The Effect of Education about Dark Patterns on User Experience

Killian Schonfeld - N00181860

Research Supervisor: Marian McDonnell

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I declare that this submission is my own work. Where I have read, consulted, and used the work of others I have acknowledged this in the text

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Abstract

Every day, users are manipulated through the pervasive use of Dark Patterns (DPs). There is little research on how educating users about DPs affects user-experience and whether it is an effective means to protect users against DPs. The aim of the current study was to explore these ideas to find ways to protect users against DPs. The study's sample consisted of 64 participants split in three groups. The first group was tasked with creating an account and selecting a service plan on the website with no DPs present. The second group had the same task but DPs were intentionally implemented in the task and education about what DPs are and examples were included. The third group also had DPs implemented but there was no education about DPs present. User-experience of the participants was tested, including a set of qualitative questions. The findings indicate DPs had a negative impact on user-experience, while educating users about DPs did not have a significant effect on user-experience. The qualitative analysis suggested that educating users about DPs increased their awareness of them. Education also increased negative emotional responses, intentions to stop using manipulative services and likelihood of placing blame on designers rather than users.

Introduction

The ability to make one's own decisions and determine preferences is often upheld as an inalienable right (United Nations, 2022). However, according to cognitive biases (CB), choices may not be solely attributable to the individual's logical reasoning or weighing of benefits and costs of a decision. When making decisions, individuals tend to rely on simplified systems of information processing called heuristics. This often results in systematic errors in judgement (Berthet, 2021). Work published by Tversky and Kahneman (1974) first developed the area of heuristics and biases. Since then, there has been research that has found the effect biases have on an individual's decision making in different environments (Acciarini et al., 2020; Kinsey et al., 2020). Examples of these CBs, like anchoring or framing, will be discussed later. These biases are often used by interface designers to guide users towards decisions. This can be seen in the use of Dark Patterns (DP).

1.1 DPs

The term DP was first coined by Harry Brignull in 2010 when he launched the website *darkpatterns.org* intending to increase awareness of DPs and record companies that implement them. Brignull describes DPs as "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, 2021). A paper from 2021's CHI conference (Mathur et al., 2021) analysed DP literature to find an underlying taxonomy based upon recurring themes in DPs. The article proposes two themes, the first being the modification of choices available to users. This modification of choice is achieved in four ways. The first is the unequal weighting of choices that are available to users, second is the removal of choices that should be available, the third is the varying treatment to

different groups of users and the fourth is the act of hiding the underlying mechanism from users. The second theme proposed by Mathur et al. (2021) is the manipulation of information made available to users. The flow of information is manipulated through deception or the concealment of information. This pair of themes seem to be effective in describing DPs, as taxonomies in previous research (Gray et al., 2018) cohere well with the themes proposed by Mathur et al.

1.2 CBs and DPs

CBs are often instrumental in the success of DPs. One study published in 2020 explored the role CBs play in DPs (Waldman, 2020). The researchers outlined five CBs commonly found in DPs, the first being anchoring. Anchoring is the overreliance on information first made available to an individual making a decision. Framing was another CB found to be pervasive in DPs, where an individual is more likely to find something more favourable when it is established positively and less favourably when something is established negatively. Hyperbolic discounting is how individuals will over-value immediate effects and under-value long term effects of a choice. Overchoice is another bias and is the way an individual will become confused or have a hard time making a decision when confronted with too many choices. The last CB outlined in the study was metacognitive processes. This is when the perceived difficulty of a decision increases, an individual is more likely to give up as they believe the decision is nearing impossible. Another study (Luguri & Strahilevitz, 2021) supports the notion that CBs have a role in the operation of DPs. The researchers found using loaded language (framing) or generating a bandwagon effect (anchoring) as part of DPs was successful in manipulating users. The idea that hyperbolic discounting is used in DPs was also suggested by Bösch et al. (2016),

when the researchers found users will focus on the instant gratification of giving out personal data rather than the long-term effects of retaining that information.

1.3 Prevalence of DPs

DPs are becoming a popular device among many companies. Even the most popular companies are employing DPs in their products. One study analysed the 30 most trending free applications from the Google Play Store from 8 different categories for a total of 240 apps, including Amazon, Facebook, Twitter and Spotify (Di Geronimo et al., 2020). It was found that 95% of apps contained at least one DP, with an average of 7.4 DPs per application. The most common DP found in applications was nagging, which is a constant interruption or redirection of a user when attempting to complete a task and often occurs when a pop-up appears and disrupts the user. The second most common DP found by the researchers was False Hierarchy. False hierarchies are used to make one option more obvious and more likely to be noticed by a user and in turn, selected more often. Preselection was the next most common DP found. Preselection is seen when an option is already selected before the user has made any input into the application. Other research exploring the prevalence of DPs reported similar findings. The researchers found in 2320 services across apps, mobile browsers and desktop browsers, that there was at least one DP present with an average of 7-8 DPs (Gunawan et al., 2021)

1.4 How DPs Affect User-experience

The importance of researching DPs is obvious when we see just how pervasive they are and how much they affect users. A study that explored the effect of DPs on the end-user experience conducted an experiment in which 300

participants were shown images of DPs and asked to fill out a questionnaire relating to the images (Maier & Harr, 2020). The questionnaire was used to find the frequency of occurrence, trustworthiness, level of frustration, misleading behaviour and physical appearance. The results showed a strong positive correlation between the frequency of DPs with trustworthiness and the level of frustration, meaning websites or applications that employ DPs may be more likely to elicit mistrust and frustration. These results are supported by previous studies (Courtney, 2019; Gray et al., 2021) which found users exposed to DPs were more likely to have a worse user-experience, indicating frustration and negative emotions while using interfaces where DPs were present. Additionally, interfaces with no DPs were more likely to elicit positive emotions, interest and user satisfaction.

Maier and Harr (2020) also found users reported that they would stop using a service if they found it was being manipulative. But users would often keep using these services when they perceive they are benefitting from the service more than they are negatively affected by DPs. Oftentimes, there are very few alternatives to certain platforms, especially the most popular ones. Some users also fear they are missing out when they choose to stop using a service, especially social network platforms.

1.5 Educating Users about DPs

The impact of education about DPs on user-experience and awareness of DPs is quite an understudied area. There has been research that has analysed general level of education and its impact on a user's susceptibility to DPs which found that those with lower levels of education were more susceptible to DPs compared to those with higher levels of education (Luguri & Strahilevitz, 2021).

However, the study didn't explicitly educate users on DPs or measure their levels of knowledge about DPs. Previous research done by Gray et al. (2021) found that their participants, 80% of whom reported that they were aware they were being manipulated when using their smartphone, were more likely to blame designers, stakeholders and developers rather than themselves. This may indicate that users more aware of DPs are more likely to blame those responsible for the website rather than themselves. However, other research found that users who reported that they were aware of the manipulative techniques present in DPs were still susceptible to DPs (Bongard-Blanchy et al., 2021). This may indicate that users who are educated and are more aware of DPs would still be susceptible to these techniques. However, they did not explicitly educate their participants on DPs but tested their awareness by asking them to identify DPs in images. Kahnemann (2013) made similar comments when talking about CBs, which are contributory to DPs, where he states that knowledge of one's own CBs does not make it easier to combat them. Lewis (2013) affirms this and suggests that education is only the first step in combating DPs with policy being the next. This sentiment is repeated by Westin and Chiasson (2019), while acknowledging that increasing users' awareness of DPs through education may help protect users against DPs, education cannot be solely relied upon to solve the problem.

1.6 Research Questions and Hypotheses

The present study looked at the 3 following research questions and tested the following 3 hypotheses:

RQ1: Will the presence of a dark pattern impact user-experience?

RQ2: Will education about dark patterns impact user-experience when a dark pattern is present?

RQ3: Will education about dark patterns help users become more aware about dark patterns?

H1: Presence of a dark pattern in the website will have an impact on a user's experience.

H2: Presence of education about dark patterns will have an impact on user-experience when a dark pattern is present.

H3: Education about dark patterns will have an impact on a user’s awareness of dark patterns.

Method

2.1 Design

The experiment used a mixed-method, embedded design, where the qualitative analysis played a secondary role to the quantitative analysis and gave further context to the overall findings (Edmonds & Kennedy, 2017). The quantitative element used an independent-measures, between-groups design. Three participant groups were used for the analysis of three conditions. Condition 1 consisted of no DPs and no education about DPs, Condition 2 had DPs present and education about DPs present, and Condition 3 had DPs and no education about DPs. The DPs present in Condition 2 and Condition 3 included urgency, false hierarchy, obstruction and nagging. The qualitative data was coded and analysed for themes and used secondarily to interpret the qualitative results and answer the third research question.

2.2 Participants

Convenience and voluntary response sampling were used in this experiment to recruit 64 participants for the study between the ages of 18 and 65. Participants were selected from students in IADT, online forums and survey swapping platforms, e.g., Surveyswap.io. The link to Condition 2's form was retweeted by Harry Brignull's *@darkpatterns* Twitter account (See Appendix A). 18 people were sampled using the first condition, 27 using the second condition and 19 using the third condition. The case processing summary indicated that 1/65 or 0.15% of the surveys were excluded from analysis due to missing values.

2.3 Materials

An information sheet (See Appendix B) was created for participants, outlining why the experiment is taking place, their right not to take part, how their data will be treated, the true purpose of the experiment, contact details for questions or problems with their data and some resources on DPs. A consent form (See Appendix C) was prepared before the experiment, to confirm that the participants understood the experiment and consented to their data being used in the present study. The USE questionnaire (Lund, 2001) (See Appendix D) was included to test user-experience of the participants, the test has a high Cronbach's Alpha, α= .98 (Gao et al., 2018). Four qualitative questions taken from Maier and Harr (2020) were also included to collect qualitative data to allow for a comparison between findings from the current study and previous research and these qualitative questions seemed to garner helpful qualitative data in previous research:

(i) What is the first thing that comes to mind about these dark patterns?

(ii) How aware are you of such techniques?

(iii) How do you usually react after you realise that you have been tricked into doing something online you might not have done otherwise?

(iv) Do you think it is your fault when something undesirable happens online or do you think you are being taken advantage of?

2.4 Procedure

Two website prototypes were created using Proto.io, which imitated the creation of an account with a movie streaming service and the selection of a subscription plan (See Appendix E). One was created with the intentional implementation of DPs in the website and one was created without these DPs

implemented. The DPs implemented in the website included nagging, false hierarchy, urgency and obstruction. Three separate Microsoft Forms were created to collect data for each of the three conditions, each form had an information sheet, a briefing document, a link to one of the website prototypes and the USE questionnaire. The form for the second condition also included a quick overview of DPs and some examples of the DPs (See Appendix F), e.g., nagging, false hierarchy, urgency and obstruction, that would be used in the website prototype. Condition 2 and Condition 3 also included 4 qualitative questions taken from a previous study (Maier & Harr, 2020). A pilot test was conducted for each condition to see how long the experiment would take and to ensure it ran smoothly when conducting the actual experiment. The pilot test revealed a few weaknesses of the study, for example, some parts of the website prototypes were undeveloped, including typos, dissimilarities between prototypes and navigational functions not working as intended. The pilot test also indicated that some questions in the USE questionnaire weren't applicable to the website and were subsequently changed or removed, including "It helps me be more effective", "It helps me be more productive", "It saves me time when I use it" and "It gives me more control over the activities in my life". Questions removed did not have a significant effect on the reliability of the USE questionnaire (Gao et al., 2018).

Results

3.1 Variables

The independent variables in the study were:

(i) Presence of a DP in the prototype website

(ii) Presence of education about DPs prior to using the prototype website

The dependent variable for this study was participants' subjective usability score of the prototype website, measured using the USE Questionnaire.

Three conditions were created using the 2 independent variables:

(i) Condition 1 (No DPs Present, No Education Present)

(ii) Condition 2 (DPs Present, Education Present)

(iii) Condition 3 (DPs Present, No Education Present)

3.2 Descriptive Statistics

The data collected for analysis is summarised in Table 1 below. The n values, mean, and standard deviation (SD) for Conditions 1, 2 & 3.

Table 1

Summary usability scores (n-values, mean and SD) collected from participants in three condition groups (Condition 1/Condition 2/Condition 3). (The Usability scores ranged from 1-7).

Condition	N	Mean	Standard Deviation
1	18	5.61	.961
2	26	3.84	1.34
3	19	3.99	1.71

Preliminary analyses were conducted to check the assumptions of the one-way analysis of variance (ANOVA) which investigated the statistical difference between the means of the three conditions. The Shapiro-Wilk test for normality of the dependent variable for each condition group was used because a smaller sample size was available. The Shapiro-Wilk Test was not violated for the one-way ANOVA, $F_1(18) = .899$, $p = .056$, $F_2(26) = .965$, $p = .495$ and $F_3(19) = .950$, $p = .398$. A Levene's Test for Homogeneity of Variance was carried out to test whether all condition groups had the same variance. The Levene's Test indicated unequal variances, violating the assumption of homogeneity of variance, $F(2,60) = 3.568$, $p = .034$. Since the assumption of homogeneity of variance was violated, a Welch's ANOVA test was used to continue with the analysis of data (See Appendix G for SPSS output).

Preliminary analyses were conducted to check the assumptions of the independent sample t-test which investigated the statistical difference between the means of Conditions 2 and 3. The Shapiro-Wilk test for normality of the dependent variable for the two condition groups was used because a smaller sample size was available. The Shapiro-Wilk Test was not violated for the independent t-test, $F_2(26) = .965$, $p = .14$ and $F_3(19) = .950$, $p = .2$. A Levene's Test for Homogeneity of Variance was carried out to test whether the condition groups had the same variance. The

Levene's Test indicated equal variances, meeting the assumption of homogeneity of variance, $F(43) = 1.98$, $p = .167$.

3.3 Inferential Statistics

Hypothesis 1 stated presence of a dark pattern in the website will have an impact on a user's experience. The Welch's ANOVA conducted to test whether there were significant differences in mean user-experience scores in the conditions showed a significant main effect, $F(2, 37.32) = 14.87$, $p < .001$, $\omega_2 = .224$. A Post-Hoc comparison, using Games-Howell, indicated that usability scores for Condition 1 were significantly higher than usability scores of Condition 2 ($p < .001$, 95% C.I. = [.94, 2.63]). Significantly higher usability scores were identified for Condition 1, compared to Condition 3 ($p = .003$, 95% C.I. = [.51, 2.75]). There was no significant difference between usability scores in the second and third conditions. Hypothesis 1 was accepted and it may be assumed that participants that used a website with DPs present had lower subjective usability than those who used a website with no DPs present.

Hypothesis 2 stated presence of education about dark patterns will have an impact on user-experience when a dark pattern is present. The independent t-test conducted to test whether there were significant differences in means in conditions 2 and 3 was not significant and Hypothesis 2 was rejected, $t(43) = 1.98$, $p = .734$, $d = 0.1$. It may be assumed that participants that completed the task with education about DPs present had similar subjective usability scores to those who completed the task with no education about DPs present.

3.4 Embedded Qualitative Analysis

Cohen's Kappa was run to determine if there was agreement between the two researcher's, the current author and a member of another psychology undergraduate degree, coding of the qualitative data. There was substantial agreement between the two researcher's judgement, $\kappa = .652$ (95% CI, .480 to .824), $p < .001$.

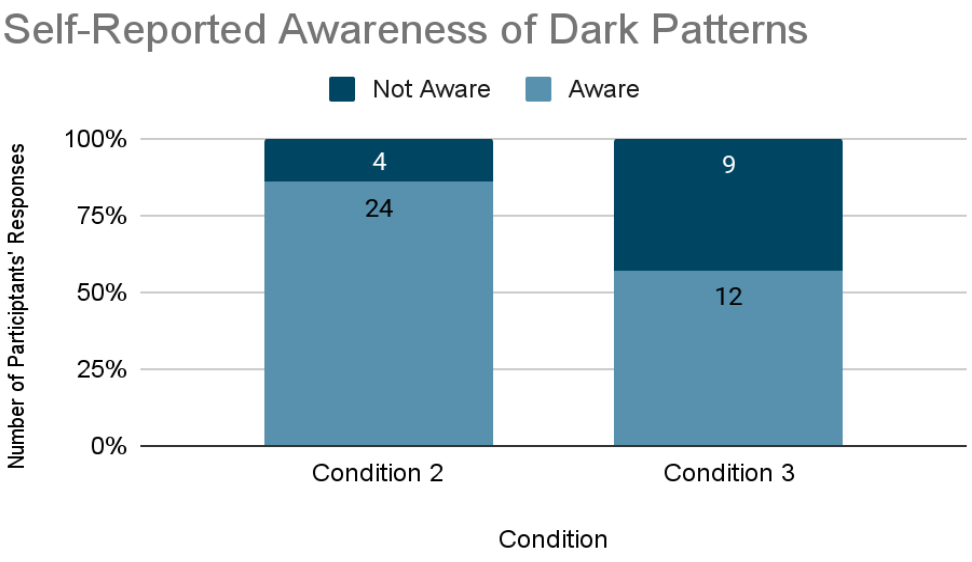
3.4.1 Theme 1: Participant's Awareness of DPs

Subtheme: Self Reported Awareness

Figure 1 below shows the N values of self-reported awareness of the participants (Aware & Not Aware) in Conditions 2 and 3. Participants in Condition 2 more often reported that they were aware of DPs compared to Condition 3, and said that they were "Quite aware" and explained that "Some of the patterns are so blatant that they're hard to miss".

Figure 1

Participant's Self-Reported Awareness



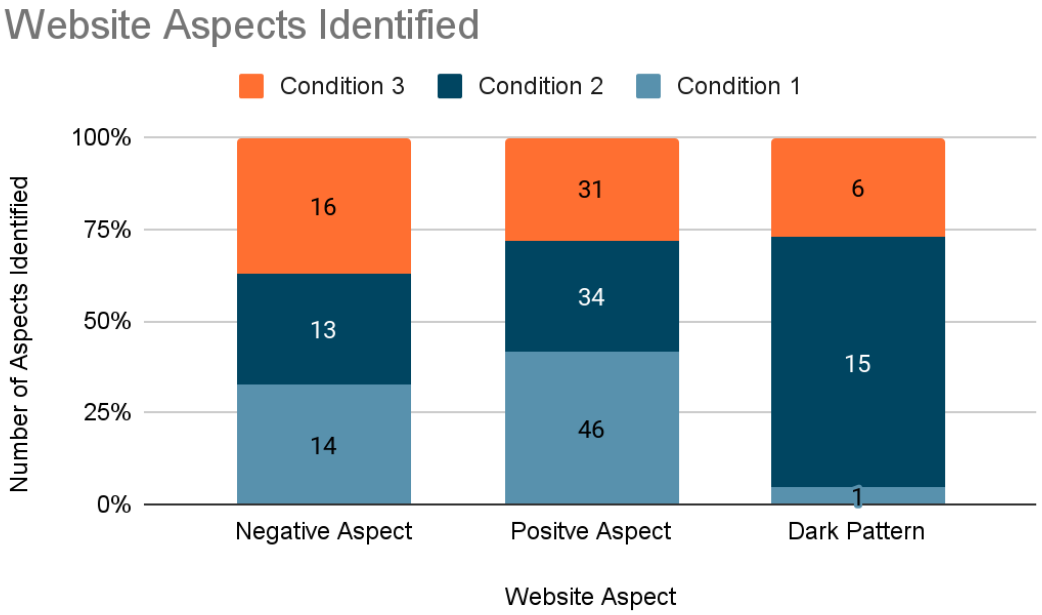
Participants in Condition 2 pointed out how aware they are of DPs from “trashy mobile games that are like, GREAT for dark patterns. Trying not to click on microtransactions is a game in its own right.” to feeling “pressure when a retailer says they only have one left of an item”. In Condition 3, participants seemed more unaware of DPs, saying they “couldn’t locate the dark patterns in this site” or they were “aware that they exist but I don't know if I would be able to detect them”.

Subtheme: Website Aspects Identified

Figure 2, shows the N values of aspects of the website that participants identified (Negative Aspects, Positive Aspects and DPs) in each Condition (Condition 1/Condition 2/ Condition 3).

Figure 2

Website Aspects Identified by Participants



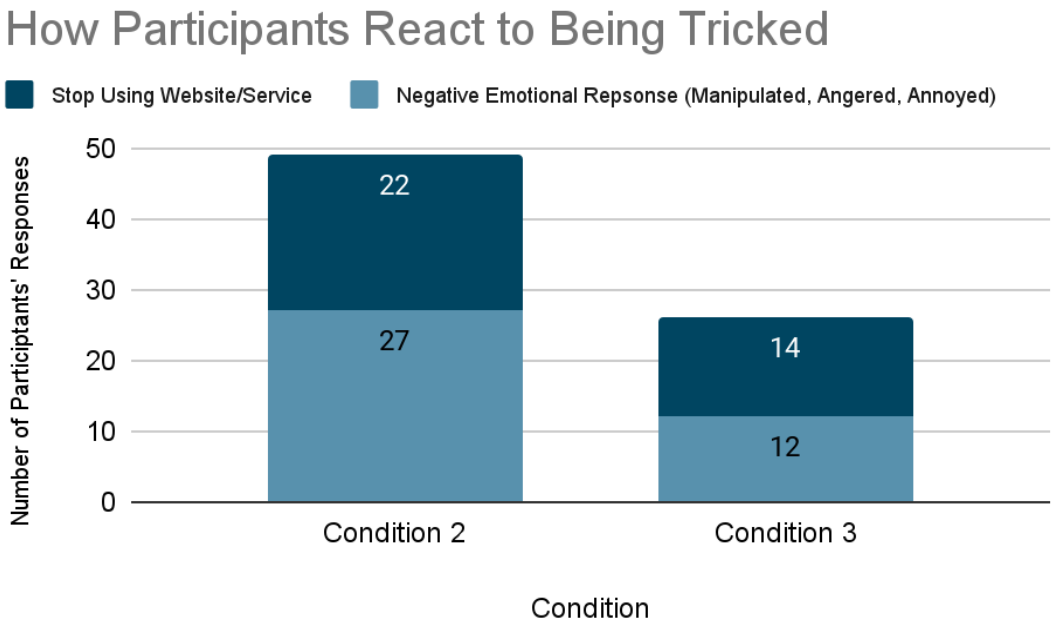
Negative Aspects included criticisms of the website that were unrelated to DPs, e.g., “ugly”, “don’t like the font” and “colour scheme”. Positive Aspects included expressions of approval that were unrelated to DPs, e.g., “Simple and easy” and “Colourful”. DPs included any identification of DPs from the website, for example, “things like the 'warning' about the 'bad deal'” and “The use of ‘worst choice’ text”.

3.4.2 Theme 2: How Participants React to Being Tricked by DPs

The data from the qualitative questions in the questionnaire is summarised in Figure 3 below. The N values for recurring themes of each condition (i.e., Condition 2, Condition 3) are presented.

Figure 3

How Participants React After Being Tricked Into Doing Something That They Otherwise Wouldn’t Have Done



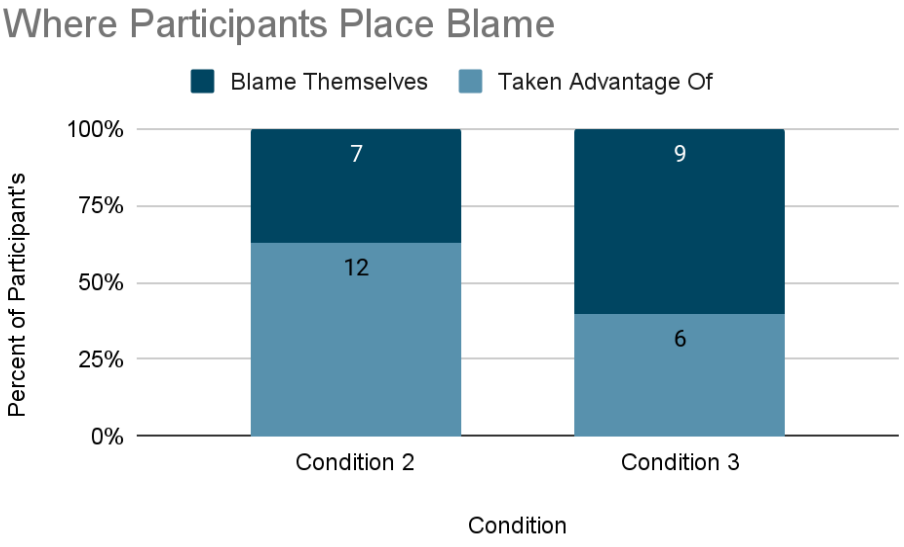
Participants in Condition 2 were more likely to report Negative Emotional Responses (Manipulated, Angered & Annoyed) when tricked by DPs. Reports of being “Manipulated to spend more money”, “outraged, depending on the trick” and “Incredibly annoyed” were more common in Condition 2 than in Condition 3. Intentions to Stop Using the Website/Service, e.g., “I stop using the website if I can” and “Switch to a different site entirely”, were more common in Condition 2 than in Condition 3. Some participants indicated that they would only stop using a website or service “unless I have no other choice”, and that “sometimes you need to use these websites”.

3.4.3 Theme 3: Where participants place blame

The data from the qualitative questions in the questionnaire is summarised in Figure 4 below. The N values for recurring themes of Condition 2 and Condition 3 are presented.

Figure 4

Where Participants Place the Blame When Something Undesirable Happens Online



Participants in Condition 2 were more likely to report they were taken advantage of rather than blame themselves compared to Condition 3. Participants from Condition 2 reported they were taken advantage of “because they use techniques to manipulate us” and “it's still the companies' fault for being terrible”. Participants in Condition 3 reported “you are always responsible for your own decisions” and participants also said it was both, “I should pay more attention but these businesses also try to take advantage of customers”.

Discussion

4.1 Overview of Findings

The purpose of the present study was to investigate if DPs have an impact on user-experience. The impact of education about DPs on user-experience was explored as well. Also, the effect of educating users about DPs on their awareness of DPs, their reaction and where they place blame was explored using qualitative analysis.

Hypothesis 1, “Presence of a dark pattern in the website will have an impact on a user's experience.”, was accepted. A post hoc analysis indicated that those in Condition 1 had higher levels of usability than those in Condition 2 . The same was true for Condition 1 and Condition 3, where participants in Condition 1 had higher usability scores. Previous research supports the idea that DPs have an impact on user-experience. For example, Maier and Harr (2020), found that participants exposed to DPs reported a more negative user-experience. Gray et al., (2021) had similar findings, where DPs had a negative impact on user-experience. However, these were qualitative findings so they may not be inferential to a larger population.

Hypothesis 2, “Presence of education about dark patterns will impact user-experience when a dark pattern is present”, was rejected. Some previous research in this area is slightly contradictory to this result. Luguri and Strahilevitz (2021) analysed whether general level of education would predict susceptibility to DPs and worse user-experience and reported that lower levels of education predicted an increased susceptibility to DPs which in turn resulted in a worse user-experience. While Luguri and Strahilevitz looked at general level of education (High school diploma or less, Bachelor degree or higher) and not specifically education about DPs, it may still be indicative that those with more awareness of

manipulative design, in general, are more likely to have a worse user-experience. Some research may support the rejection. For example, Bongard-Blanchy et al. (2021) found that even when participants were aware of manipulative techniques they remained susceptible to DPs and subsequently had worse user-experience. However, Bongard-Blanchy did not explicitly educate their participants on DPs but tested their awareness by asking them to identify DPs in images. Research on the impact of educating users about DPs on user-experience is scarce so it is difficult to see where the current study's findings stand.

Hypothesis 3, "Education about dark patterns will have an impact on a user's awareness of dark patterns.", was analysed using qualitative means so no inference to a larger population can be made. However, it is useful to explore ideas and supplement the quantitative data. From the qualitative data, it can be seen that those in the condition with education (Condition 2) were more likely to report higher levels of awareness of DPs and had a greater ability to identify DPs in the website, compared to the condition with no education (Condition 3). This may be indicative that participants who were educated about DPs were more aware of them, but still had similar usability scores to those who weren't aware of them. Again, educating users about DPs and its effect on awareness is understudied so it is difficult to find research with findings relevant to the current study. Luguri and Strahilevitz (2021) reported some relevant findings, where they found that more educated users were less susceptible to DPs possibly due to them being more aware of the DPs, which may be similar to educating users about DPs specifically, but this was not explicitly tested. The qualitative data from the current study is a good first step for research into educating users about DPs.

Further qualitative data looking at how participants react to being tricked by DPs was also collected and analysed. Participants were more likely to report negative emotional responses, including anger, annoyance and manipulation, when educated about DPs. While there is previous research that found participants who were exposed to DPs were more likely to experience negative emotions (Courtney, 2019), there is little research looking at the role education has in negative emotional responses. However, the current qualitative data may suggest that education allows users to be more aware of DPs and subsequently experience more negative emotions. Educated users were also more likely to report that they would stop using a website or service when tricked by a DP. Previous findings from Maier and Harr (2020) found participants who encountered DPs reported intentions to stop using the associated platform. The current findings that users aware of DPs may be more likely to stop using the website or service support the current research.

The current study also collected and analysed data exploring where users place blame when they are manipulated by DPs. Participants that were educated and more aware of DPs were slightly more likely to blame the designer or company responsible for the website when compared to those who were not educated about DPs. This is partly supported by previous research done by Gray et al. (2021). They found that their participants, who reported high awareness of manipulative designs, were more likely to blame designers, stakeholders and developers rather than themselves. While the study didn't explicitly educate users, they were aware of manipulative techniques which may be similar to the educated condition in the current study.

The quantitative and qualitative analysis in the current study supports the idea that DPs will affect user-experience negatively whether or not users are educated.

However, education of users may help increase their awareness of DPs and, perhaps ,in turn, increase negative emotional responses, intentions to stop using a service and likelihood of blaming those responsible for the service.

4.2 Strengths & Weaknesses of the Current Study

One strength of this research project was the exploration of gaps in the current research of DPs. Specifically, the gap centred around educating users about DPs and how it affects their user-experience, their awareness of DPs, their emotional responses and where they place blame. Part of the quantitative analysis in the current study helps to support findings found in the current research explained above, while the qualitative analysis serves as a basis for future research. Another strength of the current study was the application of the USE questionnaire, which allowed for the collection of quantitative as well as qualitative data, which may have been more difficult if another user-experience assessment was used. The use of both quantitative and qualitative data in the mixed method design allowed for triangulation in the current study, which may have produced findings that are more holistic and provide a balanced explanation of the user-experience (Noble & Heale, 2019).

Many of the weaknesses of the current study lie in the sampling methods and the number of participants recruited. The sample size of the current study was quite small, and as a result, the power of the t-test was weak, making it hard to infer the results on a larger population. Convenience and voluntary response sampling also make it difficult to generalise the findings of the current study, as it is unlikely a random sample was generated, but a sample that was interested in DPs (Dyer, 2013). Also, nearly all participants were recruited through online means, so the

sample may have been more technologically literate and not representative of the larger population. Another weakness of the current study was the lack of a fourth condition which had no presence of DPs and education about DPs present, which would have allowed for the use of a two-way ANOVA and analysis of an interaction effect between education and DPs. There was also a lack of demographic analysis, as no demographic data was collected from participants. An analysis of demographics would have produced data on whether age, gender, level of education or nationality had any effect on user-experience or had an interaction with education.

4.3 Theoretical and Practical Implications

The current study's findings have contributed to the theoretical knowledge of DPs, how they affect user-experience and how education may affect user-experience. The current study is the first quantitative study exploring DPs and user-experience, to the author's knowledge. The current study also presents findings that indicate education may affect a user's awareness of DPs, as well as users' responses to being tricked by DPs and where they place the blame. Research in this area is understudied and it is unclear how educating users about DPs affects users, including their ability to identify DPs, their ability to avoid them and whether education is an effective means to protect users against manipulative design. Future research into the effects of educating users about DPs may prove beneficial in protecting users against these manipulative techniques. It is also important for future research to explore the effects of DPs and education on vulnerable populations, e.g., the elderly and those with intellectual or physical impairments. The qualitative findings from the current study may serve as an effective starting point for future

researchers using a quantitative approach in exploring educating users about DPs, which would be more generalisable to a larger population.

4.4 Conclusion

In conclusion, the present study's findings imply that DPs have a significant negative effect on user-experience, while educating users about the DPs that are present in a website had no significant impact on their user-experience. However, education may have an impact on a user's awareness of DPs, their emotional response to DPs, their intention to stop using a service and where they place blame when being manipulated.

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Appendices

Appendix A - Retweeted Participant Recruitment Link

Appendix B - Information Sheet

Information Sheet

You are being invited to take part in the research investigating the effect of Education about Dark Patterns on User Experience. This project is being undertaken by Killian Schonfeld for the major research project as part of the BSc in Applied Psychology, IADT. Before you decide whether you wish to take part, it is important for you to understand why this research is being done and what it will involve. Please take time to read this information carefully and discuss it with someone you trust. If there is anything that is unclear or if you would like more information please ask, our contact details are at the end of this information sheet.

What is the purpose of the project?
Dark Patterns are design tecniques implemented by digital platform creators to manipulate users into making decisions they didn't mean to, like buying or signing up to something. Dark Patterns have become very popular among top companies, used by the likes of Amazon, Ryanair, Facebook and many others. The current study aims to explore how the presence of dark patterns effects user experience and also how educating users on dark patterns will effect their overall perception and experience of user interfaces.

Who is being invited to take part?
This study is for anyone that uses the websites, apps or any other digital platforms in any form.

What is involved?
You will be given an overview of Dark Patterns, including what they are and how they work. You will then be asked to complete a task on a mock up website created for the purpose of this study. Following this you will be asked to complete a short survey relating to your experience with the mock up website. The experiment should take around 10 minutes.

Do I have to take part?
You are free to decide whether you wish to take part or not. If you do decide to take part, you will be asked to sign a consent form that lets us know you have read this information sheet and understand what is involved in the research. You are free to withdraw from this study at any time for any reason. By choosing to take part or not take part in this study will have no impact on your marks, assessments or future studies.

What are the disadvantages and risks (if any) of taking part?
The current study should not be distressing in any way and should not include any disadvantages or risks.

What are the possible benefits of taking part?
We cannot promise the study will help or benefit you, but the information we get from the study will help to increase the understanding of dark patterns and the effect education has on a user's experience.

How will my information be used?
responses to the questionnaire will be combined with all other participants data and statistically analysed. No individual's data will be identifiable in the final report. The results of this analysis will be reported in the thesis for the BSc in Applied Psychology in the Dun Laoghaire Institute of Art, Design & Technology. This can be requested through the library at IADT, or by emailing the researcher or supervisor at N00181860@student.iadt.ie or marian.mcdonnell@iadt.ie. This study may also be published in an academic journal article and may be written about for blog posts or media articles and these can be requested from the researcher.

How will my data be protected?
Under the EU General Data Protection Regulation (GDPR) the legal basis for collecting data for scholarly research is that of public interest. The regulations regarding the protection of your data will be followed. Only data which is needed for analysis will be collected. By giving your consent to take part in the study you are consenting to the use of your data as detailed in this information sheet.

The data will be retained by the researcher for at least one year and may be retained for up to 7 years if the results of the study are published in certain capacities (e.g. in a journal article). There is also a possibility that the fully anonymised dataset may be submitted to a journal and made available to other researchers and academics worldwide for verification purposes, but if this occurs it will be ensured that you are not identifiable from the data.

As the supervisor on this project Marian McDonnell will be responsible for ensuring that all datasets will be stored in accordance with GDPR regulations and those which are not submitted to a journal will be fully deleted on or before 07/01/2029.

The researcher, supervisor, and statistics lecturer will have access to the data collected. The data will be stored securely on a password-protected computer. In the case of a data breach, the data protection officer in IADT will be informed immediately. The level of the identifiability of the data will be coded. The data will be kept until the end of the research process and then securely disposed of. You will find contact information for IADT's Data Protection Officer, Mr Bernard Mullarkey, and more information on your rights concerning your data at https://iadt.ie/about/your-rights-entitlements/gdpr/

Who has reviewed the study?
This study has been approved by the Department of Technology and Psychology Ethics Committee (DTPEC). What if you have any questions or there is a problem? If you have a concern about any aspect of this study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should contact Killian Schonfeld at N00181860@student.iadt.ie or their supervisor Marian McDonnell at marian.mcdonnell@iadt.ie. Thank you for taking the time to read the information sheet and considering taking part in the study. Date 18/01/2022

Appendix C - Consent Form

1

I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.

*

- Yes
- No

2

I understand that my participation is voluntary and that I am free to withdraw at any time.
*

- Yes
- No

3

I understand that data collected about me during this study will not be identifiable when the research is published.
*

- Yes
- No

4

I am over 18.
*

- Yes
- No

5

I agree to take part in this study.
*

- Yes
- No

6

Insert your code here, including the first letter of your first name, last letter of your surname, and the last three digits of your phone number. (Eg. John Smith - JH123)
*

Appendix D - USE Questionnaire

11

Please rate each statement on scale of 1 to 7 in relation to the mock up website, 1 being strongly disagree and 7 being strongly agree. **Leave blank if the statement does not apply.**

	1	2	3	4	5	6	7
It is useful	○	○	○	○	○	○	○
It meets my needs	○	○	○	○	○	○	○
It does everything I would expect it to do	○	○	○	○	○	○	○
It is easy to use	○	○	○	○	○	○	○
It is simple to use	○	○	○	○	○	○	○
It is user friendly	○	○	○	○	○	○	○
It requires the fewest steps possible to accomplish what I want to do with it	○	○	○	○	○	○	○
It is flexible	○	○	○	○	○	○	○
Using it is effortless	○	○	○	○	○	○	○
I can use it without written instructions	○	○	○	○	○	○	○
I don't notice any inconsistencies as I use it	○	○	○	○	○	○	○
Both occasional and regular users would like it	○	○	○	○	○	○	○
I can recover from mistakes quickly and easily	○	○	○	○	○	○	○
I can use it successfully every time	○	○	○	○	○	○	○
I learned to use it quickly	○	○	○	○	○	○	○

12

	1	2	3	4	5	6	7
I easily remember how to use it	○	○	○	○	○	○	○
It is easy to learn to use it	○	○	○	○	○	○	○
I quickly became skillful with it	○	○	○	○	○	○	○
I am satisfied with it	○	○	○	○	○	○	○
I would recommend it to a friend	○	○	○	○	○	○	○
It is fun to use	○	○	○	○	○	○	○
It works the way I want it to work	○	○	○	○	○	○	○
It is wonderful	○	○	○	○	○	○	○
I feel I need to have it	○	○	○	○	○	○	○
It is pleasant to use	○	○	○	○	○	○	○

13

List the top three negative aspects of the website.

Enter your answer

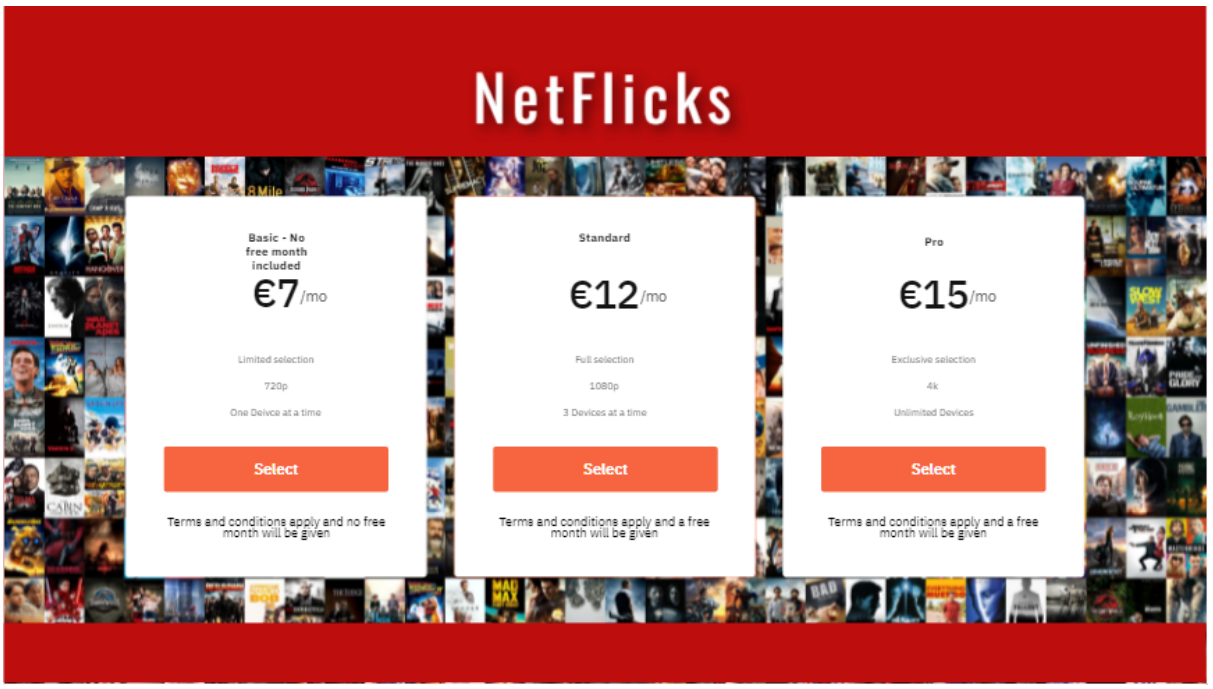
14

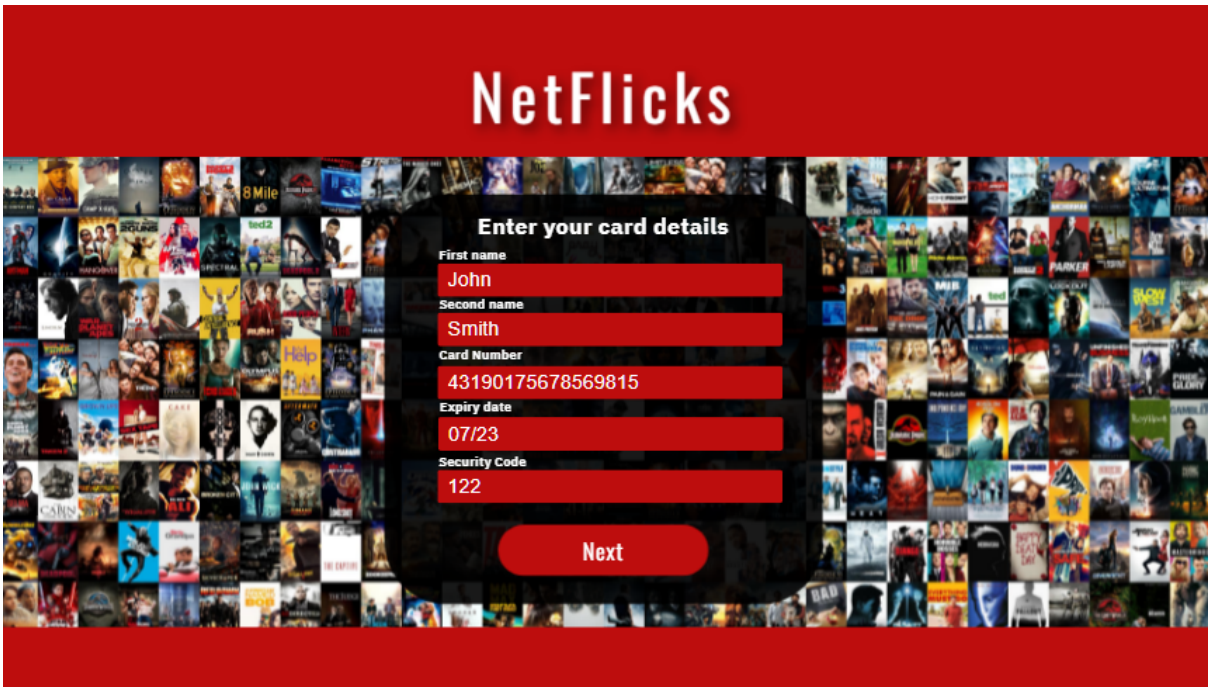
List the top three positive aspects of the website.

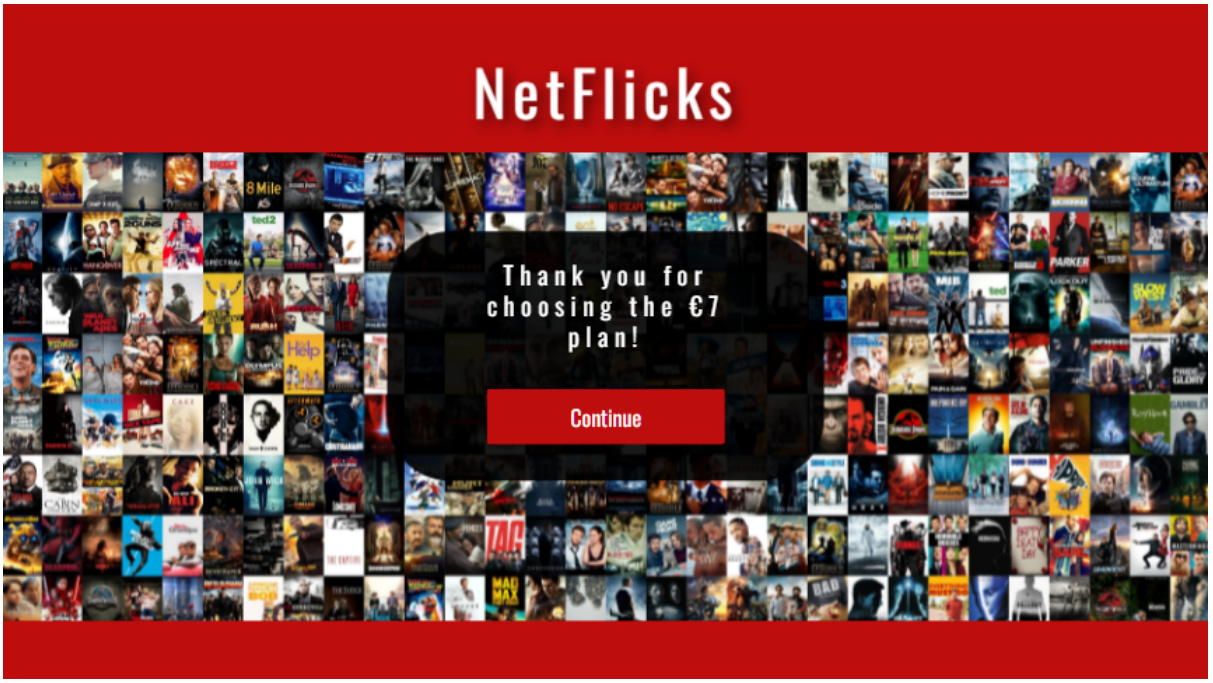
Enter your answer

Appendix E - Website Prototype Screens

No Dark Patterns Present

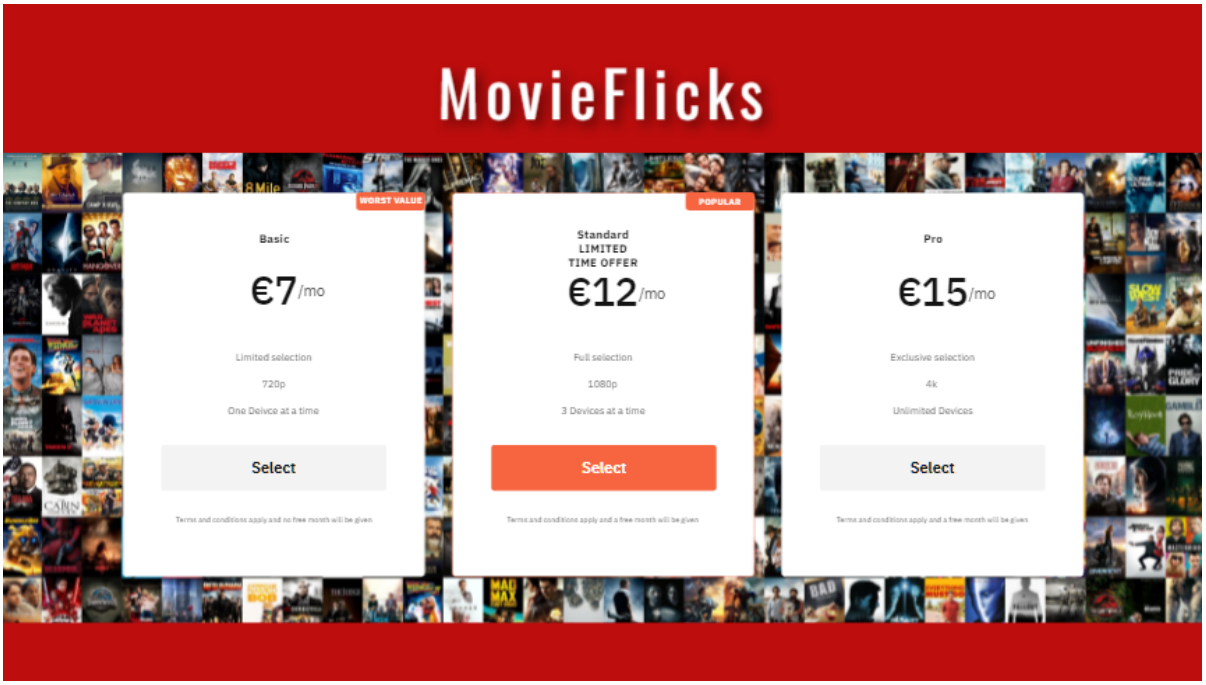

NetFlicks
Basic - No free month included
€7/mo
Limited selection
720p
One Deivce at a time
Select
Terms and conditions apply and no free month will be given
Standard
€12/mo
Full selection
1080p
3 Devices at a time
Select
Terms and conditions apply and a free month will be given
Pro
€15/mo
Exclusive selection
4k
Unlimited Devices
Select
Terms and conditions apply and a free month will be given

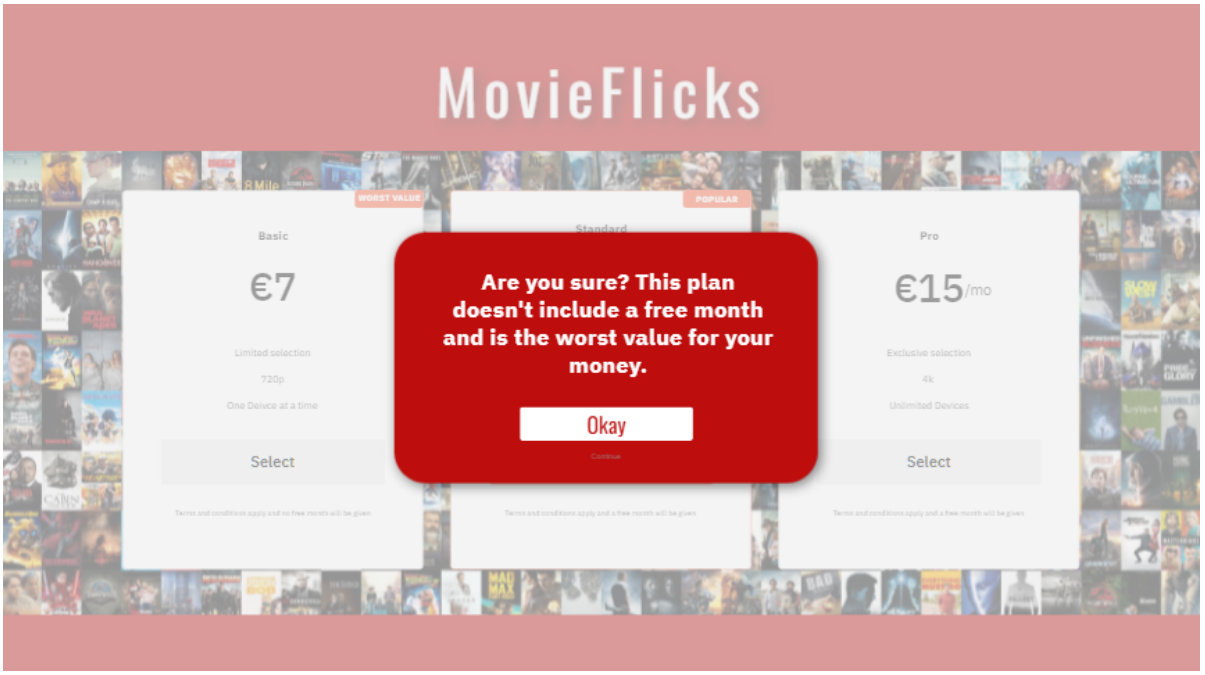

NetFlicks
Enter your card details
First name
John
Second name
Smith
Card Number
43190175678569815
Expiry date
07/23
Security Code
122
Next

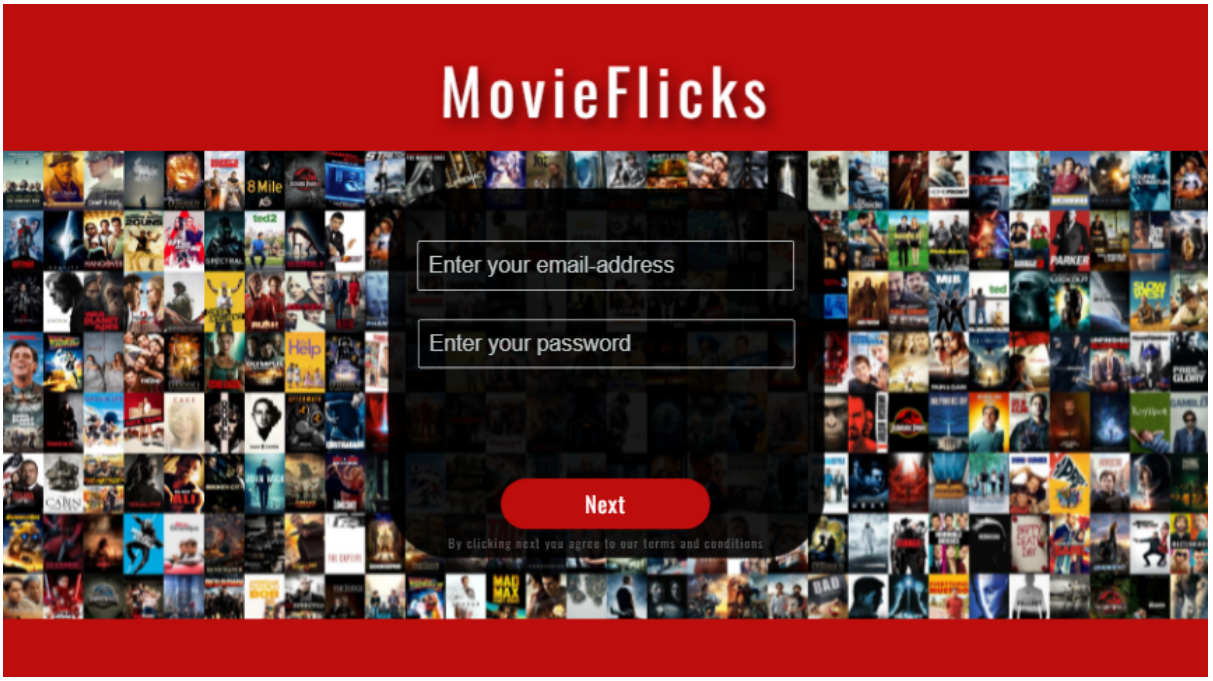

NetFlicks
Thank you for choosing the €7 plan!
Continue

NetFlicks
You have now created an account and selected a plan
A confirmation has been sent to the email provided
You can now close this tab and return to the form

Dark Patterns Present






MovieFlicks
Enter your email-address
Enter your password
Next
By clicking next you agree to our terms and conditions

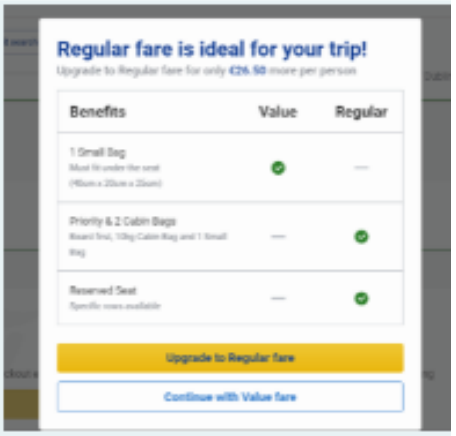
Appendix F - Education About Dark Patterns - Condition 2

What are Dark Patterns?

Before moving on to the main task of the experiment we want to give a short overview of what dark patterns are and how they work.

Dark Patterns are design tecniques implemented by digital platform creators to manipulate users into making decisions they didn't mean to, like buying or signing up to something. Dark patterns differ in how malicious they are, ranging from slightly annoying to tricking users into giving away personal information or subscribing to a expensive service. Below you will find examples of dark patterns.

7

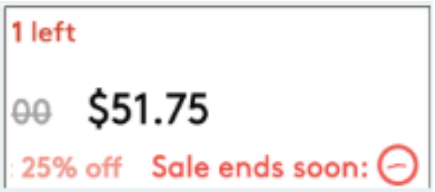


Nagging
This is where the digital platform will repeatedly redirect the user from their current task. Here is an example.

8

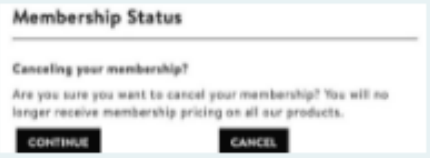
False Hierarchy
Making one or more options appear more visually appealing or concealing other options to manipulate the user into making a certain decision. In the example the way to exit the add is a tiny "X" that is hard to see.

9



Urgency
When a product or service is, sometimes falsely, advertised as being in low supply or being the last one left and insitlling a deadline on the user it can accelerate their decision making and purchase.

10



Obstruction
When a website or app purposefully blocks or misdirects a user from making a certain action in an attempt to dissuade users from making that action. The example shows a pop-up with confusing language that obstructs users from cancelling their membership.

Appendix G - SPSS Output

Questionnaire Condition

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	Questionnaire Condition	N	Percent	N	Percent	N	Percent
User Experience Score	Condition 1	18	100.0%	0	0.0%	18	100.0%
	Condition 2	26	96.3%	1	3.7%	27	100.0%
	Condition 3	19	100.0%	0	0.0%	19	100.0%

Descriptives

	Questionnaire Condition		Statistic	Std. Error
User Experience Score	Condition 1	Mean	5.6189	.22642
		Std. Deviation	.96061	
	Condition 2	Mean	3.8354	.26353
		Std. Deviation	1.34377	
	Condition 3	Mean	3.9911	.39329
		Std. Deviation	1.71430	

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Questionnaire Condition	Statistic	df	Sig.	Statistic	df	Sig.
User Experience Score	Condition 1	.158	18	.200*	.899	18	.056
	Condition 2	.149	26	.140	.965	26	.495
	Condition 3	.112	19	.200*	.950	19	.398

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Oneway

Descriptives

User Experience Score

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Condition 1	18	5.6189	.96061	.22642	5.1412	6.0966	3.56	6.74
Condition 2	26	3.8354	1.34377	.26353	3.2926	4.3781	1.08	6.56
Condition 3	19	3.9911	1.71430	.39329	3.1648	4.8173	1.00	6.56
Total	63	4.3919	1.56542	.19722	3.9977	4.7861	1.00	6.74

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
User Experience Score	Based on Mean	3.568	2	60	.034
	Based on Median	3.068	2	60	.054
	Based on Median and with adjusted df	3.068	2	53.657	.055
	Based on trimmed mean	3.581	2	60	.034

ANOVA

User Experience Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	38.204	2	19.102	10.078	<.001
Within Groups	113.728	60	1.895		
Total	151.933	62			

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	Upper
User Experience Score	Eta-squared	.251	.071	.401
	Epsilon-squared	.227	.040	.382
	Omega-squared Fixed-effect	.224	.039	.378
	Omega-squared Random-effect	.126	.020	.233

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

Robust Tests of Equality of Means

User Experience Score

	Statistic[a]	df1	df2	Sig.
Welch	14.965	2	37.321	<.001

a. Asymptotically F distributed.

Post Hoc Tests

Multiple Comparisons

Dependent Variable: User Experience Score

Games-Howell

(I) Questionnaire Condition	(J) Questionnaire Condition	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Condition 1	Condition 2	1.78350*	.34744	<.001	.9393	2.6277
	Condition 3	1.62784*	.45381	.003	.5062	2.7494
Condition 2	Condition 1	-1.78350*	.34744	<.001	-2.6277	-.9393
	Condition 3	-.15567	.47342	.942	-1.3173	1.0060
Condition 3	Condition 1	-1.62784*	.45381	.003	-2.7494	-.5062
	Condition 2	.15567	.47342	.942	-1.0060	1.3173

*. The mean difference is significant at the 0.05 level.

Presence of Education about Dark Patterns

T-Test

Group Statistics

	Questionnaire Condition	N	Mean	Std. Deviation	Std. Error Mean
User Experience Score	Condition 2	26	3.8354	1.34377	.26353
	Condition 3	19	3.9911	1.71430	.39329

Tests of Normality

	Presence of Education about Dark Patterns	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
User Experience Score	Education Present	.149	26	.140	.965	26	.495
	No Education Present	.112	19	.200*	.950	19	.398

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Independent Samples Test

		Levene's Test for Equality of Variances F	Sig.	t-test for Equality of Means t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
User Experience Score	Equal variances assumed	1.980	.167	-.342	43	.734	-.15567	.45574	-1.07475	.76341
	Equal variances not assumed			-.329	33.003	.744	-.15567	.47342	-1.11884	.80751

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	Upper
User Experience Score	Cohen's d	1.50998	-.103	-.694	.489
	Hedges' correction	1.53697	-.101	-.682	.481
	Glass's delta	1.71430	-.091	-.682	.503

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.