

The Self-Destructive Nature of Dark Patterns: Revealing Negative Impacts on Usability and Trust in Service Providers

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Abstract

“Dark patterns,” deceptive designs that intentionally lead users to take actions benefiting service providers, are widely used, especially in digital marketing. The major impacts of dark patterns includes time or money costs incurred by deceived users. However, there are other possible unintended impacts on the user experience. In particular, users who recognize and avoid dark patterns (non-deceived users) may also experience stress and frustration from the extra time and effort required. In this study, we focus on non-deceived users and examines the negative usability impact caused by avoiding dark patterns. Through this usability study using web pages containing dark patterns, we explored the possibility that the cost incurred by avoiding dark patterns may be a factor that undermines trust in service providers.

1 Introduction

Deceptive designs, widely known as **Dark Patterns** [3], are used by service providers to intentionally deceive users in order to maximize profits in marketing and other activities.

Existing research on dark patterns has developed primarily focused on their classification [2, 3] and the tendencies of users who are deceived by dark patterns (*deceived users*) [1]. Studies have also examined how different types and persistence of dark patterns affect user decision-making [5]. However, these studies have focused on deceived users and there has not been much research on users who were not deceived by dark patterns (*non-deceived users*).

Non-deceived users are assumed to understand and recognize the methods employed by dark patterns, leading them to be more cautions. Consequently, they spend extra time and effort making decision based on their intentions, leading to mental frustration and loss of trust in the service providers. Thus, non-deceived users might face unique negative impacts compared to deceived users.

We focus on these negative impacts of user experience caused by dark patterns, which represent a significant issue for service providers (See Fig. 1 in Appendix for overview of our scenario). Our goal is to address the following three research questions.

RQ1 Are there differences in the negative impacts experienced by non-deceived users compared to deceived users?

RQ2 What are the factors that make users more prone to experiencing the negative impacts caused by dark patterns?

RQ3 How do users regard the impacts caused by dark patterns in services?

This study addresses RQ1, RQ2 and RQ3 by conducting online user survey of 350 participants using a simulated online food delivery service. By conducting both quantitative and qualitative analyses of the survey results, we clarify the negative impact of dark patterns on user experience and provide insights for service providers and software developers engaged in interface design¹.

2 Method

We conducted online survey of 350 participants² using a simulated online food delivery service. Every participants was

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¹This paper is based on a previous work by the authors [4]. The differences include the addition of a **RQ3** and its evaluation through qualitative analysis using open-ended questions.

²Participants were recruited through the crowdsourcing service lancars.jp. All of participants are from Japan and the survey was conducted in Japanese.

paid 165 JPY as a reward for participating in the survey. The survey consisted of both task-based and questionnaire-based components. In the task-based component, participants experienced a scenario in which they used a food delivery service on a website. This included tasks ranging from selecting dishes to completing an order (Fig. 2 in Appendix).

The dark patterns used in this survey were selected based on categories outlined in previous studies [2,3]. For this study, we selected three representative dark patterns commonly expected in delivery service context : **Sneak into Basket**, **Trick Questions**, and **Preselection** (Fig. 3, 4, 5 in Appendix, respectively).

This study assessed the impact of dark patterns on usability by utilizing both qualitative and quantitative evaluation methods for RQ1 and RQ2. Quantitative metrics included elapsed time during the task, usability scale (WUS) [7], customer satisfaction scale (NPS) [8], whereas qualitative evaluation were derived from responses to open-ended question³. We also included demographic questions related to users' internet literacy [9].

3 Results

For the analysis, we used the survey results of 342 from the initial pool of 350 participants, excluding those who answered the Directed Questions Scale (DQS) [6] incorrectly. The analysis tested each assessment item between two groups: those who were deceived (Deceived group, D group) and those who were not (Non-Deceived group, ND group).

Out of the participants, 141 were assigned to the D group as being deceived by the **Sneak into Basket** pattern, while 29 were assigned to the ND group. For the **Trick Questions** pattern, 246 participants were assigned to the D group, and 52 to the ND group. For the **Preselection** pattern, 200 participants were assigned to the D group and 79 to the ND group.

We excluded participants who chose options benefiting the service provider despite recognizing dark patterns from the tests, as we could not definitively state that they were deceived.

3.1 Negative impacts on non-deceived users

We performed Mann–Whitney U test for each group because the Shapiro–Wilk test indicated nonnormality for both groups.

A total of nine tests were conducted on each of the three dark patterns used in this study. These tests included elapsed time during the task, user usability ratings (WUS), and customer satisfaction ratings (NPS). The results from eight of these tests (Table 1, Fig. 6, 7, 8 in Appendix) showed that non-deceived users experienced significant negative impacts compared with deceived users.

³This survey was administered following an assessment of its content and procedures in accordance with the ethical standards established by the ethics committee of the organization to which the correspondence author belong.

These results suggest that non-deceived users (ND group) likely refrained from making intuitive or suggested choices to avoid them. This avoidance behavior appears to impose costs that negatively impact each evaluation item.

3.2 Factors of negative impacts

This study investigated the factors that make users more frustrated by dark patterns. We hypothesized that a high level of internet literacy might be a contributing factor, so we analyzed whether there were differences in internet literacy between the D group and ND group. However, the results of the analysis (Table 2 in Appendix) did not reveal any significant differences between the two groups. This result contradicts the intuitive expectation that awareness of dark patterns would be related to internet literacy. It suggests that users are likely to detect dark patterns regardless of their level of internet literacy.

3.3 Users' responses to dark patterns

We discuss how participants recognize and respond to dark patterns through their open-ended responses. Prior to the open-ended responses, participants were informed that dark patterns had been used in the task survey, and they were asked to freely explain the reasons behind their decisions during the task.

We categorised and labeled the open-ended responses by keywords and extracted those that relevant to the Research Questions. The responses revealed negative opinions towards the service providers using dark patterns, including remarks such as "*I thought it was quite malicious*" and "*I felt a significant loss of trust.*" Participants expressed discomfort about being deceived. Additionally, some participants considered canceling their purchase after discovering the dark patterns, suggesting that such practices can decrease purchasing intent.

Furthermore, some participants did not avoid dark patterns even though they were aware of them, stating "*it's fine*" and choosing not to circumvent the guidance. This suggests that the deceptiveness of dark patterns is not the only reason why users do not avoid them. In some cases users decide to accept dark patterns even if they notice them, while estimating the costs involved in avoidance. Such users may appear to service providers as if they have been deceived by the dark patterns, while in reality, their actual user experience may be deteriorating. It is possible that service providers do not fully consider the presence of these users, and this aspect warrants further detailed examination in future research.

4 Conclusion

We found the unique negative impacts experienced by non-deceived users. This suggest that digital marketing practices that prioritize short-term gains over all else could ultimately lead to long-term risks and erosion of trust.

Acknowledgments

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Appendix

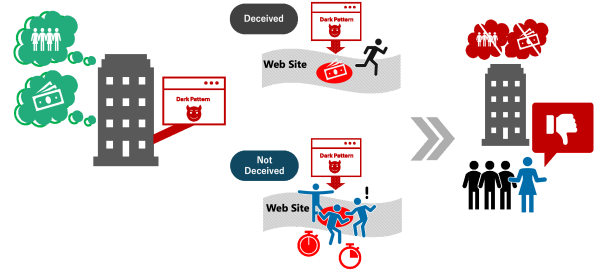


Figure 1: Responsivity to the dark patterns of deceived users and non-deceived users. Service providers employ the use of dark patterns with the intention of maximizing profit. However, these patterns have the unintended consequence of negatively impacting the user experience and eroding trust among non-deceived users.

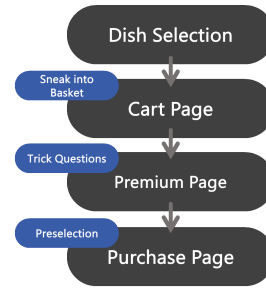


Figure 2: The process of task-based survey

Your Order		
¥2170		
Items	Description	Price
Beef stew	Special slow-cooked beef stew made with domestically sourced beef	980
Seafood pizza	A thick pizza crust loaded with an abundance of seafood toppings.	890
Iced tea	As a side to your meal	300

Figure 3: Example of “Sneak into Basket”

Wouldn't you not like to try the 3-month premium membership free trial?

After the free trial, it's ¥590 (tax included) per month. You can cancel anytime.
We also offer annual plans and family plans, which you can easily switch to after signing up.

Yes No

Figure 4: Example of “Trick Questions”

Table 1: Results of the Mann–Whitney U test for each indicator for each page

Page	Elapsed Time	WUS	NPS
Cart	$p \ll 0.001^{***}$	$p \ll 0.001^{***}$	$p \ll 0.001^{***}$
Premium	0.00106**	0.00144**	0.0384*
Purchase	$p \ll 0.001^{***}$	0.221	0.00260**

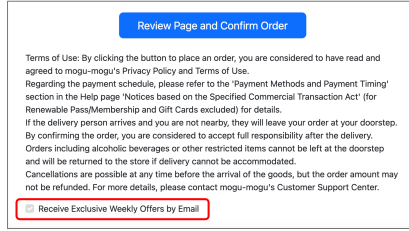


Figure 5: Example of “Preselection”

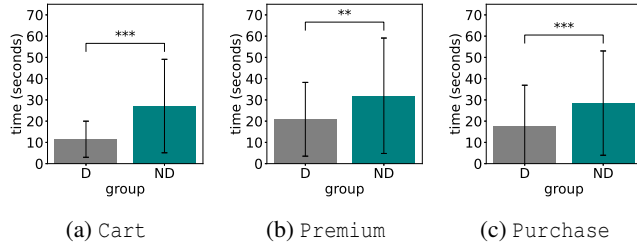


Figure 6: Mean and standard deviation of elapsed time for each page

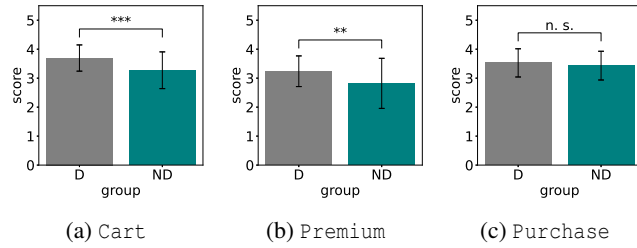


Figure 7: Mean and standard deviation of the Web Usability Scale (WUS) for each page

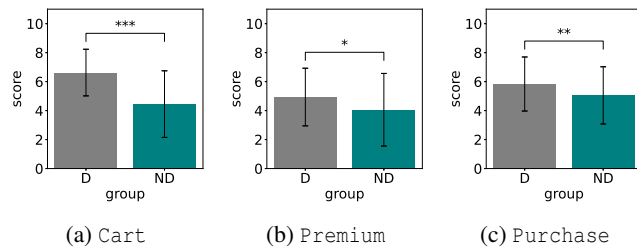


Figure 8: Mean and standard deviation of the Net Promoter Score (NPS) for each page

Table 2: Results of Mann–Whitney U test for internet literacy for each page

Page	<i>p</i> -value
Cart	0.813
Premium	0.460
Purchase	0.164