

Using Persuasive Strategies Inside App Distribution Platforms to Warn Users About Manipulative Design Used by Applications

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Abstract

The number of available websites and mobile applications is continuously increasing along with the use of persuasive strategies (PS) to influence human behavior and decision-making. While designing for persuasion has its benefits, recent developments have brought to light the existence of manipulative design (MD), known as dark patterns, which use psychological factors to guide people in desired directions from someone else perspective. Earlier studies have classified MD, analyzed the impact on users, measured the prevalence, and evaluated it from a user perspective. However, there has been little work informing and warning people of MD. In this study, we propose to investigate the impact of employing PS in mobile app distribution platforms to inform users about the MD used by mobile applications. Our research would be considered as a baseline for future investigation aiming to caution users about MD usage within app distribution platforms.

Keywords

Persuasive Strategy, Manipulative Design, Behavior Change

1. Introduction

Nowadays, technology is present everywhere and the number of websites and mobile applications is increasing rapidly. The main objective of designers when creating interfaces is to help users achieve their objectives by making them easy to understand and presenting information in a way that is easy to access. Lately, there has been a significant increase in the use of technology to affect how humans make decisions. By understanding psychological principles that govern human thinking, designers can create user experiences that intentionally and effectively influence people's behavior in ways that are beneficial for them. Persuasive strategies have been used in various domains, such as online commerce, fundraising, promotion [1, 2, 3], mental health [4], warning compliance [5, 6], and have shown persuasive influences [7]. While persuasive design strategies are not inherently alarming, the knowledge of how the human mind operates can also be exploited for unethical purposes, manipulating users' decision-making process in ways that go against their goals and are in favor of other stakeholders, owners (shareholders) of

Proceedings of BehavRec '23, the First International Workshop on Behavior Change and Persuasive Recommender Systems at the 17th ACM Conference on Recommender Systems (RecSys '23), Singapore, September 18-22, 2023

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CEUR Workshop Proceedings (CEUR-WS.org)

the company. These alluring design approaches that people might face when reaching websites or mobile applications, known as manipulative design (MD) or dark patterns, exploit the user by applying deceitful elements in their path. In this paper We use the term "manipulative design" as equivalent to the terms "dark pattern", "malicious design", and "deceptive design" that occur in the existing literature.

So far, studies have categorized manipulative designs (MD), studied their impact on users, measured their prevalence, and evaluated them from a user perspective. However, there has been little work on informing users of MDs and evaluating approaches to influence users' opinions and adoption of applications that use MD. In addition, to the best of our knowledge, there is no prior research on employing persuasive strategies (PS) to warn users of the presence of MD in a particular application. Therefore, in this paper, we propose to explore the effectiveness of notifying users of MD using PS. We will design a study with three groups, where we measure the attitudes and intentions of the participants toward MD using a questionnaire before and after the participants have been presented with an intervention. Our intervention is a simulation of a sample app's presentation in a typical app marketplace, such as the Google Play Store, that includes persuasive warnings of the presence of MD in the app. The PS deployed in the intervention are *authority* and *social influence*.

The rest of the paper is organized as follows. In section 2, to provide background and motivate the importance of our work, we review briefly the field of Persuasive Technology and PS, and present in more detail the research on manipulative designs. In section 3, we present and justify the design of our study. In section 4, we describe the expected results and contributions, as well as the limitations of this work.

2. Background

We will first explain the differences between PS and MD. Next, we present existing work that demonstrates the effectiveness of PS in persuading people to justify our decision to use and evaluate their effectiveness in our work. Then we present a taxonomy of MD, and to demonstrate the importance of our research, we review the existing research on the prevalence and impact of MD. Finally, we briefly present existing solutions in the current literature to counteract MD.

2.1. Persuasive Strategies vs. Manipulative Designs

Design, by its nature, involves the act of persuasion [8]. Fogg introduced the term *Persuasive Technology* in 2002, describing it as "a computing system, device, or application intentionally designed to change a person's attitude or behavior in a predetermined way" [9]. Although persuasive technology is often lauded as a tool for achieving behavior changes that benefit the users in health, the environment, or society, persuasive technology can be used for less noble purposes, so ethical concerns must be taken into account [10]. The designers' intentions need to be evaluated to distinguish between persuasive techniques and deceptive practices. When employing persuasive techniques, designers seek to motivate users to engage in actions that are intended to benefit users. On the other hand, in deceptive practices (manipulative designs), the persuasive techniques are no longer created in a user-centered manner (i.e. to benefit the user) but are rather business-centric [10] and deliberately designed to change the user behavior

so that it can be exploited towards the goals of the system owners or shareholders without any benefit or with minimal benefit for the user. Figure 1 shows the Venn diagram of this comparison.

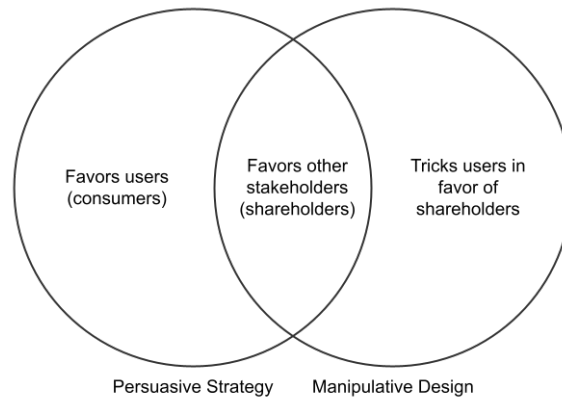


Figure 1: persuasive strategy vs. manipulative design

2.2. Persuasive Strategies (PS)

One of the most well-known categorizations of PS is provided by Cialdini (2009) [11]. He has identified six persuasion strategies including consensus, reciprocity, scarcity, authority, commitment and consistency, and liking. The *consensus* or *social influence* strategy leverages the power of group behavior and social influence to persuade individuals, as people often follow the majority or public opinion in their behavior [12]. The *authority* strategy relies on people's tendency to comply with competent authorities, e.g. credible experts or institutions [13].

Other authors have noted many other persuasive strategies. For instance, *fear* is also a type of PS. Fear appeals are a type of persuasive communication that highlights the possible risks and negative consequences that may occur if individuals fail to comply with the recommendations presented in the message. Hence, to some extent, it inherently exists in all warnings. Previous research has shown that appeals to fear are effective at positively affecting attitudes, choices, and behaviors [14]. The success of a warning as a means of convincing someone depends largely on the message it contains [15]. Some researchers assert that warnings need specific persuasive elements to increase people's trust in the warning system and encourage them to consider it [5, 16]. We propose to use *fear* in combination with *social influence* or with *authority* as PS in the design of effective warnings for users against manipulative designs.

2.3. Manipulative Designs

One of the earliest works on dark patterns or its newer term, deceptive design, is the informative website by Harry Brignull in 2010 [17], where he introduced the term "dark patterns" and provided a framework for classifying them. So far, Brignull has identified 12 types of dark patterns, including "trick questions", "roach motel", "forced action", "misdirection", "hidden

costs”, ”obstruction”, ”privacy zuckering”, ”price comparison prevention”, ”bait and switch”, ”disguised ads”, ”forced continuity”, and ”friend spam”. This served as a fundamental framework for future studies to establish the principles involved in MD. The term ”dark patterns” has since been used in the User Interface design and Game Design communities, but more recently, to avoid negative racial connotations, it has been replaced with other terms, e.g. MD, malicious design, and deceptive design.

MDs are widely used despite the ethical concerns that have been raised. In [18], the authors conducted a study where they utilized a website crawler to examine 11,000 widely used e-commerce websites to determine the prevalence of MDs in e-commerce. The results of the study showed that 11% of the websites analyzed contained elements that qualified as MDs. Additionally, the study found that the use of deceitful patterns was more prevalent in more popular e-commerce websites. In another research [19], the authors ran an experiment in which they investigated the frequency of impulse buying-inducing factors in the top 200 e-commerce websites in the US. The findings indicated that every website studied had a minimum of four features that encouraged impulse buying, while 75% of the websites had at least 16 features that prodded customers toward impulsive purchases. Similarly, [20] showed that out of the 240 apps that were analyzed, 95% contained at least one MD in their interfaces. Collectively, the researchers identified a total of 1,787 Dark Patterns across all the apps, averaging 7.4 harmful designs per app.

It is not unexpected that MDs are widely used because they have been proven in multiple studies to be highly effective in modifying user behaviour. MDs have performed well in various types of testing, such as multivariate tests and A/B testing, as noted by Brignull in 2011 [21]. Using MDs in interface design can increase sales, generate higher revenues, and obtain more user data compared to a design without MD. Luguri and Strahilevitz [22] provided compelling evidence that MDs are effective in influencing consumers’ decisions. They conducted a study on the acceptance rate of a security program using three levels of MD: no MD, mild MD, and aggressive MD. The results showed that when no MDs were used, only 11.3% of participants accepted the program, while more than double the participants (25.8%) accepted when mild MD tactics were used. With the use of aggressive MDs, the acceptance rate increased further to 41.9%.

Even after learning about these manipulative practices, research shows that people are still susceptible to the persuasive influence of technology [23]. In [20], the authors conducted an online study where they asked participants to identify MD elements in the user interfaces (UI) of various applications. The study found that more than half of the participants (55%) did not recognize MDs. This phenomenon was explained by the concept of ”Dark Pattern Blindness,” where these patterns are so common in today’s applications that users have become accustomed to them and no longer notice them easily or at all.

Previous studies have proposed solutions to counteract MD. Graßl et al. [24] used nudges to flip the direction of MDs and lead users’ approval decisions towards the privacy-friendly choice. Based on a survey among impulse shoppers, Moser et al. [19] suggested friction techniques that neutralize manipulative mechanisms in purchase decisions (e.g., disabling urgency and scarcity messages). Bhoot et. al [25] and Mathur et al. [18] suggested a plug-in or browser extension that automatically detects MDs on websites and notifies the user. Laser [26] discussed the regulatory means that can be leveraged to restrict and fine manipulative tactics.

In this paper, we propose to inform people of MDs inside mobile app distribution platforms (e.g. Google Play Store) by leveraging persuasive strategies. Statistics have shown there were over 6.5 billion smartphone users across the world [27] with downloading around 255 billion mobile apps to their connected devices in 2022 [28]. Moreover, according to statistics in 2020, 83% of time spent with tablets and 90% of time spent with smartphones is in apps [29]. However, browser extensions suggested by previous studies would not be an effective and practical approach, because of their limited user coverage and the fact that they work on the client side and need to be updated constantly to be able to warn their users of new apps (websites) with MDs and new types of MDs. In contrast, app distribution platforms are accessed by billions of users and have the power to inspect and vet apps before allowing them in and to apply rules or laws that demand MDs to be revealed in the app description. Submitting to such control by the distribution platform would ultimately benefit the platform in the long run, since, as [30] suggested, MDs diminish customers' trust in the brand's credibility in the long term. Therefore application distribution platforms, such as Google Play Store, provide a feasible opportunity to inform users of MD.

3. Methodology

We hypothesize that warning users about the potential presence of MD in the app representation page in the app distribution platform would be an effective way to catalyze user behavior change regarding using apps with manipulative designs. We also hypothesize that using persuasive strategies in warning against MD within app distribution platforms would amplify the behavior change effect.

The proposed study uses a combination of within-subject and between-subject designs to investigate the impact of the two persuasive designs on informing users of MD used inside mobile applications. To analyze the impact of our interventions (Baseline, Authority, Social Influence), we will compare the participants' behavior before and after the experiment. To measure behavior change we will use a literature-backed method [31] based on measuring the change in the user's attitude, intention to avoid, and self-efficacy. We will do so by asking participants to answer the same questionnaire utilizing a seven-point Likert scale (1 = Strongly disagree – 7 = Strongly agree) before and after the intervention. As a validated tool, we used an adapted version of the questions used in [32]. Some of the items of the questionnaire are shown in table 1.

Google Play Store and Apple App Store are among the best candidates to inform users of dark patterns. We propose to run our experiment inside a simulation of Google Play Store because it is the biggest mobile app distribution platform, with over 6.5 billion smartphone users across the world [27] downloading around 255 billion mobile apps to their connected devices in 2022 [28]. We choose to simulate a shopping application representation in the Google Play Store as a tool to implement our approach because according to the existing literature reviewed in the previous section, MDs are mostly in shopping apps and websites. Moreover, presenting the same application to all participants helps mitigate the impact of participants' personal preferences for specific types of applications.

Of all Cialdini's principles, we choose to use only "authority" and "social influence" because

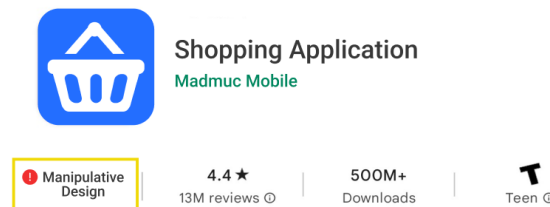
Table 1

Sample questions for measuring users' behavior

Measured element	Item
Intention	I intend to learn more about manipulative designs in the immediate future.
Intention	I will try to report manipulative designs examples in case I face them in apps.
Attitude	Paying attention to manipulative designs and counteracting them would be important.
Attitude	Paying attention to manipulative designs and counteracting them would be beneficial.
Self-Efficacy	If I want, I could easily detect and counteract manipulative design in applications.
Self-Efficacy	I have control over my reactions and response to manipulative designs.

they seem to be the most suitable ones to the task of amplifying the persuasiveness of a warning. Other than these two and outside of Cialdini's principles, "fear" also exists implicitly in our method but we do not plan to evaluate its effect separately in our study because any warning or explanation of MD by itself expresses the possible risks and harms for users, and would evoke fear.¹

We create two designs (experimental conditions) of the Play Store simulation, each applying one of the two PS, *authority*, or *social influence*. In both designs, to warn the user of the existence of MD inside the shopping app, there is a warning notice - a red circle with a red "!" image and text "Manipulative Design" - along with the standard information about the app provided by the Google Play Store (number of reviews, downloads, and age group), as shown in Figure 2. Previous research shows that warnings containing a color or an icon are more effective in getting peoples' attention than warnings without such elements [33, 6]. Besides, we add a separate section (MD-Section) in the app's description specifically to create MD awareness. A persuasive message is added to the beginning of this section, as shown in Table 2 and two examples of manipulative designs in the hypothetical app.

**Figure 2:** Warning notice at the top of installing page in designs with persuasive intervention

The message differs in the two conditions. In the authority (A) condition, the detection of the two examples is claimed to be made by Google itself as an authoritative and reputable system. In the social influence (SI) condition, the examples are shown as reviews of the application provided by users in a separate section from the other reviews inside the Google Play Store. Figure 3 shows the MD section for the SI design version.

¹It is worth noting that evoking fear in our study should not be considered an MD since we intend to inform people about the possible risks, which is beneficial for users, since it may help them save time or money.

Table 2
Persuasive Explanations

Persuasive principle	Message
Authority	Google has detected some possible manipulative designs inside the app and suggests that you pay attention to them.
Social Influence	There are reports by other users about the possible existence of manipulative designs inside the app.

Manipulative Design !

There are reports by other users about the possible existence of manipulative designs inside the app.

P

Pooria Babaei
4/24/23

⋮

The app makes it easy to sign up for a service, but when it comes to canceling, the process is deliberately confusing and difficult. It feels like the company is trying to trap me into continuing to use their service even if I don't want to.

J

Julita Vassileva
5/24/23

⋮

They show that only a few a product has been left but it is in stock yet after 3 months. They obviously do it to make us rush.

Figure 3: The MD warning section in the shopping app Play Store page using the social influence strategy

The Baseline design (B) presents a typical app representation on the Google Play Store with a list of user reviews. There is no red icon or any explicit warning, however, the app also contains MD. Among the user reviews for the app, there are two that describe user experience with the MD; the user may notice or overlook them.²

In all three designs, to create a realistic, balanced list of user reviews, we add entirely positive reviews along with those reporting MD.

The participants in the study will be recruited through the University's bulletin board, on social networks, and possibly through a crowd-sourcing website. We aim to have 100 participants.

The study will begin by asking the user for consent to participate in the study, and then

²It is worth noting, however, that it is hard to design a totally neutral control condition inside Google Play Store because being in this medium assumes that some authority has vetted the app acceptable and the user reviews provide additional information that can influence the users' decision, which can act as implicit persuasion.

they will be provided with a short explanation of what MD is. Next, they will answer a few demographic questions and questions to measure their attitude, intention, and self-efficacy in noticing MD in apps. Next, they will be randomly assigned to one of the three experimental groups. Participants will observe and work with the installing page of the same shopping application in the Google Play Store simulation with a different persuasive technique based on the group they will be assigned to. After the intervention, the participants will answer the same questions regarding attitude, intention, and self-efficacy to measure their behavior change. In addition, during the experiment, we will collect interaction data that can indicate the efficacy of each design, such as the time each participant spends viewing and working with the simulation, whether they click on the red dot warning at the top of the page, and whether they click on the install or ignore button at the end of the page.

4. Expected Results and Contributions

Currently, we are waiting for the research ethics approval to be issued by the University of Saskatchewan ethics office. After getting approval, we will be able to run the experiment. Our general hypothesis is that all three designs will change the participants' behavior toward manipulative design (MD) and that designs with a persuasive strategy (A, SI) will be more effective in creating behavior change than the design without any persuasive strategy (B). We hypothesize that the designs that use a persuasive strategy will lead the participants to spend more time reading the information regarding MD.

There are several possible criticisms to our approach. First, it is not clear if warning the user about the possible presence of MD in the app distribution platform will change the user's decision to download an application because there are times when there are no alternatives. However, the goal of our proposed solution is to create awareness and persuade the user to pay attention to the MD, and to change their attitude, intention, and confidence that they can avoid the negative effects of the MD. Second, it is not clear whether the tool that we used to measure behaviour change which is borrowed from tools used in health sciences can predict behaviour change in this domain. Third, in our study, we did not specifically educate the participants about the different types of MD. Instead, we gave a short description of what an MD is at the very beginning of the study, before the questionnaire. Adding an educational section and elaborating on MD to familiarize users with the different types of MD would bias the results of the study significantly. Our study is aimed at evaluating persuasive approaches that can be implemented by app distribution platforms. How to educate users about MD is an important challenge that is left for future studies.

Our work can contribute to the area of ethical aspects of persuasive strategies by proposing a method to warn users about manipulative designs in mobile applications. It can be considered as a baseline for further work to warn users of MD inside app distribution platforms. Future research can include and evaluate other types of applications, such as games and social media. Although we designed a simulated representation in the Google Play Store, we expect similar results for a study done inside the Apple App Store since their designs and architectures are similar. We believe that our research will demonstrate a practical approach to providing more transparency for users of mobile applications regarding MD on a large scale.

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