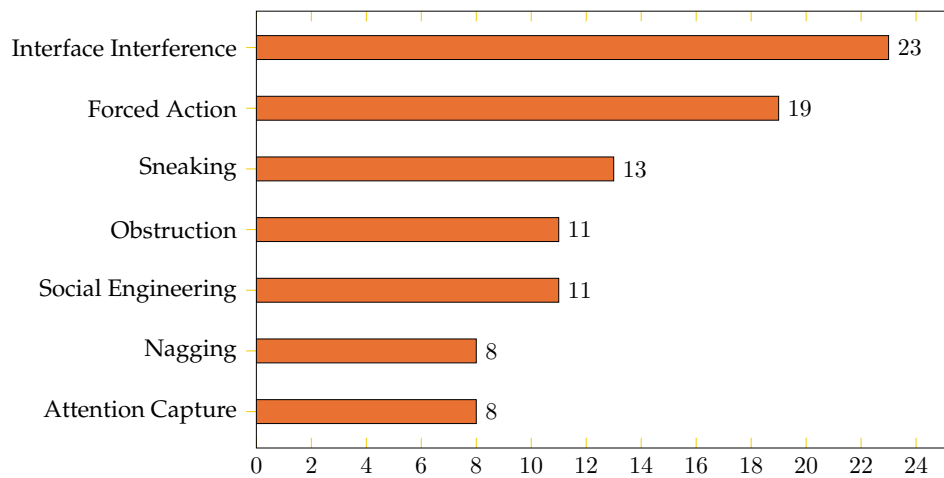
Figure 3.2: This bar chart depicts the distribution of the codes within the category of dark pattern types. 34 out of 47 research papers within the analysed dataset have been focusing on at least one dark pattern type.

Interface
Interference **and**
Forced Action
were the most
prevalent

The types most frequently examined were `Interface Interference` **and** `Forced Action`. `Interface Interference` emerged as the most scrutinised dark pattern across CHI conferences, appearing in 68% of the 34 papers. The `Forced Action` code was almost as prevalent as `Interface Interference`, featuring in 56% of the papers. `Sneaking` was discussed in 38%, while `Obstruction` **and** `Social Engineering` were the subject of 32% of the papers each. `Nagging` **and** `Attention Capture` were addressed in 23% within the papers each. The distribution of the seven dark pattern types is visualised in Figure 3.2.

Interface
Interference **and**
Forced Action
were most often
analysed in the same
paper

We also identified clusters of dark pattern types that were frequently analysed together. `Interface Interference` **and** `Forced Action` were commonly examined together in 50% of the papers. The combination of `Interface Interference`, `Forced Action` **and** `Sneaking` was studied simultaneously in 32% of all papers. Additionally, `Interface Interference`, `Forced Action`, **and** `Obstruction` were found together in 27% of the 34 papers. `Social Engineering` was frequently analysed alongside `Interface Interference` **and** `Forced Action`, as these three dark pattern types were coded together in 21% of the research papers. Further-
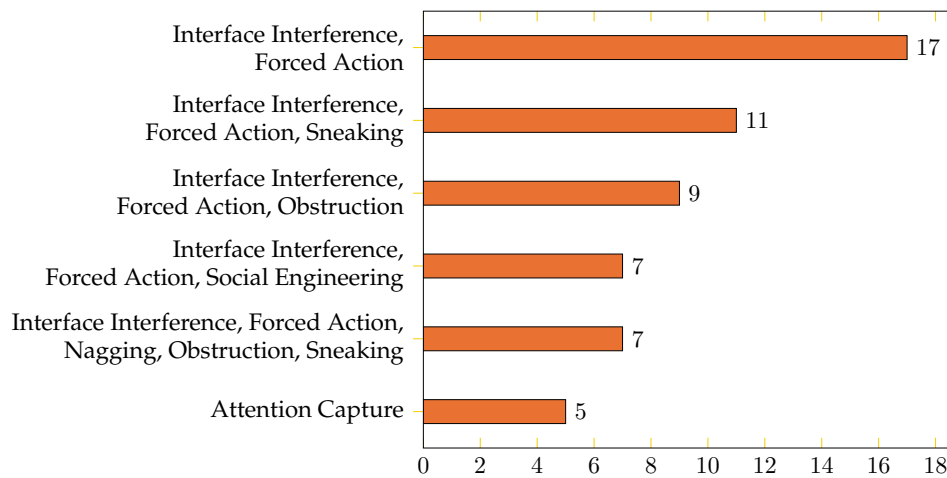
Figure 3.3: This bar chart depicts the distribution of the six most common code combinations within the category of dark pattern types. `Attention Capture` was frequently examined separately in the papers. 34 out of 47 research papers within the analysed dataset have been focusing on at least one dark pattern type.

more, the group consisting of `Nagging`, `Obstruction`, `Sneaking`, `Interface Interference`, and `Forced Action` was also identified in 21% of the papers. The code `Attention Capture` was used mostly independently (15%). The seven clusters of dark pattern types that were studied most frequently together in the same paper are illustrated in Figure 3.3.

`Attention Capture` was often analysed independently in studies

Distribution of Data-Gathering Methods

44 research papers utilised a specific method for data collection (94%). Only two papers, a `Methodological` and an `Opinion` contribution, did not collect any new data. The methods employed within the 44 research papers are `User Study`, `Questions`, `Experiment`, `Content Analysis` and `Brainstorming`, further discussed in Section 3.1.3.

94% of the research papers used a method, to collect data
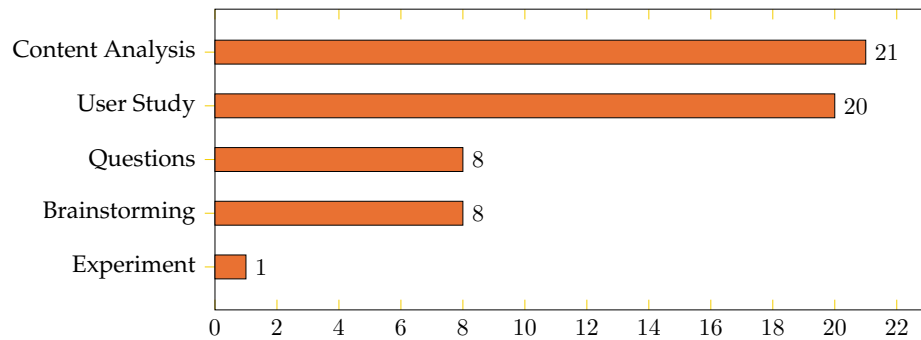
Figure 3.4: This bar chart depicts the distribution of the codes within the category of data-gathering methods. 44 out of 47 research papers within the analysed dataset have been using at least one data-gathering method.

Content Analysis and User Study were the most commonly employed methods, appearing in 48% and 45% of papers respectively. Brainstorming and Questions were the second most frequently used methods in dark pattern literature, with 18% of occurrences each. An Experiment was only conducted once (2%). The distribution of the different data collection methods can be observed in Figure 3.4.

The method User Study was predominantly employed as a standalone method in research papers, occurring in 30% of the 44 papers. Content Analysis was used in 23% of instances independently without additional data-gathering methods. It was also combined in 11% with Questions and with a User Study each. Questions were frequently used with a Content Analysis (11%). Conversely, Brainstorming was primarily used in isolation (14%). Figure 3.5 illustrates the five most commonly employed combinations of data-gathering methods.

The code User Study (n=20) consisted of 13 field Studies (65%) and seven Lab Studies (35%), employing a total of seven research methods. Surveys were the most prevalent data-gathering method, being utilised in in 55% of instances, followed by Interviews in 30% of cases, and Logging in 20%. The Thinking-Aloud Protocol was employed in 15% of papers, while a standard Protocol was used in 10%. Sketching ideas and Rating were each utilised only once (5%). In terms of

Content Analysis and User Study were the most often used method, to collect knowledge

Content Analysis, User Study and Brainstorming were most often used independently

Surveys were the most often used technique within the methods User Study and Questions
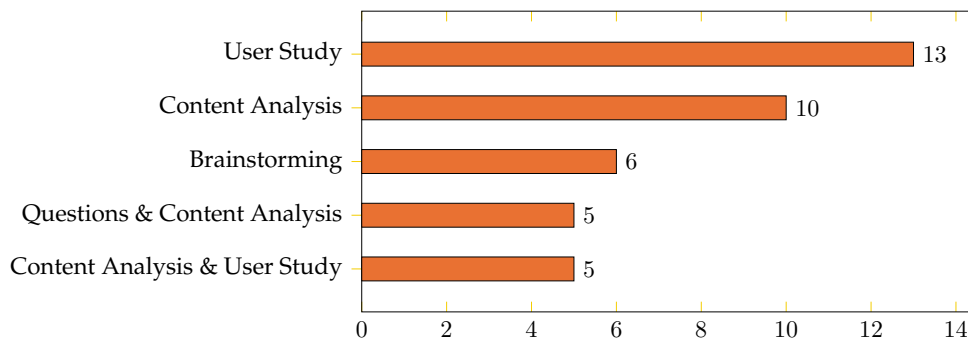
Figure 3.5: This bar chart depicts the distribution of the six most common code combinations within the category of data-gathering methods. `Content Analysis`, `User Study` and `Brainstorming` were often used independently within a paper. 44 out of 47 research papers within the analysed dataset have been using at least one data-gathering method.

`Questions` (n=8), `Surveys` were also favoured, being employed in 75% compared to `Interviews` which were used in 35% of `Questions`. The `Brainstorming` (n=8) method was further broken down into 63% `Focus Groups`, 38% `Discussions` and 38% `Scenario Constructions`.

The majority of all research papers (62%) did not focus their studies on a particular country. Nonetheless, some researchers did specify their research locations. The predominant research was carried out in the United States, comprising ten studies. Following this, eight studies were conducted in Europe, with only one study in Asia.

The United States, had the most research on dark patterns

Distribution of Research Contribution Types

Out of the 47 papers that were reviewed, three of them did not fall into a research contribution type. These three papers, which were included in CHI EA, consisted of workshops and special-interest-group discussions and therefore were not contributing any new knowledge for the dark pattern research field yet. The seven contribution types, `Empirical`, `Theoretical`, `Methodological`, `Artifact`, `Survey`, `Dataset` and `Opinion`, were introduced in Section 3.1.3.

Not every research paper, was coded with a contribution type
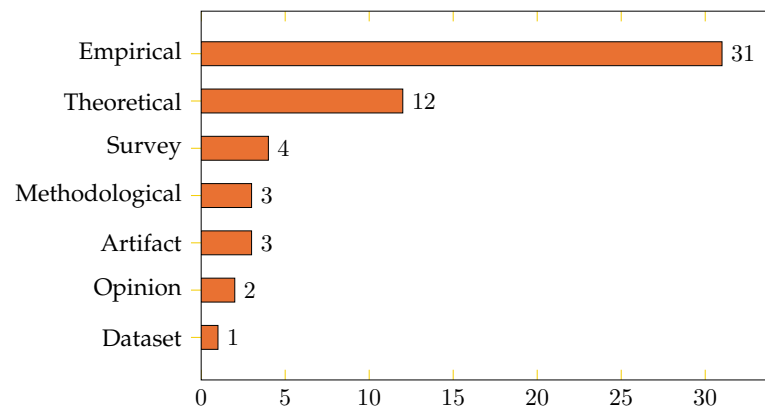
Figure 3.6: This bar chart depicts the distribution of the codes within the category of research contribution types. 44 out of 47 research papers within the analysed dataset have been categorised within at least one research contribution type.

70% of the papers were `Empirical` research contributions

Among all the papers coded with a research contribution type (n=44), those categorised as `Empirical` contributions were published significantly more frequently (70%) than any other type of contribution, and nearly three times more often as `Theoretical` contributions. `Theoretical` contributions (27%) were over three times more prevalent than all other types of contributions. `Artifact`, `Methodological`, `Opinion`, `Dataset` and `Survey` contributions appeared each in less than 9% of the papers. The distribution of the research contribution types is illustrated in Figure 3.6.

Most publications had only one contribution type

Most of the literature focused on a single type of research contribution, accounting for 68% of the publications. No more than two types of contributions were published together. `Empirical` contributions were not only the most frequently published type but also the sole type of contribution in 55% of the cases. Both `Empirical` and `Theoretical` contributions were present in the same publication in 14% of the publications. `Theoretical` contributions were only published independently in 7% of papers, while in the remaining instances, they were combined with other types of contributions. The other contribution types have not been used enough to identify any correlations between them. Figure 3.7 illustrates the three most common combinations of research contributions.
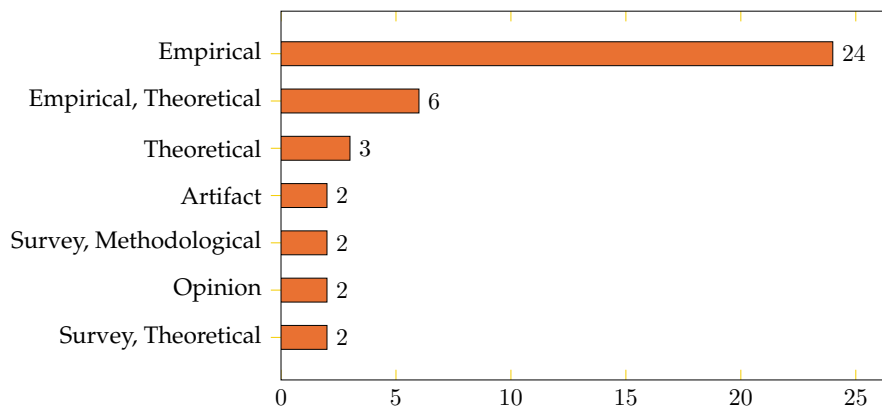
Figure 3.7: This bar chart depicts the distribution of the three most common code combinations within the category of research contribution types. `Empirical`, `Theoretical`, `Artifact` and `Opinion` contribution types were often categorised independently within a paper. 44 out of 47 research papers within the analysed dataset have been categorised with at least one research contribution type.

Distribution of Main Achievements

The main achievements are the primary purpose of a publication and every paper, out of the 47, was coded with one of the four codes explained in more detail in Section 3.1.3. The four codes are `Discussing Challenges`, `Improving DP Research`, `Proposing a Solution`, and `Studying DPs`.

Every research paper was coded with at least one main achievement

Among these achievements, `Studying DPs` has been the most common main achievement in the literature on dark patterns, with 70% of papers dedicated to this aspect. The objective of 40% of the papers was `Proposing a Solution`, while 36% of the papers focused on `Improving DP Research`. The main achievement `Discussing Challenges` was less frequently addressed. The distribution of the main achievements is visualised in Figure 3.8.

`Studying DPs` was the most common main achievement

Looking at the correlations between the main achievements, we find, that almost half (49%) of the four codes have been used isolated. More than one achievement was accomplished in 51% of the papers. `Studying DPs` emerged as the most prevalent objective by it-

Almost half of the research papers had only one main achievement
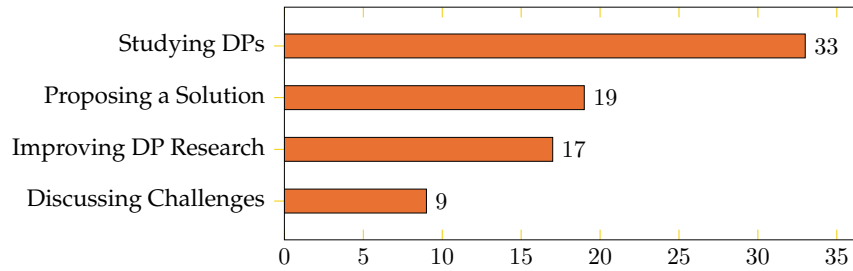
Figure 3.8: This bar chart depicts the distribution of the codes within the category of main achievements. All of the 47 research papers within the analysed dataset have been focusing on at least one main achievement.
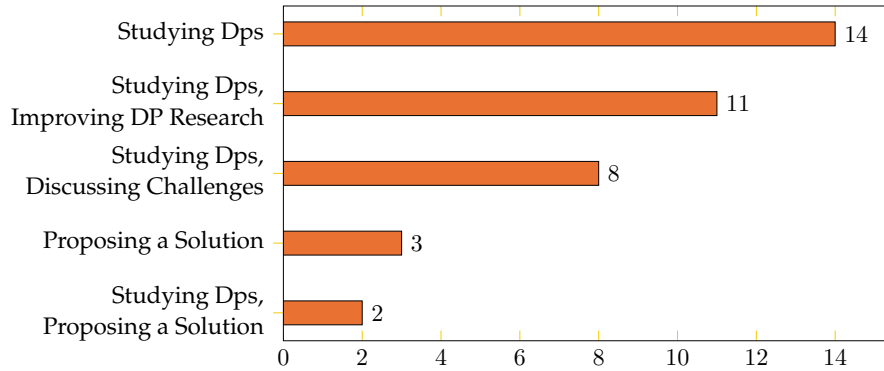
Figure 3.9: This bar chart depicts the distribution of the five most common code combinations within the category of main achievements. All of the 47 research papers within the analysed dataset have been categorised within at least one main achievement. `Proposing a Solution` and `Studying DPs` were often categorised independently within a paper.

self (30%). This aim was also explored in conjunction with all other objectives. In 23% of instances, papers concentrated on `Studying DPs` along with `Improving DP Research`. `Studying DPs` was discussed in connection with `Discussing Challenges` in 17% and `Proposing a Solution` in 15% of publications. Additionally, `Proposing a Solution` was identified as the sole objective in 15% of all papers and in correlation with `Improving DP Research` in 11% of instances. Figure 3.9 illustrates the most frequent combinations of main achievements.

Among the papers focusing on `Studying DPs` (n=33),
a majority (76%) studied the impact of dark patterns on
users, coded with `DP Effects`. `Identifying DPs` was
another commonly studied aspect, appearing in 61% of pa-
pers. Less attention was given to the different `DP Motives`
(12%), the `Prevalence of DPs` (12%), and on `How DPs
Work` (3%). In terms of `Improving DP Research` (n=17),
the priority was on `Defining DPs`, accounting in 71%
of the studies. `Taxonomies` were also extensively ex-
amined, with 47% of instances. On the other hand,
`Research Methods` (18%), `Terminologies` (12%), and
`Ontologies` (6%) received less attention. Regarding
`Proposing a Solution` (n=19), two types of solutions
were distinguished. `Solutions for Designers` that
encourage designers to enhance their interfaces for more
ethical designs, were discussed in 63% of the papers,
while `Solutions for Users` aimed at helping users
detect and eliminate dark patterns were addressed in
42% of the papers. The `Discussing Challenges`
(n=9) code comprised a subcategory. Discussions on the
`Responsibility` for ethical design occurred in 56% of
the nine papers, while 20% of the papers were coded with
`Identifying Challenges` for researchers to investigate
and another 20% of the papers examined compliance with
dark pattern-related laws, with the code `Law-Abiding`.

All main
achievements had
subcategories

Distribution of Domains

Out of the 47 publications within the dataset, eleven
papers could not be classified within a distinct domain.
The identified twelve distinct domains that charac-
terise the subject of a paper are `Extended Reality`,
`Apps`, `Advertisement`, `Social Media`, `Digital
Well-being`, `Games`, `Privacy`, `European Law`,
`E-Commerce`, `IoT Devices`, `E-Mails` and `Safety
Technologies`.

36 papers were
categorised with a
domain

Two domains were extensively addressed compared to all
other subjects within the 36 papers, visualised in Figure
3.10. `Digital Well-being` was discussed in 38% of pa-
pers, while `Social Media` was the focus in 36% of pa-
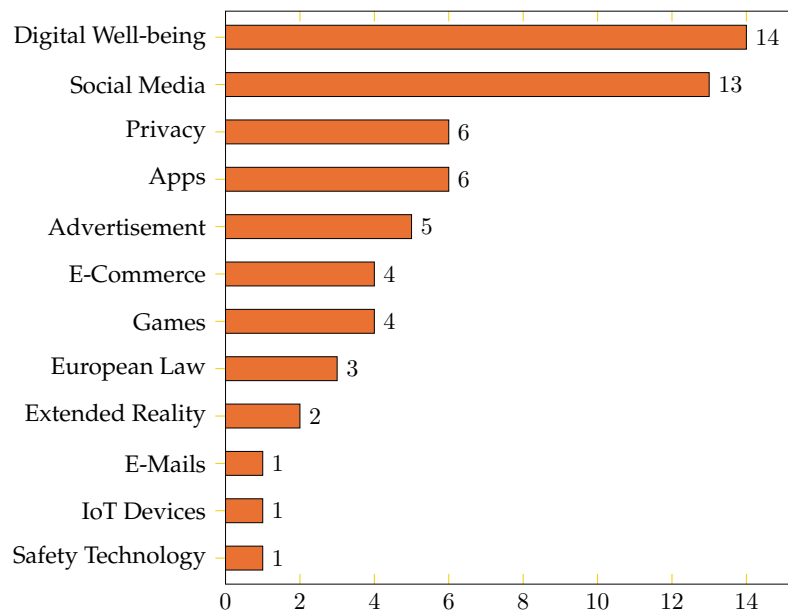
Figure 3.10: This bar chart depicts the distribution of the codes within the category of domains. 36 of the 47 research papers within the analysed dataset have been focusing on at least one domain.

Digital
Well-Being and
Social Media
were the domains,
which occured the
most often

pers. `Privacy` and `Apps` are each covered in 16% of publications, which is nearly half the frequency of the top two topics. `Games` and `E-commerce` were addressed in 10% of research papers each. `European Law` was the subject of 8%, while `Extended Reality` was examined in 5% of papers. `Safety Technologies`, `IoT Devices`, and `E-Mails` are each the focus of only 3% of studies.

Digital
Well-Being and
Social Media
were discussed
together in 25% of
the papers

Correlations between domains were not often noticed. An association between `Social Media` and `Digital Well-Being` was observed, with these areas being discussed together in 25% of the same documents. In contrast, the rest of the categories were only mentioned together in less than 8% of papers. Additionally, no category stood out as being used independently.
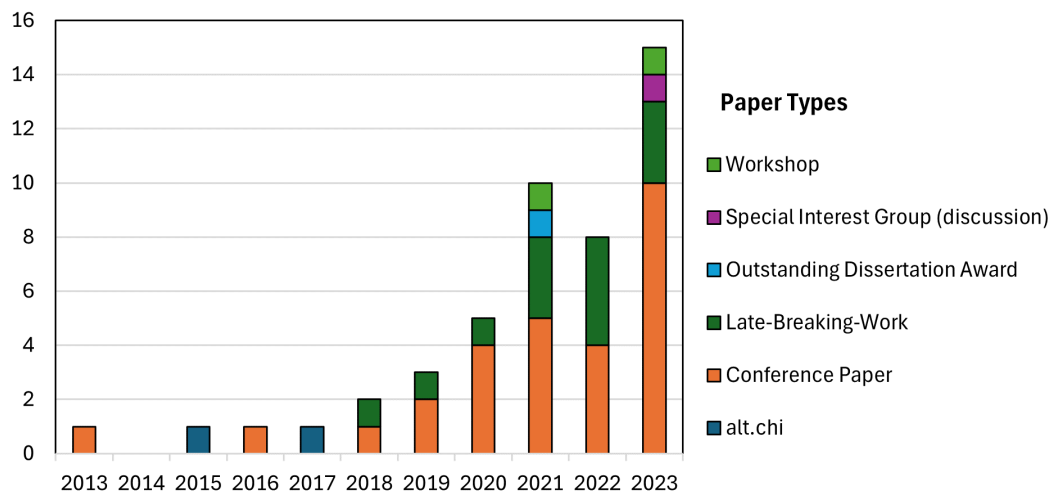
Figure 3.11: This chart shows the distribution of different research paper types published in CHI and CHI EA between 2013 and 2023 (n=47).

3.2.3 The Evolution of Dark Pattern Literature

The literature, collected in the dataset, consists of more than 60% of conference papers, further more, the dataset includes late-breaking works, workshops, alt.chi papers, an outstanding dissertation award, and a special-interest-group paper. Figure 3.11 illustrates the quantity and distribution of various types of papers of dark pattern literature published in CHI from 2013 to 2023.

Initially, there was only one publication per year in the early stages of dark pattern research. However, from 2018 onwards, there was an exponential increase in dark pattern literature. In 2022, there was a decrease of 20% in the number of dark pattern publications. Nevertheless, in 2023, the dark pattern literature reached its peak with 15 (30%) publications in CHI and CHI EA. Driven by the increasing amount of publications per year, all our studied categories have been increasing in number over time as well.

The amount of dark pattern publications has been rising exponentially

Different dark pattern types have been appearing in studies slowly over the years, which is illustrated in Figure 3.12. However noticeably all five of Gray et al. [2018]'s initial dark pattern types have been studied before the
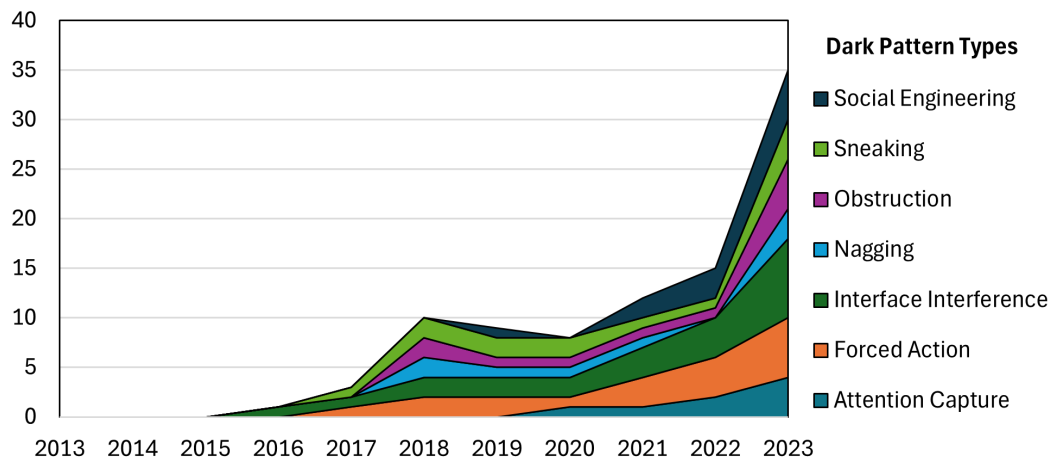
Figure 3.12: This area chart shows how often research papers focusing on different dark pattern types, were published (n=34). The papers were published in CHI and CHI EA between 2013 and 2023, however in the years 2013-2016 there were no papers focusing on distinct dark pattern types. The dark pattern types in the area chart are stacked.

Social Engineering and Attention Capture were studied later than other dark pattern types

other two types, `Social Engineering` and `Attention Capture`. `Interface Interference` was the first dark pattern type studied in a research paper in 2016. Subsequently, an increasing number of research papers on dark patterns have been published, leading to the analysis of a wider range of dark pattern types. In 2017, the types `Forced Action` and `Sneaking` were studied for the first time. The year 2018 saw the analysis of `Nagging` and `Obstruction` as dark pattern types for the first time. Studies on `Social Engineering` and `Attention Capture` have been starting more recently. `Social Engineering` was initially investigated in 2019, and `Attention Capture` was first mentioned in 2020.

Brainstorming methods have been appearing more often since 2021

Different data-gathering methods have been used starting in the first research paper published in 2013. `Brainstorming` methods however, have increasingly been used starting in 2021. Also `Content Analysis` has significantly risen in usage in 2023. Figure 3.13 illustrates the relationship between data collection methods throughout the years.
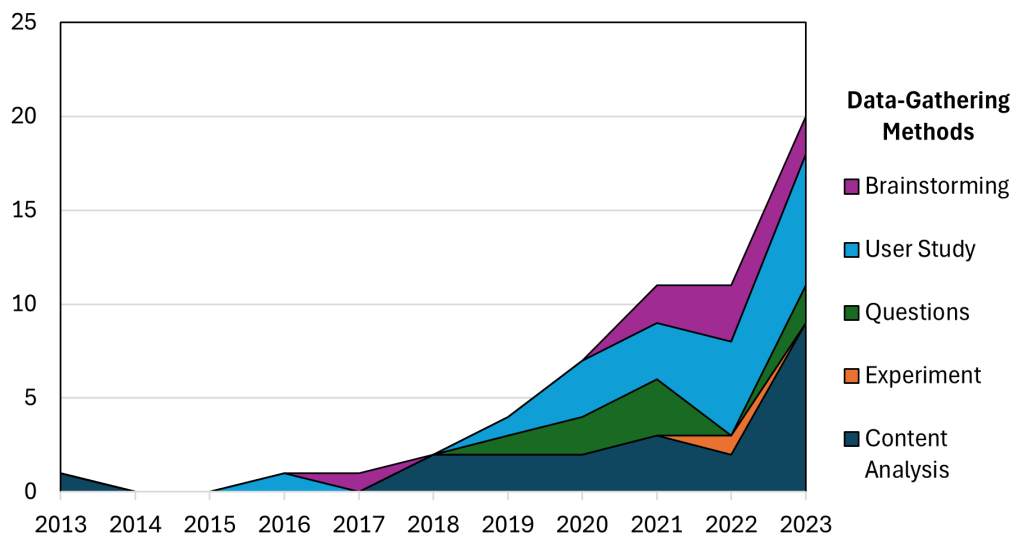
Figure 3.13: This area chart shows how often research papers using different data-gathering methods, were published (n=44). The research papers were published in CHI and CHI EA between 2013 and 2023. The data-gathering methods in the area chart are stacked.

Research contribution types were not as easy to analyse over the years. Especially in the earlier years, there were not enough publications to see any kind of pattern. However, especially from 2021 to 2023, the `Empirical` and the `Theoretical` contributions seem to be published more than other contribution types. The amount of `Empirical`, `Theoretical`, and `Survey` contributions have shown a consistent increase over time. `Empirical` and `Theoretical` contributions have been dominant since 2016 and 2013, respectively. The discussion of `Opinion` contributions emerged only at the beginning of dark pattern research. `Survey` contributions began to emerge in 2021. Figure 3.14 depicts the progression of research contribution types from 2013 to 2023.

`Empirical` studies were the most prevalent in every year

The focus of the main achievements of the literature have been shifting slightly over years, as is illustrated in Figure 3.15. `Improving DP Research` was a key focus in the initial two years and has resurfaced regularly in dark pattern research since 2021. `Discussing Challenges`, which was generally a less explored goal, has been in-

`Discussing Challenges` has been incresingly been studied since 2020
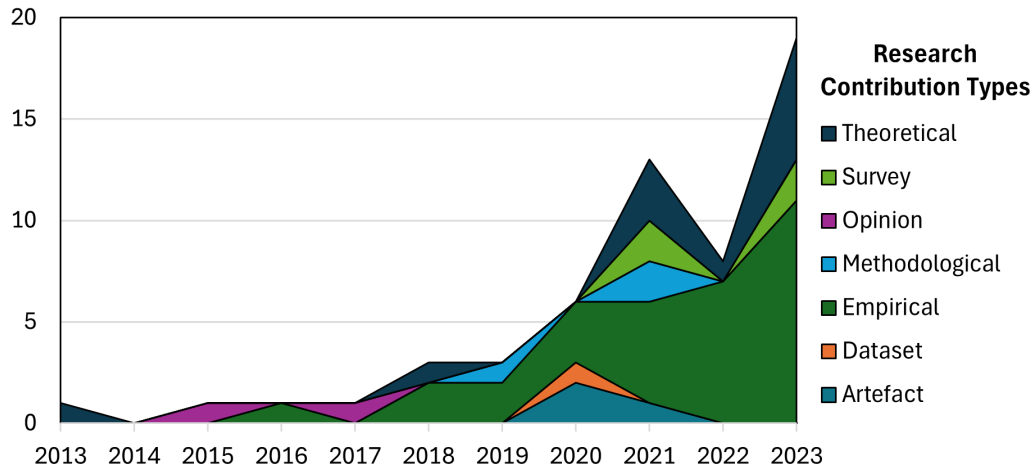
Figure 3.14: This area chart shows how often research papers focusing on different research contribution types, were published (n=44). The research papers were published in CHI and CHI EA between 2013 and 2023. The research contribution types in the area chart are stacked.

creasingly addressed since 2020. `Studying DPs` and `Improving DP Research` appear to be consistent objectives in many publications.

Research papers focusing on `Advertisement` have been decreasing

From 2018 to 2023, `Social Media` has remained a consistent subject of research interest. Starting in 2020, various other fields have been addressed in the literature. It is noteworthy that `Digital Well-being`, a topic that has received considerable attention, only surfaced in 2020. Conversely, there has been a decrease in the occurrence of `Advertisement`, as can be observed in Figure 3.16.

3.2.4　Correlations of Dark Pattern Types

Correlations of dark patterns with other analysed categories were computed

Exploring the seven distinct types of dark patterns, we examined the relationships and patterns among different categories, created in Section 3.1.3. This involved tallying the occurrences of codes for dark pattern types alongside other categories. To assess the various associations, we computed the frequency of a code appearing together with a dark pattern type as a percentage within the whole dataset (n=47).
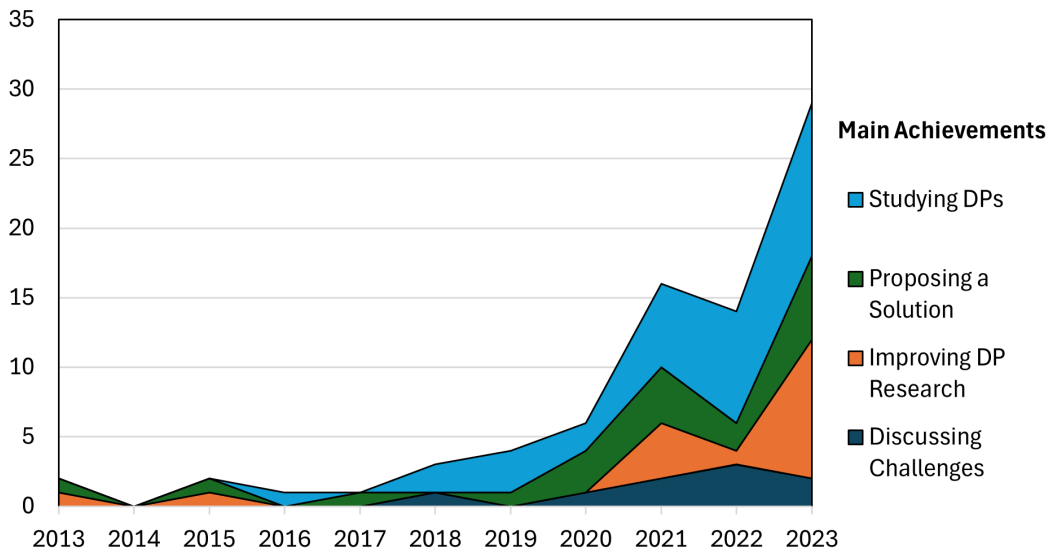
Figure 3.15: This area chart shows how often research papers focusing on different main achievements, were published (n=47). The research papers were published in CHI and CHI EA between 2013 and 2023. The main achievements in the area chart are stacked.
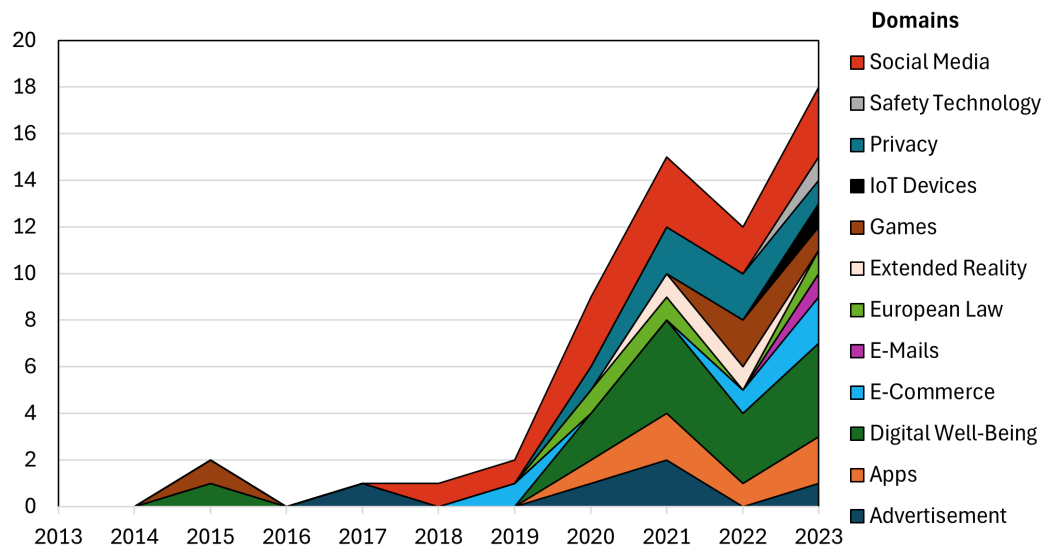
Figure 3.16: This area chart shows how often research papers focusing on different domains, were published (n=36). The research papers were published in CHI and CHI EA between 2013 and 2023, however in the years 2013-2015 there were no papers focusing on distinct domains. The dark pattern types in the area chart are stacked.

As shown in the Table 3.1, the predominant type of contribution, that was coded with dark pattern types, was the `Empirical` contribution, accounting to 13% to 43% of all papers. Specifically, `Interface Interference` and `Forced Action` were often associated with `Empirical` contributions with 43% and 34% respectively. `Theoretical` and `Survey` contributions were linked to all seven types of dark patterns, while `Methodological` contributions did not focus on any specific dark pattern type. Other types of contributions have seldom focused on a particular type of dark patterns.

		Dark Pattern Types						
		Interface Interference	Forced Action	Sneaking	Obstruction	Social Engineering	Nagging	Attention Capture
Research Contribution Types	Empirical	0,43	0,34	0,21	0,21	0,21	0,15	0,13
	Theoretical	0,15	0,13	0,06	0,09	0,09	0,06	0,04
	Survey	0,02	0,02	0,02	0,02	0,02	0,02	0,02
	Artefact	0,00	0,00	0,02	0,00	0,00	0,00	0,02
	Methodological	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Opinion	0,02	0,02	0,02	0,00	0,00	0,00	0,00
	Dataset	0,02	0,02	0,02	0,02	0,00	0,02	0,00

Table 3.1: This table shows the correlation between dark pattern and research contribution types, through the percentage of how often they were coded within the same paper. Both types were ranked by their prevalence within the literature (n=47). The cells are coloured according to how often they appeared together within the dataset, starting from the highest in green to the lowest in red.

`Content Analysis`, the most common method in the dataset, was also the most common method for almost all dark pattern types (15%-36%), except `Attention Capture` (4%), which is visualised in the Table 3.2. The `Attention Capture` dark pattern type was more often used within a `User Study` with 13%. The method `User Study`, which was the second most common method within all papers, was not often used with `Sneaking`, `Obstruction` and `Nagging`, with less than 4% each. `Questions` was rarely used with `Sneaking`, `Social Engineering` and `Nagging`, with less than 4%. `Brainstormin` and the `Experiment` were both not used often with any dark pattern type, with 0% to 4%.

		Dark Pattern Types						
		Interface Interference	Forced Action	Sneaking	Obstruction	Social Engineering	Nagging	Attention Capture
Data-Gathering Methods	Content Analysis	0,36	0,30	0,23	0,21	0,15	0,15	0,04
	User Study	0,17	0,11	0,04	0,00	0,13	0,02	0,13
	Questions	0,11	0,11	0,04	0,09	0,09	0,02	0,04
	Brainstorming	0,04	0,04	0,02	0,02	0,00	0,00	0,00
	Experiment	0,00	0,00	0,00	0,02	0,00	0,00	0,00

Table 3.2: This table shows the correlation between different dark pattern types and data-gathering methods, through the percentage of how often they were coded within the same paper. The dark pattern types and the data-gathering methods are ranked by their prevalence within the literature (n=47). The cells are coloured according to how often they appeared together within the dataset, starting from the highest in green to lowest in red.

The code `Studying DPs`, was the most common main achievement and also appeared most often with all seven distinct dark pattern types (13%-40%). The code `Proposing a Solution` which was slightly more common than `Improving DP Research`, appeared less frequently with almost all dark pattern types (6% - 11%), than `Improving DP Research` did. Only , `Attention Capture` (11%) was more often coded together with `Improving DP Research`. `Improving DP Research` was coded often along `Interface Interference` (17%) and `Forced Action` (15%). The other dark pattern types appeared together with `Improving DP Research` in 4% to 11% of the papers. `Discussing Challenges` was only discussed often with `Interface Interference`, with 11% and `Forced Action` with 9%. The Table 3.3 demonstrates the allocation of different dark pattern types and the main achievement within the same document.

Only , `Attention Capture` (11%) was more often coded together with `Improving DP Research`, than `Proposing a Solution`

Table 3.4 illustrates the frequency with which various types of dark patterns were examined in the papers categorised under the label `Studying DPs`. All types of patterns were predominantly discussed in the context of `Identifying DPs`. Additionally, the investigation of `DP Effects` was common, with the exception of `Nagging`, which was only addressed in 4% of the studies. The exploration of `Prevalence of DP` was the least studied in the dataset, however, `Interface Interference` received the most

`Identifying DPs` was the most prevalent achievement with all seven dark pattern types

		Dark Pattern Types						
		Interface Interference	Forced Action	Sneaking	Obstruction	Social Engineering	Nagging	Attention Capture
Main Achievements	Studying DPs	0,40	0,34	0,21	0,21	0,21	0,13	0,13
	Proposing a Solution	0,09	0,06	0,06	0,00	0,04	0,02	0,11
	Improving DP Research	0,17	0,15	0,09	0,11	0,09	0,06	0,04
	Discussing Challenges	0,11	0,09	0,02	0,04	0,00	0,04	0,02

Table 3.3: This table shows the correlation between different dark pattern types and the main achievements, through the percentage of how often they were coded within the same paper. The dark pattern types and the main achievements are ranked by their prevalence within the literature (n=47). The cells are coloured according to how often they appeared together within the dataset, starting from highest in green to lowest in red.

attention when analysing the prevalence of dark pattern types, while `Social Engineering` (2%) and `Attention Capture` (0%) received the least focus. `DP Motives` were also infrequently examined, with no studies delving into `Social Engineering` and `Attention Capture`. `How DPs Work` was the least explored aspect and was only addressed in the context of `Interface Interference`.

		Dark Pattern Types						
		Interface Interference	Forced Action	Sneaking	Obstruction	Social Engineering	Nagging	Attention Capture
Studying DPs	Identifying DPs	0,30	0,30	0,17	0,19	0,15	0,11	0,09
	DP Effects	0,30	0,21	0,13	0,13	0,17	0,04	0,06
	Prevalence of DP	0,09	0,06	0,06	0,04	0,02	0,04	0,00
	DP Motives	0,04	0,04	0,04	0,02	0,00	0,02	0,00
	How DP work	0,02	0,00	0,00	0,00	0,00	0,00	0,00

Table 3.4: This table shows the correlation between different dark pattern types and the main achievement `Studying DPs`. This is done through the percentage of how often they were coded within the same paper. The dark pattern types and the subcategories of the achievement `Studying DPs` are ranked by their prevalence within the literature (n=47). The cells are coloured according to how often they appeared together within the dataset, starting from highest in green to lowest in red.

With twelve codes in the category domain in place, it was
observed that while `Digital Well-being` was a popu-
lar research topic, it was primarily examined in the context
of `Attention Capture` dark patterns (15%). `Digital
Well-being` was not discussed with `Sneaking` and
`Nagging`. The domain `Social Media` was discussed
with all seven dark pattern types, but most often to-
gether with `Attention Capture` patterns. `Interface
Interference` (9%), `Forced Action` (11%), and
`Social Engineering` (9%) were also mentioned more
often. `Privacy` was often studied with `Interface
Interference` patterns, with 13% of papers. `Apps` were
most often discussed with `Forced Action` patterns.
While `Interface Interference`, `Forced Action`,
`Sneaking`, `Obstruction`, and `Social Engineering`
were discussed in more than seven different domains,
`Nagging` and `Attention Capture` were studied in less
than four domains. The Table 3.5 displays how various
dark pattern types are distributed across different domains.

`Digital
Well-being` was
not discussed with
`Sneaking` and
`Nagging`

	Dark Pattern Types						
	Interface Interference	Forced Action	Sneaking	Obstruction	Social Engineering	Nagging	Attention Capture
Digital Well-Being	0,02	0,04	0,00	0,02	0,06	0,00	0,15
Social Media	0,09	0,11	0,06	0,06	0,09	0,04	0,15
Privacy	0,13	0,06	0,02	0,04	0,02	0,00	0,00
Apps	0,06	0,11	0,06	0,06	0,06	0,04	0,04
Advertisement	0,06	0,04	0,04	0,00	0,02	0,02	0,00
E-Commerce	0,06	0,04	0,02	0,00	0,06	0,00	0,00
Games	0,02	0,02	0,02	0,00	0,02	0,00	0,00
European Law	0,06	0,04	0,02	0,02	0,00	0,00	0,00
Extended Reality	0,02	0,02	0,00	0,00	0,00	0,00	0,00
IoT Devices	0,02	0,02	0,02	0,02	0,00	0,02	0,00
E-Mails	0,02	0,00	0,02	0,00	0,02	0,00	0,00
Safety Technology	0,02	0,02	0,00	0,02	0,02	0,00	0,00

(Row label header: **Domains**)

Table 3.5: This table shows the correlation between different dark pattern types and
the domains, through the percentage of how often different dark pattern types were
coded with a domain in the same paper. The dark pattern types and the domains
are ranked by their prevalence within the literature (n=47). The cells are coloured
according to how often they appeared together within the dataset. Starting from
highest in green to lowest in red.

Chapter 4

Evaluation

In this chapter, the final results are discussed while answering the four research questions introduced in the Introduction. Finally we conclude this chapter with the limitations of this work.

4.1 Discussion

This section discusses the results from the meta-analysis and answers the research questions outlined in the introductory chapter. The results will further be compared with the literature review conducted by Gray et al. [2023b].

4.1.1 Contributions within Dark Pattern Research

In this thesis, we reviewed 47 research papers about dark patterns, and determined their research contribution type by Wobbrock and Kientz [2016], which we defined in Section 3.1.3. Furthermore, we identified four main achievements, defined in Section 3.1.3, within dark pattern literature, that were frequently achieved. The contribution types and the main achievements were analysed, in order to find out what kind of contributions have been made for the field of dark pattern research (RQ2).

The prevalence of `Empirical` and `Theoretical` contributions align with the results from Gray et al [2023b], to some extent

While examining the research contributions, a notable emphasis is placed on `Empirical` studies, with occasional publications of `Theoretical` contributions. These findings align with those of Gray et al. [2023b] to some extent, as they observed many taxonomy-building publications in `Empirical` research papers. Other types of contributions are not as common in the realm of dark pattern studies.

`Studying DPs` was often a contribution of research papers

The main achievements, which also describe a contribution within dark pattern literature emphasise that the focus lies on the thorough analysis of dark patterns by identifying them, examining their influence on user behaviour, and determining their prevalence. Additionally, there remains a focus on proposing countermeasures against dark patterns and on enhancing research on dark patterns, which contradicts with Gray et al. [2023b]'s results, which indicate very few countermeasures on dark patterns. Less frequently explored are challenges associated with dark patterns, including uncertainties regarding the responsibility and the effectiveness of laws aimed at combating them. Literature has been thoroughly examining the impact of dark patterns on user behaviour. Nevertheless, the underlying motives behind dark patterns, how they work and the prevalence of them are areas that have received less attention in the CHI community. Additionally, there was only one study on ontology, one on terminology and three research methods, which is relatively limited considering the significance of these topics [Gray et al., 2023b].

4.1.2   Dark Pattern Types within Studies

34 out of the 47 reviewed research papers focused on at least one dark pattern type, which were defined in Section 3.1.3. In order to find out, to which extent the various types of dark patterns have been investigated (RQ1), the prevalence of all codes with every dark pattern type were analysed in Section 3.2.4.

Our results indicate that all seven categories of deceptive design patterns have been thoroughly examined. Among them, `Interface Interference` and `Forced Action` have received the most attention, while `Nagging` and `Attention Capture` have been studied to a lesser extent. `Interface Interference` and `Forced Action` were often investigated together in the same research paper, suggesting that these two forms of deceptive practices often coexists in a user interface. All seven deceptive design patterns were primarily found in `Empirical` or `Theoretical` studies.

`Interface Interference` and `Forced Action` were most often studied

There has been a greater emphasis on studying and analysing dark patterns rather than developing solutions to combat them. This could be attributed to the necessity of understanding why and how these patterns adversely impact users before devising effective countermeasures. Consequently, research papers tend to focus more on identifying the presence and effects of deceptive design patterns before delving into solution strategies.

There are less countermeasures against dark patterns, than studies focusing to understand dark patterns

The majority of discussions on deceptive design patterns were centered around `Digital Well-Being` and `Social Media`. In general, many studies focused on areas involving interactions with other users or stakeholders, such as `Social Media`, `E-Mails`, `Advertisement`, and `Extended Reality`. Additionally, a significant number of research papers emphasised the user's health, specifically their `Digital Well-Being`. `Interface Interference` and `Forced Action` were commonly analysed concerning `Apps`, `Privacy`, and `Social Media`. Both types of dark patterns were explored across all domains, except for `E-Mails`, which specifically employed `Interface Interference`, `Nagging`, and `Social Engineering`. Possibly indicating to be challenging for designers, to implement other types of dark patterns in `E-Mail` communications.

Dark pattern research focused on users health and interfaces, where users interact with each other, the most

`Attention Capture` has primarily been investigated in isolation, possibly because this particular dark pattern was added as a seventh category to the existing ontology by Gray et al. [2023c], in Section 3.1.3. Additionally, `Attention Capture` is a category that was adapted

from a well-established taxonomy [Monge Roffarello et al., 2023], primarily designed for dark patterns found in social media platforms. The remaining six categories are intended to be applicable across various platforms and devices, as noted by Gray et al. [2023c], hence they tend to co-occur more frequently. Additionally, `Attention Capture` stands out as the dark pattern type which had the most countermeasures in CHI literature. The frequent association of `Attention Capture` with `Digital Well-Being` and `Social Media` might imply that researchers consider attention-grabbing tactics to be the most problematic deceptive strategy targeting users.

`Attention Capture` had the most countermeasures

All categories of dark patterns were extensively examined, yet there was limited discussion on how they work and the reasons driving designers to employ such strategies. While it is clear that these techniques benefit the website and service owners, the specific advantages they yield have not been frequently addressed. Additionally, despite the frequent identification and discussion of dark patterns across different interfaces, there has been a scarcity of comprehensive quantitative studies exploring their prevalence in diverse domains.

It was not often discussed, how dark patterns work

When examining various domains, it was observed that there is a wide range of domains with distinct focuses and purposes. Notably, the types of dark patterns known as `Nagging` and `Attention Capture` were investigated in fewer than half of these domains, suggesting that these specific dark pattern types have not been thoroughly researched or are not prevalent in the majority of domains. Moreover, in the context of `Extended Reality`, the focus was on studying `Interface Interference` and `Forced Action`, implying that other dark pattern types are less common in the realm of `Extended Reality`. A similar trend was observed in the domain of `E-Mails`, where only `Interface Interference`, `Sneaking`, and `Social Engineering` were explored, indicating that integrating other dark pattern types into this medium might be difficult.

Some domains were only studied with specific dark pattern types

4.1.3 Dark Pattern Research between 2010 and 2023

By organizing our findings chronologically, we successfully traced the initial discovery of various types of dark patterns in CHI conferences and tracked the evolution of dark pattern research (RQ3). Examining publications from different years also allowed us to gauge the current topics of interest among researchers in the dark pattern community (RQ4).

In 2010, Harry Brignull introduced the concept of dark patterns, however, the first scholarly mention of dark patterns in the context of CHI occurred in 2013. Since then from 2013 to 2017, there was a scarcity of publications on dark patterns, with no more than one paper per year dedicated to the topic. It was not until 2018 that there was a notable surge in research and interest in dark patterns, indicating a growing concern among scholars in this field. However, in 2022, there was a slight decline in the volume of dark pattern publications, mirroring the general trend of submissions and acceptances for CHI '22. In 2021, CHI '21 received around 4100 submissions, whereas CHI '22 saw a slightly lower number of submissions, close to 3800, possibly influenced by the ongoing impact of Covid-19, which was particularly severe in early 2022[1] worldwide. Nonetheless, in 2023, the body of literature on dark patterns reached its peak with 15 publications in CHI and CHI EA. Fueled by the growing interest of researchers and the increasing publication output each year, all the categories studied have shown a consistent rise in numbers over time.

> Mirroring the decrease of submissions for CHI '22, there were less dark pattern publications in 2022

The initial research papers focused on three dark pattern types: `Forced Action, Interface Interference` and `Sneaking`, which might indicate them to be easily identifiable as manipulative tactics aimed at harming users for the benefit of the service. `Attention Capture` and `Social Engineering` were identified as dark patterns at a later stage compared to the other types. It is noteworthy that the original dark pattern types outlined by Gray et al. [2018] emerged in the research before the recognition of `Social Engineering` and `Attention Capture` as

> Studies on `Attention Capture` and `Social Engineering` started more recently in 2019/2020

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[1]https://data.who.int/dashboards/covid19/cases?n=c, Accessed: 18.03.2024

dark patterns. This delay in recognition may be attributed to the fact that pressuring users through social psychology and exploiting techniques to capture a user's attention were acknowledged as dark patterns only in a later phase [Lukoff et al., 2021b, Mathur et al., 2019].

The appearance of `Survey` contributions suggests a big research field, with a need of summarised knowledge

`Empirical` studies were published quite early, but the difference in the amount of publications compared to other contributions, became more pronounced around 2021, in the same year, when `Theoretical` and `Survey` contributions were more often published. This shift may be attributed to the limited number of contributions in the early years and the increasing number of publications since 2018. The appearance of `Survey` contributions in 2021 suggests a substantial amount of research on dark patterns has already been conducted, as `Survey` contributions typically emerge when a research field has accumulated numerous contributions and sufficient knowledge to summarise research papers [Wobbrock and Kientz, 2016]. The emergence of more `Theoretical` contributions suggests a need and interest for researchers to find a common language and definitions to improve the research field [Gray et al., 2023b].

More researchers started to publicate research to improve future research

It is noteworthy that there has been a focus on countermeasures in publications since 2013, suggesting that the identification of countermeasures may have been a significant concern for researchers as dark patterns became more prominent. Starting from 2018, there has been an increasing amount of research specifically on dark patterns, a trend that has continued up to 2023 and could further rise in 2024. In 2021, researchers began enhancing their studies by introducing new approaches, classifications, and explanations, likely in response to the growing attention on dark patterns and the substantial volume of publications.

Primarily, `Content Analysis` and `User Study` were the primary approaches utilised for collecting information and insights on dark patterns, while `Brainstorming` has seen increased adoption since 2021.

`Social Media` has been consistently emphasised in dark pattern research papers, revealing numerous issues related to user's consumption of social media content. The exploration of `Digital Well-being` has also become a common focus, emerging as a research area starting in 2020.

Summarising the current focus of researchers on dark patterns in 2023, there is a balanced interest in studying various types of dark patterns, with `Interface Interference` and `Forced Action` receiving slightly more attention than others. The preferred methods for acquiring knowledge were `Content Analysis` and `User Study`, although there is a recent increase in the use of `Brainstorming` techniques like `Discussions` and `Focus Groups`. Among the types of contributions, `Empirical` studies are the most prevalent, followed by a few `Theoretical` and `Survey` contributions. No other types of contributions were explored in 2023. Researchers are interested in main achievements such as `Studying DPs`, `Proposing a Solution`, `Improving DP Research`, and `Discussing Challenges`, indicating that these areas, were not researched enough and remain as a focus within the community. This trend is also reflected in the extensive range of domains where dark patterns are identified and investigated in 2023.

A currently rising interest of researchers is the use of `Brainstorming` methods

4.1.4 Comparison with prior Research

In 2023 Gray et al. [2023b] published their systematic review of dark pattern literature, to identify trends and research gaps. Their method resembles the method used in this thesis, as they used the PRISMA Statement [Page et al., 2021], to identify and screen literature for their analysis. Contradicting to our corpus, they included the most relevant literature found through Google Scholar[2] and the ACM digital library[3], found with the keyword "dark patterns". Literature for their review needed to be empirical and published within a conference, a journal paper, as a government report or in similiar venues. Also dark pat-

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[2]https://scholar.google.com
[3]https://dl.acm.org

terns had to be mentioned in text at least once. Press article, workshops, abstracts, theses and similiar publication types, were excluded. They analysed a dataset of 79 papers.

Similiar to our results, they find that domains, focusing on interactions with users and stakeholder were most often studied. Also, they looked more into specific functionality and found that consent banners were studied excessively, which were only rarely a subject of our literature. We identified six papers within privacy, which some of them were about consent banners. These difference in findings could be, as we looked at only CHI conference papers, where the focus was less on consent banners, and Gray et al. focused on all kinds of publication papers. Another possible reason could be, that consent banners are a topic of interest for internet users, and therefore public press articles have been focusing on dark patterns as well [Hupe, 2022, Todd, 2023], which might make consent banner publications more relevant on google.scholar and the ACM digital library.

Contradictingly to our results, Gray et al. [2023b]'s dataset focused primarily on consent banners

Just like Gray et al. we also noticed a predominant use of content analysis within dark pattern research papers. The second most common method in their paper were experimental methods. We noticed the same method, which we classified as `User Studies` in this thesis. Also our findings of literature focusing on `Studying DPs`, aligned with Gray et al.'s findings, as they noticed, that a lot of their literature had evaluative and descriptive framings. These framings indicate, that dark patterns were often evaluated, studied and described. Gray et al. mentioned in their findings, that especially a common language for users is still missing, which was also only once focus in a paper of our dataset.

Many results aligned with the findings from Gray et al. [2023b]

4.2   Limitations

The initial limitations of this thesis were explained in Section 3.1.2, and will be further summarised in this section, coupled with additional limitations. Due to constraints in time and resources typical of a bachelor thesis, only conference papers from CHI were considered and reviewed.

Since the analysis was carried out by a single individual, there is a possibility of inaccuracies in the coding of the literature. Despite conducting a double analysis and coding of the dataset in Section 3.1.3, there may still be some qualitative imperfections.

There might be errors, in the data

As observed during the search in the ACM digital library for dark pattern literature, it became evident that not all papers related to dark patterns were retrieved. Hence, there is a likelihood that additional research papers, whether directly or indirectly writing about dark patterns, were not included in this thesis.

Possibly not all dark pattern papers within CHI were identified

The quantity of 47 papers is relatively small, which may diminish the significance of statistical outcomes compared to studies with larger datasets, as demonstrated in the analysis by Gray et al. [2023b]. With only 47 research papers in the literature corpus, it was challenging to group research topics into broader categories, often resulting in single coding instances throughout the dataset.

A small literature corpus is less representative than a big one

Chapter 5

Summary and Future Work

In this chapter, the summary and contributions of this thesis are discussed. Also we introduce possible future work, that may be conducted after this thesis.

5.1 Summary and Contributions

The objective of this thesis was to identify a gap in the current dark pattern literature and to enhance the comprehension of dark patterns. To achieve this, a thorough review of the existing literature and a meta-analysis were conducted to explore the research questions, outlined in the Introduction:

RQ1 How thoroughly have different dark pattern types been researched?

RQ2 What kind of research contributions have been made for dark patterns?

RQ3 How has dark pattern research evolved over time?

RQ4 What are current topics of interest for dark pattern scholars within the SIGCHI community?

Our meta-analysis reveals that various types of dark patterns are predominantly studied within the realms of `Digital Well-Being` and interaction focused domains, particularly in domains like `Social Media and Games`. `Attention Capture` dark patterns are especially often examined in the context of `Social Media` and `Digital Well-Being`, and they are also the subject of numerous proposed countermeasures presented at CHI conferences. Additionally, our findings indicate a wide range of domains being investigated, complicating the identification of relationships between them. The issues of accountability for deceptive interface techniques and if laws relating to dark patterns are abided, remains unresolved and continues to be a focal point in recent research publications.

`Social Media`, `Games` and `Digital-Well-Being` were the most prevalent domains

While `Empirical` studies have been common in dark pattern research since 2013, recent attention has been given to `Theoretical` frameworks and `Survey` contributions. This shift highlights the importance and interest among researchers in developing more widely understood languages, definitions, and concise summaries of dark pattern knowledge. A deficiency was discovered in the lack of a ontologies, terminologies, and methodologies, which has the potential to significantly improve future studies. Additionally, a gap was observed in understanding the motives, prevalence, and mechanisms of dark patterns.

There are notable gaps, within dark pattern research

5.2   Future Work

Future work following this thesis may include a similar review, with a larger body of literature, since the number of 47 papers is relatively small and could reduce the significance of statistical results.

Additionally, the seven types of dark patterns investigated in this study were quite broad, leading to their presence in multiple papers simultaneously. Therefore, a study that delves into specific pattern types, such as the meta- or low-level patterns outlined in Gray et al. [2023c, 2024]'s ontology, could offer a more precise and comprehensive insight into the prevalence and depth of different dark patterns.

Further research could delve into more specific dark pattern types

There is further research on deceptive design practices in various venues, including conferences like DIS and IDC, as well as in journals and regulatory documents, which were not integrated into this study. It could be beneficial to explore whether the results of this meta-analysis differ when considering these additional sources. Future research could shift its focus from tracing the evolution of deceptive design research over time to concentrating on recent findings presented at different conferences.

Future research could focus on different conferences

As mentioned in the discussion, forthcoming work could also work towards a common terminology, ontology or methodology for dark pattern research, addressing the issue of who is accountable for deceptive strategies in interfaces or find out the prevalence, motives or mechanisms behind dark patterns. Moreover, as countermeasures targeting `Attention Capture` patterns were the most frequent, future studies could explore additional strategies to combat other types of dark patterns, such as `Obstruction`, which currently lacks any countermeasures, as well as `Nagging` and `Social Engineering`, for which countermeasures are limited.

Future work could be within the identified gaps in our literature review

Appendix A

Unscreened Dataset

This table shows the unscreened dataset, which was gathered in Section 3.1.2. InitialSearch are the papers found through the first search and initial keywords, References are the papers identified through the references and NewSearch are the papers added through the adjusted search and more keywords. The records, that were not a paper, are not in this table, as they could not be cited. The eight records were the *Proceedings of the 2021 CHI conference on human factors in computing systems*, the *Extended abstracts of the 2021 and 2023 CHI conference on human factors in computing systems*, the *Companion proceedings of the annual symposium on computer-human interaction in play* in 2023, the *Proceedings of the 5th international conference on conversational user interfaces* in 2023, the *Proceedings of the 22nd annual ACM interaction design and children conference* in 2023, the *Proceedings of the 25th international conference on mobile human-computer interaction* in 2023 and the *Proceedings of the 36th annual ACM symposium on user interface software and technology* in 2023.

Unreviewed Dataset: PART 1/5					
Reference	Derived From	Screened	Eligible	DP mentioned	Conference
[Pinder et al., 2017]	InitialSearch	✓	✓	✗	MobileHCI
[Lyckvi and Torgersson, 2018]	InitialSearch	✓	✓	✗	MobileHCI
[Woźniak et al., 2021]	InitialSearch	✗	✗	✓	MobileHCI
[Monge Roffarello and De Russis, 2023]	InitialSearch	✓	✓	✗	MobileHCI
[Datta et al., 2022]	References	✓	✓	✗	IUI
[Fitton and Read, 2019]	InitialSearch	✓	✓	✗	IDC
[Dowthwaite et al., 2020]	InitialSearch	✗	✗	✓	IDC
[Van Mechelen et al., 2020]	InitialSearch	✗	✗	✓	IDC
[Landesman et al., 2023]	InitialSearch	✗	✗	✓	IDC
[Grace et al., 2023]	InitialSearch	✗	✗	✓	IDC
[Lacey and Caudwell, 2020]	InitialSearch	✓	✓	✗	HRI
[Desai et al., 2023]	NewSearch	✗	✗	✓	CUI
[Avanesi et al., 2023]	InitialSearch	✓	✓	✗	CUI
[Chen et al., 2023]	InitialSearch	✓	✓	✗	UIST
[Ravenet, 2021]	InitialSearch	✗	✗	✗	ICMI
[Greenberg et al., 2014]	InitialSearch	✓	✓	✗	DIS
[Chivukula et al., 2018]	References	✓	✓	✗	DIS
[Fikar et al., 2018]	NewSearch	✗	✗	✗	DIS
[Thibault et al., 2020]	InitialSearch	✗	✗	✗	DIS
[Gray et al., 2020]	InitialSearch	✓	✓	✗	DIS
[Bongard-Blanchy et al., 2021]	InitialSearch	✓	✓	✗	DIS
[Chaudhary et al., 2022]	InitialSearch	✓	✓	✗	DIS
Continued on next page					

Unreviewed Dataset: PART 2/5					
Reference	**Derived From**	**Screened**	**Eligible**	**DP mentioned**	**Conference**
[Kender and Frauenberger, 2022]	InitialSearch	✓	✓	✗	DIS
[Guzij et al., 2022]	InitialSearch	✗	✗	✓	DIS
[Altarriba Bertran et al., 2023]	NewSearch	✗	✗	✓	DIS
[Eghtebas et al., 2023]	InitialSearch	✓	✓	✗	DIS
[Sánchez Chamorro et al., 2023]	InitialSearch	✓	✓	✗	DIS
[Mildner et al., 2023a]	InitialSearch	✓	✓	✗	DIS
[Paek et al., 2011]	InitialSearch	✗	✗	✗	CHI
[Adar et al., 2013]	InitialSearch	✓	✓	✓	CHI
[Dombrowski et al., 2016]	References	✓	✓	✗	CHI
[Chang et al., 2016]	References	✓	✓	✗	CHI
[Aylett and Lawson, 2016]	InitialSearch	✗	✗	✗	CHI
[Chen et al., 2017]	InitialSearch	✗	✗	✓	CHI
[Vitale et al., 2017]	InitialSearch	✗	✗	✓	CHI
[Gray et al., 2018]	InitialSearch	✓	✓	✓	CHI
[Fritsch et al., 2018]	InitialSearch	✗	✗	✓	CHI
[Kaptelinin, 2018]	InitialSearch	✗	✗	✓	CHI
[Melcer and Isbister, 2018]	InitialSearch	✗	✗	✗	CHI
[Tran et al., 2019]	InitialSearch	✗	✗	✓	CHI
Moser et al. [2019]	InitialSearch	✓	✓	✓	CHI
[Chivukula et al., 2019a]	InitialSearch	✓	✓	✓	CHI
[Tomlinson, 2020]	NewSearch	✗	✗	✗	CHI
[Lyngs et al., 2020]	References	✓	✓	✗	CHI
[Nouwens et al., 2020]	References	✓	✓	✓	CHI
[Rogers et al., 2020]	InitialSearch	✓	✓	✗	CHI
Continued on next page					

Unreviewed Dataset: PART 3/5					
Reference	**Derived From**	**Screened**	**Eligible**	**DP mentioned**	**Conference**
[Monaco, 2020]	InitialSearch	✗	✗	✓	CHI
[Di Geronimo et al., 2020]	InitialSearch	✓	✓	✓	CHI
[Chivukula et al., 2020]	InitialSearch	✗	✗	✓	CHI
[McNutt et al., 2020]	InitialSearch	✓	✓	✗	CHI
[Morreale and Eriksson, 2020]	InitialSearch	✗	✗	✓	CHI
[Swart et al., 2020]	InitialSearch	✓	✓	✓	CHI
[Mhaidli and Schaub, 2021]	References	✓	✓	✓	CHI
[Lukoff et al., 2021b]	References	✓	✓	✓	CHI
[Gray et al., 2021]	InitialSearch	✓	✓	✓	CHI
[Alexandrovsky et al., 2021]	InitialSearch	✓	✓	✓	CHI
[Mathur et al., 2021]	InitialSearch	✓	✓	✓	CHI
[Pitt et al., 2021]	InitialSearch	✗	✗	✓	CHI
[Chivukula et al., 2021]	InitialSearch	✗	✗	✓	CHI
[Westin and Chiasson, 2021]	InitialSearch	✓	✓	✓	CHI
[Dingler et al., 2021]	InitialSearch	✗	✗	✓	CHI
[Baughan et al., 2022]	NewSearch	✓	✓	✗	CHI
[Tseng et al., 2022]	InitialSearch	✓	✓	✗	CHI
[Kitkowska et al., 2022]	InitialSearch	✓	✓	✗	CHI
[H. Tan et al., 2022]	InitialSearch	✗	✗	✓	CHI
[Zhang et al., 2022]	InitialSearch	✗	✗	✗	CHI
[Petrovskaya et al., 2022]	InitialSearch	✓	✓	✓	CHI
[Habib et al., 2022]	InitialSearch	✓	✓	✓	CHI
Continued on next page					

Unreviewed Dataset: PART 4/5					
Reference	Derived From	Screened	Eligible	DP mentioned	Conference
[Gugenheimer et al., 2022]	InitialSearch	✗	✗	✓	CHI
[Buruk et al., 2023]	NewSearch	✗	✗	✓	CHI
[Ehsan et al., 2023]	InitialSearch	✗	✗	✓	CHI
[Berger et al., 2023]	InitialSearch	✓	✓	✓	CHI
[Kowalczyk et al., 2023]	InitialSearch	✓	✓	✓	CHI
[Stefanidi et al., 2023]	InitialSearch	✗	✗	✓	CHI
[Chordia et al., 2023]	InitialSearch	✓	✓	✓	CHI
[Purohit et al., 2023]	InitialSearch	✓	✓	✓	CHI
[Sergeeva et al., 2023]	InitialSearch	✓	✓	✗	CHI
[Mo and Kristensson, 2023]	InitialSearch	✓	✓	✗	CHI
[Bonnail et al., 2023]	InitialSearch	✗	✗	✓	CHI
[Hidaka et al., 2023]	InitialSearch	✓	✓	✓	CHI
[Lisnic et al., 2023]	InitialSearch	✓	✓	✗	CHI
[Chiossi et al., 2023]	InitialSearch	✓	✓	✓	CHI
Monge Roffarello et al. [2023]	InitialSearch	✓	✓	✓	CHI
[Bouma-Sims et al., 2023]	InitialSearch	✓	✓	✗	CHI
[Mildner et al., 2023b]	InitialSearch	✓	✓	✓	CHI
[Kyi et al., 2023]	InitialSearch	✓	✓	✓	CHI
[van der Linden et al., 2011]	InitialSearch	✗	✗	✗	UbiComp
[Sokol et al., 2015]	InitialSearch	✗	✗	✗	UbiComp
[Norval et al., 2018]	InitialSearch	✗	✗	✓	UbiComp
[Dechant et al., 2023]	NewSearch	✗	✗	✓	CHIPLAY
[Seaborn, 2023]	InitialSearch	✗	✗	✓	CHIPLAY
[Frommel et al., 2023]	InitialSearch	✓	✓	✗	CHIPLAY
Continued on next page					

Unreviewed Dataset: PART 5/5					
Reference	Derived From	Screened	Eligible	DP mentioned	Conference
[Pienta et al., 2016]	NewSearch	✗	✗	✗	AVI
Linehan et al. [2015]	InitialSearch	✓	✓	✓	CHI EA
[Pinder, 2017]	References	✓	✓	✓	CHI EA
[Fansher et al., 2018]	InitialSearch	✓	✓	✓	CHI EA
[Chivukula et al., 2019b]	InitialSearch	✓	✓	✓	CHI EA
[Purohit et al., 2020]	References	✓	✓	✓	CHI EA
[Mathur, 2021]	InitialSearch	✓	✓	✓	CHI EA
[Tahaei and Vaniea, 2021]	InitialSearch	✓	✓	✓	CHI EA
[Mildner and Savino, 2021]	InitialSearch	✓	✓	✓	CHI EA
[Kollnig et al., 2021]	InitialSearch	✓	✓	✓	CHI EA
[Rogers et al., 2021]	InitialSearch	✗	✗	✗	CHI EA
[Lukoff et al., 2021a]	InitialSearch	✓	✓	✓	CHI EA
[Ma and Birrell, 2022]	References	✓	✓	✓	CHI EA
[Aagaard et al., 2022]	InitialSearch	✓	✓	✓	CHI EA
[Monge Roffarello and De Russis, 2022]	InitialSearch	✓	✓	✓	CHI EA
[Dickinson et al., 2022]	InitialSearch	✓	✓	✓	CHI EA
[Tiemessen et al., 2023]	InitialSearch	✓	✓	✓	CHI EA
[Gray et al., 2023c]	InitialSearch	✓	✓	✓	CHI EA
[Gray et al., 2023a]	InitialSearch	✓	✓	✗	CHI EA
[Gray et al., 2023d]	InitialSearch	✓	✓	✓	CHI EA
[Sánchez Chamorro, 2023]	InitialSearch	✓	✓	✓	CHI EA
[Birk et al., 2023]	InitialSearch	✓	✓	✓	CHI EA
[Gray et al., 2023b]	InitialSearch	✓	✓	✗	DIS Companion
[Diana et al., 2015]	NewSearch	✗	✗	✗	ICMI-MLMI

Table A.1

Appendix B

Reviewed Dataset

This table shows all the 27 dark pattern papers, that were reviewed in this thesis. Also all the codes that describe each paper are shown in this table, which are further described in the codebook C or in the Section 3.1.3. The letters S, Q and B, which are written after the codes of the Data-Gathering Method Subset, stand for Questions, User Study and Brainstorming. They symbolise, to which category they belong.

Reviewed Dataset: PART 1/4

Paper Type	Research Contribution Type	Main Achievement	Main Achievement Subset	DP Type	Domain	Data-Gathering Method	Data-Gathering Method Subset	Country	Reference
Conference Paper	Empirical	Improving DP Research, Studying DPs	DP Motives, Identifying DPs, Taxonomy	Forced Action, Interface Interference, Nagging, Obstruction, Sneaking	IoT Devices	Content Analysis	nan	Not Specified	[Kowalczyk et al., 2023]
Conference Paper	Empirical, Theoretical	Improving DP Research, Studying DPs	DP Effects, Defining DPs, Identifying DPs, Taxonomy	Forced Action, Interface Interference, Obstruction, Social Engineering	Apps, Safety Technology	Content Analysis, Questions	Interview(Q)	US	[Chordia et al., 2023]
Conference Paper	Empirical	Proposing a Solution	Solution for Users	Attention Capture	Digital Well-being, Social Media	User Study	Field Study, Survey(S)	US	[Purohit et al., 2023]
Conference Paper	Empirical	Improving DP Research, Proposing a Solution, Studying DPs	DP Effects, Identifying DPs, Solution for Designers, Taxonomy	Interface Interference, Sneaking, Social Engineering	Advertisement, E-Mails	Content Analysis, User Study	Interview(S), Lab Study, Think-Aloud-Protocol(S)	Not Specified	[Sergeeva et al., 2023]
Conference Paper	Empirical, Theoretical	Proposing a Solution	Solution for Designers	Interface Interference	E-Commerce	User Study	Lab Study, Rating(S), Survey(S)	UK	[Mo and Kristensson, 2023]
Conference Paper	Empirical, Theoretical	Improving DP Research, Studying DPs	Identifying DPs, Taxonomy	Forced Action, Interface Interference, Nagging, Obstruction, Sneaking	Apps	Content Analysis	nan	Japan	[Hidaka et al., 2023]

Conference Paper	Empirical	Proposing a Solution, Studying DPs	DP Effects	Attention Capture	Digital Well-being, Social Media	User Study	Lab Study, Survey(S)	Germany	[Chiossi et al., 2023]
Conference Paper	Survey, Theoretical	Improving DP Research, Studying DPs	Defining DPs, Identifying DPs, Taxonomy	Attention Capture	Digital Well-being	Content Analysis	nan	Not Specified	Monge Roffarello et al. [2023]
Conference Paper	Empirical, Theoretical	Improving DP Research, Studying DPs	Defining DPs, Identifying DPs, Taxonomy	Attention Capture, Forced Action, Interface Interference, Social Engineering	Social Media	Content Analysis, User Study	Field Study, Think-Aloud-Protocol(S)	Germany	[Mildner et al., 2023b]
Conference Paper	Empirical	Discussing Challenges, Improving DP Research, Studying DPs	DP Effects, Identifying DPs, Law Abiding	Forced Action, Interface Interference, Obstruction	European Law, Privacy	Content Analysis, Questions	Survey(Q)	Europe	[Kyi et al., 2023]
Late-Breaking-Work	Empirical	Studying DPs	DP Effects	Social Engineering	E-Commerce	User Study	Field Study, Survey(S)	Europe	[Tiemessen et al., 2023]
Late-Breaking-Work	Survey, Theoretical	Improving DP Research	Defining DPs, Ontology, Terminology	Forced Action, Interface Interference, Nagging, Obstruction, Sneaking, Social Engineering	nan	Content Analysis	nan	Not Specified	[Gray et al., 2023c]

Reviewed Dataset: PART 2/4

Paper Type	Research Contribution Type	Main Achievement	Main Achievement Subset	DP Type	Domain	Data-Gathering Method	Data-Gathering Method Subset	Country	Reference
Special-Interest-Group Discussion	nan	Improving DP Research, Proposing a Solution	Defining DPs, Research Methods, Solution for Designers, Solution for Users, Terminology	nan	nan	Brainstorming	Discussion(B)	Not Specified	[Gray et al., 2023d]
Late-Breaking-Work	Empirical	Proposing a Solution, Studying DPs	DP Effects, Identifying DPs, Solution for Designers	nan	nan	Content Analysis, User Study	Interview(S), Lab Study	Not Specified	Sánchez Chamorro, [2023]
Workshop	nan	Discussing Challenges, Improving DP Research, Studying DPs	DP Effects, Responsibility	nan	Digital Well-being, Games	Brainstorming	Focus Groups(B)	Not Specified	[Birk et al., 2023]
Conference Paper	Empirical	Discussing Challenges, Proposing a Solution, Studying DPs	DP Effects, Responsibility, Solution for Designers	Attention Capture	Digital Well-being, Social Media	User Study	Field Study, Interview(S), Logging(S), Survey(S)	US	[Baughan et al., 2022]
Conference Paper	Theoretical	Discussing Challenges, Improving DP Research, Studying DPs	DP Effects, Defining DPs, Identifying Challenges, Identifying DPs, Taxonomy	Forced Action, Interface Interference	Extended Reality	Brainstorming	Discussion(B), Focus Groups(B)	Not Specified	[Tseng et al., 2022]

Conference Paper	Empirical	Studying DPs	DP Effects, Prevalence of DP	Forced Action, Interface Interference, Sneaking, Social Engineering	Games	Content Analysis	nan	Not Specified	[Petrovskaya et al., 2022]
Conference Paper	Empirical	Studying DPs	DP Effects, Identifying DPs	Forced Action, Interface Interference, Social Engineering	E-Commerce, Privacy	Content Analysis, User Study	Field Study, Survey(S)	Not Specified	[Habib et al., 2022]
Late-Breaking-Work	Empirical	Studying DPs	DP Effects, How DPs work	Interface Interference	Privacy	User Study	Field Study, Logging(S)	US	[Ma and Birrell, 2022]
Late-Breaking-Work	Empirical	Discussing Challenges, Proposing a Solution, Studying DPs	DP Effects, DP Motives, Responsibility, Solution for Designers	nan	Digital Well-being, Games	Brain-storming, User Study	Discussion(B), Field Study, Focus Groups(B), Interview(S)	Not Specified	[Aagaard et al., 2022]
Late-Breaking-Work	Empirical	Studying DPs	DP Effects, Identifying DPs	Attention Capture, Forced Action, Social Engineering	Apps, Digital Well-being, Social Media	User Study	Field Study, Logging(S), Survey(S)	Not Specified	[Monge Roffarello and De Russis, 2022]
Late-Breaking-Work	Empirical	Studying DPs	DP Effects, Identifying DPs	Obstruction	nan	Brain-storming, Experiment	Scenario Construction(B), lab experiment	Not Specified	[Dickinson et al., 2022]

Reviewed Dataset: PART 3/4

Paper Type	Research Contribution Type	Main Achievement	Main Achievement Subset	DP Type	Domain	Data-Gathering Method	Data-Gathering Method Subset	Country	Reference
Conference Paper	Theoretical	Discussing Challenges, Improving DP Research, Studying DPs	Defining DPs, Identifying Challenges, Identifying DPs, Taxonomy	nan	Advertisement, Extended Reality	Brainstorming	Focus Groups(B), Scenario Construction(B)	US	[Mhaidli and Schaub, 2021]
Conference Paper	Empirical	Proposing a Solution, Studying DPs	Identifying DPs, Solution for Designers	Attention Capture, Forced Action, Social Engineering	Apps, Digital Well-being, Social Media	Questions, User Study	Interview(S), Lab Study, Sketching(S), Survey(Q), Survey(S), Think-Aloud-Protocol(S)	US	[Lukoff et al., 2021b]
Conference Paper	Empirical	Studying DPs	DP Effects, DP Motives, Identifying DPs	Forced Action, Interface Interference, Sneaking	European Law, Privacy	Content Analysis	nan	Europe	[Gray et al., 2021]
Conference Paper	Methodological, Survey	Improving DP Research, Studying DPs	DP Effects, DP Motives, Research Methods	nan	nan	Content Analysis	nan	Not Specified	[Mathur et al., 2021]
Conference Paper	Empirical, Theoretical	Studying DPs	DP Effects	Social Engineering	Digital Well-being, Social Media	Questions	Interview(Q)	Not Specified	[Westin and Chiasson, 2021]
Outstanding Dissertation Award	Methodological, Survey	Improving DP Research	Defining DPs, Research Methods	nan	nan	nan	nan	Not Specified	[Mathur, 2021]

Late-Breaking-Work	Empirical	Discussing Challenges, Proposing a Solution	Responsibility, Solution for Designers	Forced Action, Interface Interference, Nagging	Advertisement	User Study	Lab Study	Not Specified	[Tahaei and Vaniea, 2021]
Late-Breaking-Work	Empirical	Studying DPs	DP Effects, Identifying DPs	Interface Interference, Obstruction	Digital Well-being, Privacy, Social Media	Content Analysis, Questions	Survey(Q)	Not Specified	[Mildner and Savino, 2021]
Late-Breaking-Work	Artefact, Theoretical	Proposing a Solution	Solution for Users	nan	Apps, Digital Well-being	User Study	Field Study	Not Specified	[Kollnig et al., 2021]
Workshop	nan	Improving DP Research, Proposing a Solution	Defining DPs, Solution for Designers, Solution for Users	nan	nan	Brain-storming	Focus Groups(B)	Not Specified	[Lukoff et al., 2021a]
Conference Paper	Empirical	Proposing a Solution	Solution for Users	nan	Digital Well-being, Social Media	User Study	Field Study, Interview(S), Logging(S), Survey(S)	UK	[Lyngs et al., 2020]
Conference Paper	Empirical	Discussing Challenges, Studying DPs	DP Effects, Law Abiding, Prevalence of DP	Interface Interference	European Law, Privacy	Content Analysis, User Study	Field Study, Survey(S)	UK, US	[Nouwens et al., 2020]
Conference Paper	Dataset, Empirical	Studying DPs	DP Effects, Identifying DPs, Prevalence of DP	Forced Action, Interface Interference, Nagging, Obstruction, Sneaking	Apps	Content Analysis, Questions	Survey(Q)	US	[Di Geronimo et al., 2020]

Reviewed Dataset: PART 4/4

Paper Type	Research Contribution Type	Main Achievement	Main Achievement Subset	DP Type	Domain	Data-Gathering Method	Data-Gathering Method Subset	Country	Reference
Conference Paper	Artefact	Proposing a Solution	Solution for Users	Sneaking	Advertisement, Social Media	User Study	Field Study, Protocol(S), Survey(S)	Not Specified	[Swart et al., 2020]
Late-Breaking-Work	Artefact	Proposing a Solution	Solution for Users	Attention Capture	Digital Well-being, Social Media	Questions	Survey(Q)	Not Specified	[Purohit et al., 2020]
Conference Paper	Empirical	Studying DPs	DP Effects, Identifying DPs	Forced Action, Interface Interference, Sneaking, Social Engineering	E-Commerce	Content Analysis, Questions	Survey(Q)	US	Moser et al. [2019]
Conference Paper	Methodological	Proposing a Solution, Studying DPs	DP Effects, Solution for Designers	nan	nan	User Study	Lab Study, Protocol(S)	US	[Chivukula et al., 2019a]
Late-Breaking-Work	Empirical	Studying DPs	DP Effects, Identifying DPs	Forced Action, Interface Interference, Nagging, Obstruction, Sneaking	Social Media	Content Analysis	nan	Not Specified	[Chivukula et al., 2019b]
Conference Paper	Empirical, Theoretical	Studying DPs	Defining DPs, Identifying DPs, Responsibility	Forced Action, Interface Interference, Nagging, Obstruction, Sneaking	nan	Content Analysis	nan	Not Specified	[Gray et al., 2018]

Late-Breaking-Work	Empirical	Discussing Challenges, Studying DPs	Identifying Challenges, Prevalence of DP	Forced Action, Interface Interference, Nagging, Obstruction, Sneaking	Social Media	Content Analysis	nan	Not Specified	[Fansher et al., 2018]
alt.chi	Opinion	Proposing a Solution	Solution for Users	Forced Action, Interface Interference, Sneaking	Advertisement	Brain-storming	Scenario Construction(B)	Not Specified	[Pinder, 2017]
Conference Paper	Empirical	Studying DPs	DP Effects	Interface Interference	nan	User Study	Field Study, Survey(S)	Not Specified	[Chang et al., 2016]
alt.chi	Opinion	Improving DP Research, Proposing a Solution	Defining DPs, Solution for Designers	nan	Digital Well-being, Games	nan	nan	Not Specified	Linehan et al. [2015]
Conference Paper	Theoretical	Improving DP Research, Proposing a Solution	Defining DPs, Solution for Designers	nan	nan	Content Analysis	nan	Not Specified	[Adar et al., 2013]

Table B.1

Appendix C

Codebook

This codebook explains every category and subcategory we defined in Section 3.1.3. The indented codes symbolise a subcategory. Also the quantity, of how often every code was used is shown in this table. The letters S, Q and B, which are written after the subcategory of the Data-Gathering Methods, stand for Questions, User Study and Brainstorming. They symbolise, to which category they belong.

Codebook: PART 1/5		
Qty	Code	Definition
	Dark Pattern Types	The DP types that categorise DP into seven categories.
19	Forced Action	To force a user to do an action, in order to gain a benefit or to not have a disadvantage.
23	Interface Interference	To change and use an interface to nudge a user to do actions, the user might not want to do.
13	Sneaking	To sneakily hide or disguises information or actions, that might harm a user or change their behavior.
11	Obstruction	To actively hinder a user to do an action, they want to do.
8	Nagging	To continuously remind and nag users, to do something they might not want to do.
11	Social Engineering	To manipulate users to do actions, through using social psychology
8	Attention Capture	To capture a user's attention.
Continued on next page		

Qty	Code	Definition
Codebook: PART 2/5		
Qty	**Code**	**Definition**
	Data-Gathering Methods	The method in papers used to collect knowledge of DPs
21	Content-Analysis	When Content, such as Interfaces are analyzed.
8	Questions	When users are asked questions, without them being part of a study.
2	Interview(Q)	When users are interviewed.
6	Survey(Q)	When users are given a questionnaire to answer.
8	Brainstorming	When new ideas are collected, based on one or more people's ideas.
5	Focus Groups(B)	When many groups, work together in order to find answers and ideas for topics.
3	Discussion(B)	When people discuss topics.
3	Scenario Construction(B)	When one or more people create possible scenarios, that could happen in the future.
1	Experiment	When the cause and effect of a phenomenon is examined, which usually will have the same outcome.
20	User Study	When users are examined, while they do tasks.
13	Field Study	When the study is conducted in the normal environment of a user.
7	Lab Study	When the study is conducted in a laboratory.
12	Survey(S)	When users are given a questionnaire to answer.
1	Rating(S)	When users are tasked to rate things on a scale.
3	Think-Aloud-Protocol(S)	When users are supposed to say what they think loudly, so examiners know their thought process.
6	Interview(S)	When users are interviewed.
4	Logging(S)	When the (online) actions of a user are logged.
2	Protocol(S)	When a user is supposed to write down what happened.
1	Sketching(S)	When users are supposed to sketch their ideas.
Continued on next page		

Qty	Code	Definition
Codebook: PART 3/5		
	Main Achievements	The main contribution, described by the author of the paper.
33	Studying DPs	Focuses in gathering knowledge and deepen the understanding of DPs.
4	DP Motives	Find out what motivates designer to deploy DPs.
25	DP Effects	Investigate the effects of DPs on users.
4	Prevalence of DPs	Investigate how prevalent DPs are in interfaces.
20	Identifying DPs	Identify if a design is a DP.
1	How DPs Work	Investigate how DPs work.
17	Improving DP Research	Aim to improve the research, through methods, definitions and so on.
12	Defining DPs	Elaborating a definition of DPs.
8	Taxonomy	Create a taxonomy of DP types.
1	Ontology	Create an ontology between categories, such as DP types.
2	Terminology	Create a shared terminology of DPs.
3	Research Methods	Introduce research methods, to improve the way, DPs are investigated.
9	Discussing Challenges	Challenges within the DP research, that do not have any kind of solution yet.
5	Identifying Challenges	Identifying challenges, that are yet to be discussed.
3	Responsibility	Who is responsible, of protecting users against harmful interface design.
2	Law-Abiding	Do companies abide the law, that already exists.
19	Proposing a Solution	Discussing any kind of countermeasures against DPs.
8	Solutions for Users	Discussing any kind of countermeasures against DPs, designed for the user, to protect themselves.
12	Solutions for Designers	Discussing any kind of countermeasures against DPs, designed for the designers, to not employ DPs.
Continued on next page		

Codebook: PART 4/5		
Qty	Code	Definition
	Research Contribution Types	These type classify every paper into seven very basic contributions types, most often found in HCI literature[Wobbrock and Kientz, 2016].
31	Empirical	Contribute new knowledge through observations and data collecting.
12	Theoretical	Contribute novel concepts, definitions, models, frameworks etc.
3	Methodological	Contribute a new method, to improve the research.
4	Survey	Analyse existing work of other researchers.
1	Dataset	Contribute a new collection of data.
3	Artefact	Contribute novel creations, tools, frameworks and so on.
2	Opinion	Present the opinion of the author of a specific topic.
	Domains	The topic of the research paper.
2	Extended Reality	Includes any form of virtual, augmented and mixed reality.
1	Safety Technology	Technologies used to protect users, such as natural disaster warning apps.
5	Advertisement	Any form of advertisement, that makes people buy or use something.
6	Apps	Any software that can be installed.
13	Social Media	Websites and Apps, where users can interact with each other.
14	Digital-Wellbeing	Health of users within digital interfaces.
4	Games	Digital games, where users play alone or with each other.
6	Privacy	Personal information, that should not be shown and given to other people.
1	E-Mails	Digital letters, that are send to a persons e-mail account.
1	IoT Devices	All kinds of devices, that can be connected with the internet.
3	European Law	Exisiting laws, employed in europe.
4	E-Commerce	Sites, where users can buy things and services.
Continued on next page		

Codebook: PART 5/5		
Qty	**Code**	**Definition**
	Country	The country where the study was conducted.
10	US	United States of America
1	Japan	Japan
3	UK	United Kingdom
3	Europe	European Countries
29	Not Specified	The country, where the data was gathered, was not specified, or people from all over the world, participated, because of an online survey.

Table C.1

Appendix D

Dark Pattern Synonyms

In this table, all 14 identified synonyms of dark patterns are listed. They were found while reading and reviewing our dataset. The names *dark patterns* and *deceptive patterns* or *deceptive design* were not included, as these names are used very often in literature.

Dark Pattern Synonyms		
Synonym	**About DPs according to the Author**	**Research Paper**
malevolent deception	✓	[Adar et al., 2013]
benevolent deception	✓	[Adar et al., 2013]
norm-shaping design patterns	✗	[Chang et al., 2016]
digital distraction	✗	[Lyngs et al., 2020]
dark digital infrastructure	✓	[Westin and Chiasson, 2021]
systematic dark design	✓	[Westin and Chiasson, 2021]
capture attention	✗	[Baughan et al., 2022]
virtual-physical perceptual manipulation (VPPM)	✗	[Tseng et al., 2022]
persuasive tactics	✗	[Sergeeva et al., 2023]
attention-drawing	✗	[Mo and Kristensson, 2023]
damaging design patterns	✓	[Monge Roffarello et al., 2023]
unethical design	✓	[Mildner et al., 2023b]
dark game design pattern	✓	[Linehan et al., 2015]
asshole design	✓	[Chivukula et al., 2019b]

Table D.1

Appendix E

PRISMA Statement: Checklist

This appendix includes two checklists, derived from the PRISMA Statement[Page et al., 2021], which is a guideline for literature reviews and meta-analysis. The first checklist E.1 shows if the 27 recommended items were followed and if it was followed, where the information can be found. The second table is the same checklist E.2, but for abstracts.

PRISMA Statement Checklist: PART 1/6			
Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	See Table E.2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Chapter 1
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Chapter 1
Continued on next page			

PRISMA Statement Checklist: PART 2/6			
Section and Topic	**Item #**	**Checklist item**	**Location where item is reported**
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Chapter 3.1.2
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Chapter 3.1.2
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Chapter 3.1.2
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Chapter 3.1.2
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Chapter 3.1.3
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Chapter 3.1.3
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Chapter 3.1.3
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Chapter 4.2
Continued on next page			

PRISMA Statement Checklist: PART 3/6			
Section and Topic	**Item #**	**Checklist item**	**Location where item is reported**
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Not appliccable as we coded the literature.
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item 5)).	Chapter 3.1.3
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Chapter 3.1.3
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Chapter 3.2
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Chapter 3.1 & 3.2
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Not done, as study results were not analysed and compared
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Not done, as study results were not analysed and compared
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Chapter 3.1.2
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Not done, as we did not find a method, that would faciliate certainty, except the steps done in Item 14
Continued on next page			

PRISMA Statement Checklist: PART 4/6			
Section and Topic	**Item #**	**Checklist item**	**Location where item is reported**
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Chapter 3.1.2, Figure 3.1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Chapter 3.1.2,
Study characteristics	17	Cite each included study and present its characteristics.	Appendix B
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Not done, as we did not find a risk of bias within studies, because we did not analyse and compare the results of the studies
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Appendix B
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Not done, as we did not find a risk of bias within studies, because we did not analyse and compare the results of the studies
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Chapter 3.2

PRISMA Statement Checklist: PART 5/6			
Section and Topic	**Item #**	**Checklist item**	**Location where item is reported**
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Not done, as study results were not analysed and compared
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Not done, as study results were not analysed and compared
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Chapter 4.2
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Not done, as we did not find a method, that would faciliate certainty, except the steps done in Item 14
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Chapter 4.1
	23b	Discuss any limitations of the evidence included in the review.	Chapter 4.2
	23c	Discuss any limitations of the review processes used.	Chapter 4.2
	23d	Discuss implications of the results for practice, policy, and future research.	Chapter 5.2
Continued on next page			

PRISMA Statement Checklist: PART 6/6			
Section and Topic	**Item #**	**Checklist item**	**Location where item is reported**
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Not done, as this is a review in the HCI field, and does not have registrations or protocols
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Not done, as this is a review in the HCI field, and does not have registrations or protocols
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not done, as this is a review in the HCI field, and does not have registrations or protocols
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	No financial support, which is not mentioned in the thesis, as it is supposed to not be sponsored
Competing interests	26	Declare any competing interests of review authors.	Chapter 2.1.4 & 4.1.4
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Appendix A, B, C & D

Table E.1

PRISMA Statement Abstract-Checklist: PART 1/2			
Section and Topic	**Item #**	**Checklist item**	**Reported (Yes/No)**
TITLE			
Title	1	Identify the report as a systematic review.	Yes
BACKGROUND			
Objectives	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	Yes
METHODS			
Eligibility criteria	3	Specify the inclusion and exclusion criteria for the review.	Yes
Information sources	4	Specify the information sources (e.g. databases, registers) used to identify studies and the date when each was last searched.	Yes, except when they were searched, which only implied through the studies, which were published between 2010-2023
Risk of bias	5	Specify the methods used to assess risk of bias in the included studies.	No, as there was no assessed risk of bias between study results, as these were not considered in this review
Synthesis of results	6	Specify the methods used to present and synthesise results.	Yes
Continued on next page			

PRISMA Statement Abstract-Checklist: PART 2/2			
Section and Topic	**Item #**	**Checklist item**	**Reported (Yes/No)**
RESULTS			
Included studies	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	Yes
Synthesis of results	8	Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured).	Yes
DISCUSSION			
Limitations of evidence	9	Provide a brief summary of the limitations of the evidence included in the review (e.g. study risk of bias, inconsistency and imprecision).	Yes
Interpretation	10	Provide a general interpretation of the results and important implications.	Yes
OTHER			
Funding	11	Specify the primary source of funding for the review.	No, as it does not exist
Registration	12	Provide the register name and registration number.	No, as it does not exist

Table E.2

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Index