The Time is Ticking: The Effect of Limited Time Discounts on Consumers' Buying Behavior and Experience

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ABSTRACT

Deceptive countdown timers indicate a limited-time offer that is not truly limited-time, as the deal continues after the timer reaches zero. The effects of such deceptive (dark) patterns on consumers' buying behavior are largely unknown. We present a setup to research such effects and use it in this exploratory study to investigate deceptive countdown timers through a simulated online shopping task (N=245), followed by a questionnaire. We compared the reaction of participants who encountered i) no special offers, ii) only a discount, and iii) a discount accompanied by a deceptive countdown timer. The results show that both types of discounts increase customers' preference for the discounted product. However, we observe various negative responses towards deceptive timers (e.g., they are perceived as manipulative, immoral, and unethical). Our findings indicate that deceptive timers can induce a fear of missing out and make consumers averse to offers and websites that use such practices.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI**; • **Applied computing** → *Online shopping*.

KEYWORDS

Deceptive design patterns, online shopping, countdown timers, manipulation

1 INTRODUCTION

As the competition to attract customers intensifies, online retailers sometimes try to influence consumers' choices through questionable means [4, 6, 49]. For example, online retailers display sold-out items [19], put consumers under time pressure [10] or use other deceptive design patterns to influence users [37]. 'Limited-time discounts' are examples of such patterns where retailers use time limits in combination with discounts [10, 14, 31, 47], exploiting the scarcity bias [37]. Limited-time discounts impose a deadline on a sale or deal, and by doing so force consumers to decide under time pressure [2, 13, 41, 48, 57], accelerate their purchase decision making [21, 27, 37], increase purchase likelihoods [1, 14], and induce a 'fear of missing out' [37].

'Countdown timers' are a popular way to implement a limited-time discount [10, 31]. A countdown timer is a design pattern that indicates a deadline for a special offer, counting down until the deadline is reached. Prior work has found that some countdown timers were deceptive [37], since the special offer is still available even after the timer expires. For example, a timer can simply restart when it reaches zero, or when the page is reloaded. Our work focuses on such deceptive countdown timers. Deceptive countdown timers are an example of a 'deceptive design pattern' (also known as 'dark patterns'). Deceptive designs/dark patterns[1] can be described as user interface (UI) elements designed to trick users into doing things they might not want to do but benefit the business in question [8, 24]. Past research studied deceptive design patterns in domains including gaming [55], robotics [33], proxemic interactions [26], social media [38, 42, 51, 53], mobile apps [7, 12, 35], privacy and identity [17, 18], cookies and consent [22, 25, 40, 46], subscriptions [23, 37] and e-commerce [24, 36, 37]. Prior deceptive design research [7, 8, 11, 24] has provided taxonomies to describe existing designs, their characteristics, and the domains they are found in [37]. Furthermore, multiple studies used automated web scraping to gain insights into their prevalence [30, 37, 40]. In addition, some studies have investigated how deceptive design patterns affect users [5, 11, 12, 22, 23]. However, the effects of many deceptive design patterns' still have not yet been researched [36]. This exploratory study aims to fill this research gap by investigating the effects of deceptive countdown timers on consumers' shopping behavior and experience.

Our main research questions are (1) whether and how limited-time discounts affect consumers' product choice and (2) whether and to what degree they induce feelings of urgency. We predict that participants will choose a product over a similar, equally priced alternative if it is accompanied by either a discount or a time-limited discount. In addition, we expect that the discount/timer is mentioned as a reason for product choice. We also expect that participants who have encountered a (limited-time) discount will report greater feelings of urgency (a: perceived time pressure, b: fear of missing out, c: feeling steered towards a certain product) than

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[1] Throughout the paper, we will use the term 'deceptive design patterns' as this is the most recent term. However, when referring to the experiment and questionnaire, we use 'dark patterns' as this term was used in the experiment.

those who did not encounter any discounts. Furthermore, we predict that participants who encounter a limited-time discount report greater urgency than those who encounter a discount without a time limit.

This paper is based on a Master's thesis by the first author [50] and its main contributions are the following: We present a preliminary analysis of deceptive countdown timers found on real websites, which informs the design of our study. Furthermore, we develop and employ a setup to research the effects of deceptive design patterns in an online shopping context. Our setup can be reused in similar future studies on the effects of deceptive patterns. Through quantitative and qualitative analyses, we characterize how countdown timers can affect consumers' purchasing behavior. Our findings indicate that deceptive countdown timers might make consumers averse to offers and websites that use such patterns.

2 METHOD AND PROCEDURE

In order to design and use a realistic countdown timer in our experimental setup, we first constructed a corpus of 60 countdown timers as found on real-world websites. We then conducted an online between-subjects experiment (N = 245) with a simulated shopping task to investigate the effect of time-limited discounts on consumers' experience and behavior. The study has been independently reviewed and approved by the Research Ethics Committee of our university. We conducted a pilot study (N = 10) to verify that the experiment was working as intended, which resulted in minor alterations. A visual overview of the experimental procedure is given in Appendix C.

2.1 Countdown timer corpus and characteristics

We searched for countdown timers on online shopping websites (excluding shopping cart pages) using the source code engine on publicwww.com [45] and manual examination of websites detected in an earlier empirical study [37] and Wappalyzer [54]. Out of the 60 observed countdown timers, at least 27 were confirmed deceptive. We labeled a countdown timer as deceptive when: (1) the timer starts from the original time again (i.e., starts over) when the same webpage is opened on another device or after resetting cookies (since cookies allow websites to recognize returning visitors), or after the time runs out and (2) if the discount or deal remains in place or does not change after the timer runs out/resets. Based on the resulting corpus (Table 1), we concluded that the countdown timer used in our experiment should have the following characteristics: the deceptive countdown timer is placed on a front page next to a specific product, offering a discount. When the product is clicked from the front page or via the product overview, the product details will be displayed, again accompanied by a deceptive countdown timer. While deceptive countdown timers in the wild typically had longer time durations, we opted for a countdown that starts at seven minutes, which is a little over half of the time indication that we gave participants for the duration of the experiment (13 minutes).

2.2 Participants

A total of N = 260 participants were recruited using Prolific [43]. In order to detect an effect of η_p^2 =.04 with 80% power in a one-way between-subjects ANOVA (three groups, alpha=.05), G*Power [15, 16] suggests we would need 79 participants in each group (N = 237). To account for unusable data, we increased the number of participants by 10%. All participants were based in the European Union, required to have an approval rate[2] between 80 and 100 on Prolific, and not have participated in the pilot study. All participants were between 18 and 65 years old. Participation was estimated to take approximately 13 minutes, and participants were rewarded £1.74. After filtering out corrupted data and participants who failed to answer the control questions/attention checks, 245 participants (control group = 75, discount group = 91, timer group = 79) were included in the analysis.

2.3 Apparatus and Materials

Each participant entered the experiment on their own device via the Prolific platform. The online experiment consisted of a webshop that was designed to look as realistic as possible [52]. The webshop fictionally sells office supplies such as electronics, desks, and office chairs. Three versions of the same webshop were created, one version for each experimental condition (Figure 1). A complete overview of the webshop can be found in Appendix A. The back-end of our fictional webshop was based upon the work of Geels [20]. The webshop offered two office chairs that differ in color. All groups saw the same two office chairs (Figure 1), one grey and one black, whose product names were displayed as 'ARGON <color> – Office chair'. In all conditions, the two chairs were equally priced, so as not to influence consumer preferences through price differences.

2.3.1 Conditions. Figure 1 illustrates the three conditions. The control group saw both chairs offered without additional differences other than the color and product name of the office chairs. For the discount group, the 'ARGON Grey – Office Chair', is presented with an original price set at $320.00, discounted to $260. For the timer group, the grey office chair is also on sale. However, the offer is now paired with a deceptive countdown timer to put the participant under additional time pressure. The deceptive countdown timer displays 'Offer expires in: <hours>h <minutes>m <seconds>s'. The starting time is seven minutes, counting down to zero. Because the countdown timer is deceptive, it resets to seven minutes if timer group participants refresh the webpage or navigate between webpages. The deceptive nature of the countdown timer thus could be noticed by alert participants (just like this is possible with some deceptive timers in the wild). As all groups were provided with a fictional budget of $300, the option to purchase the grey chair would seemingly expire for the timer group as soon as the timer runs out.

2.3.2 Task. A cover story was used to disguise the true purpose of the online experiment to stimulate natural spending behavior as best as possible, although the purchase would be made using fictional money. The disguised task asked participants to select (i.e., 'purchase') an office chair from a fictional webshop using 'working budget' of $300, while being informed this was to study how people buy products online and what elements influence their buying choices tailored on 'work budget webshops'.

Time left on timer	Deceptive/Non-deceptive	Location of timer	Deceptive/Non-deceptive	Offer/message paired with timer	Deceptive/Non-deceptive
< 2 hours left	6/8	Frontpage	10/26	Discount	23/46
2 – 12 hours left	9/16	Banner	12/23	Free shipping/item	3/4
12 – 24 hours left	7/21	Product page	5/6	Low-stock message	1/2
> 24 hours left	5/15	Product overview	0/5	Other	2/8

Table 1: Number of deceptive instances per countdown timer characteristic
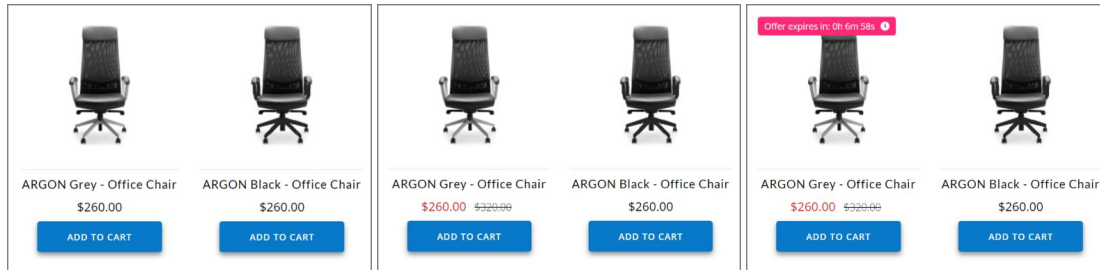
Figure 1: Experimental conditions (f.l.t.r.): Control Group, Discount group, Timer group.

2.3.3 Questionnaire and Measurements. During the experiment, we recorded the product selected by participants and the group participants were assigned to. After completing the task, participants were asked to fill in a questionnaire (Appendix B) consisting of five sections: 1) two attention check questions, 2) questions about why participants selected their chosen chair, 3) questions about feelings of urgency, 4) information that some participants saw a deceptive countdown timer, information about dark patterns in general, and the question of how they think about them, and 5), questions about demographics, online shopping behavior, and if the participant ever encountered deceptive designs earlier.

As countdown timers are used to increase urgency [9, 10, 37], we measured several urgency-related constructs. We operationalized urgency in terms of "fear of missing out" (FOMO), "perceived time pressure" and "feeling steered towards a certain product". In addition, we also explored to what extent participants would expect feelings of regret after finding out that a limited-time offer has not really expired. To measure perceived time pressure, an existing 9-point Likert scale [21] was used. Self-constructed Likert scales and questions were used for the other measurements (Appendix B) due to a lack of fitting existing scales. For example, existing FOMO scales measure "fear of missing out" as a general personal feeling rather than as a passing experience related to a specific product/offer [32, 44, 56].

3 RESULTS AND DISCUSSION

In this section, we present and discuss the results for each of our analyses. For all statistical tests, assumptions were verified following Laerd Statistics [34] and p-values less than 0.05 were considered significant (details for the tested assumptions, are provided in table 2 in Appendix D). Likert-scales (which combine several Likert-type questions into one score) were treated as interval data. Single Likert-type questions were treated as ordinal data. More information about the qualitative analysis can be found in Appendix E.

3.1 Product Selection

A Pearson chi-square test of homogeneity found a statistically significant difference in proportions across the groups, $p < 0.001$, with regard to product selection. In line with our expectations, the post hoc analysis (a pairwise comparison using the z-test of two proportions with a Bonferroni correction) revealed that both the discount group and the timer group selected the discounted product (grey chair) significantly more than participants in the control group (Figure 2). Product selection was not statistically significantly different between the discount and timer groups. We found no evidence that discounts with timers have a stronger effect on product choice than discounts alone. Both types of discounts reduce the apparent preference for the black chair (observed in the control group) and thus, as predicted, affect product choice.
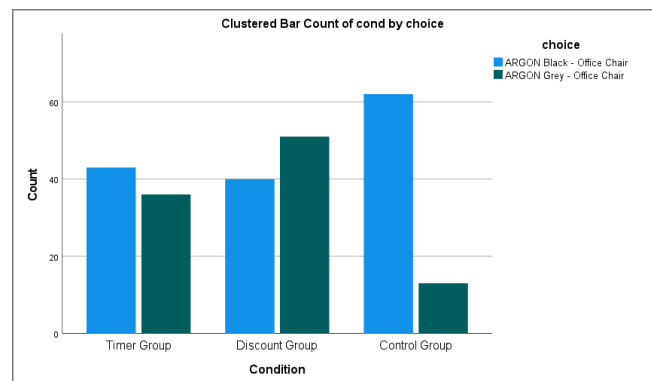
Figure 2: Product choice distribution per experimental condition.

3.2 Reason for Product Selection

An open question was presented to measure the reasons for participants' product choice. Participants in the control group selected the product based on product color, looks (other than color), comfortability, and because it was the only type of chair offered. As expected, participants in the discount group additionally provided discount (i.e., offer/sale/price difference) as a reason. For instance, one participant mentioned: *"They're the same chair, but I feel like I'm saving money by buying the one with a discount"*. Furthermore, participants mentioned that the perceived value of the selected chair was higher due to the price difference. Similarly, almost one-third of the timer group mentioned the discount as a reason for product selection. Contrary to our expectations, no participant in the timer group mentioned the countdown timer as a reason for choosing the chair with the time-limited discount. In fact, participants mentioned choosing the non- limited-time discount product because of the sketchy and fake-looking countdown timer. For example, one participant mentioned: *"It was the same chair so I chose the less 'sketchy' one"*. This finding adds to existing research that argues that in some situations, countdown timers can decrease purchase intent [29] and have the potential to reduce the effects of discount incentives [28].

3.3 Fear of Missing Out

The construct 'fear of missing out' (FOMO) was assessed with three Likert-type questions (Appendix B.3.1). The scale had a high level of internal consistency, as determined by a Cronbach's alpha of 0.890. FOMO was measured using only participants that selected the grey chair (n control = 13, n discount = 51, n timer = 36), because FOMO is related to a product, and not the product choice participants face. Perceived fear of missing out increased from the control group (M = 2.69, SD = 1.40) to the discount group (M = 3.86, SD = 1.68), and timer group (M = 4.44, SD = 1.73) (Figure 3). A one-way ANOVA showed that fear of missing out was statistically significantly different between conditions, $F_{(2, 97)} = 5.266$, $p = .007$, $\omega^2 = 0.08$. A Tukey post hoc analysis revealed that the mean increase from the control group to the timer group (1.74, 95% CI [0.46, 3.03]) was statistically significant (p = .005), but no other group differences were statistically significant. Thus, as predicted, the deceptive countdown timer seems to increase the fear of missing out, similar to what is suggested in existing literature [37]. The increase from the discount group to the timer group was not statistically significant. Hence, our assumption that a limited-time discount would create greater fear of missing out than a discount without a time limit was not supported. A possible reason we did not find such an effect is that discounts typically are not endless, and participants thus could also fear missing out on those.

3.4 Perceived Time Pressure

The construct 'perceived time pressure' consisted of three questions [21] (Appendix B.3.2). The scale had a high level of internal consistency (Cronbach's alpha: 0.822). As the assumption of homogeneity of variances was violated, a Welch ANOVA was carried out to identify statistically significant differences between group means. Although perceived time pressure increased (a lower mean indicates higher perceived time pressure) from the control group
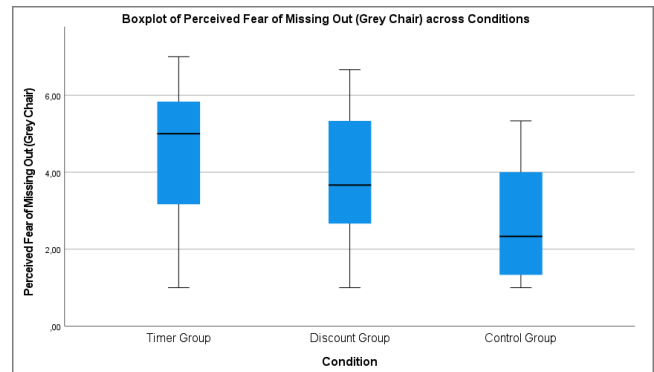

Figure 3: Boxplot of Perceived Fear of Missing Out (Grey Chair) across conditions.

(M = 6.82, SD = 1.64) to the discount group (M = 6.73, SD = 1.75), to the timer group (M = 6.20, SD = 2.24), the differences between groups were non- significant, Welch's $F_{(2, 156.658)} = 2.049$, $p = .132$. This result does not support our assumptions and is surprising, as the study of [21] did find a significant difference in perceived time pressure when comparing non-time-pressured and time- pressured groups in the context of limited-time price discounts. We expect this is related to the time pressure participants felt during the experiment as a whole or that some participants deliberately avoided the discount and countdown timer and thus selected the other product.

3.5 Feeling Steered Towards a Certain Product

The construct 'steering towards products' was measured using a single Likert-type question (Appendix B.3.3). While the feeling of being steered towards a certain product increased from the control group (Mdn = 4) to the discount group and timer group (Mdn = 5), a Kruskal-Wallis H test showed no statistically significant differences in scores across conditions, H(2) = .421, p = .810. Contrary to our expectations, we thus did not find any evidence that discounts or countdown timers steer consumers towards a certain product when facing a product choice. A possible explanation could be that all participants felt steered towards a certain product (the chair) since this was the imposed task.

3.6 Dark Patterns

In the second half of the questionnaire, we informed participants about dark patterns and asked what they thought about them. Participants stated they are aware of dark patterns and mentioned that dark patterns are manipulative, unethical, immoral, and unfair—which is in line with past research [5, 39]. For instance, one participant mentioned: *"I think it is highly manipulative and unethical"*. Another participant mentioned: *"It is an unethical and immoral practice. I would avoid shops that are using this"*. In contrast, some participants do not mind dark patterns (i.e., do not worry about them, also found by [5, 39]), or see it as a simple marketing trick.

3.7 Deceptive Countdown Timers

Most responses provided by participants deemed deceptive countdown timers unethical, unfair, immoral, and manipulative. This is

in line with the findings of the recent survey by the Norwegian Consumer Council [39]. For some, deceptive countdown timers mark the line between what is acceptable marketing and what is manipulation, as elucidated by one participant: *"fake countdown timers is where I draw the line, its misinformation to force the user buy them and force a decision on them"*. Furthermore, many participants extended their view on deceptive design and deceptive countdown timers specifically by mentioning aspects related to urgency such as the pressuring, stressing, or rushing element of the deceptive countdown timer. For instance, participants mentioned: *"I think they are useful for businesses but put customers under stress and maybe do not leave them enough time to make the decision that is best for them"*; *"I think they are designed to stress out the consumer, so that they do not think much about their choice"*; *"they pressure people into rushy decisions"*. This tells us that many participants recognize the pressuring nature of the deceptive countdown timer but do not necessarily feel pressured by it themselves.

We asked participants if they felt influenced by a countdown timer (open question) when purchasing a product online. 93 participants indicated that countdown timers do influence them. 38 participants did feel somewhat or sometimes influenced, dependent on the situation the countdown timer would be presented in. 108 participants did report not feeling influenced by countdown timers. Finally, six answers were unusable. Interestingly, 4 participants indicated they dislike being pressured and therefore will not select a certain product on purpose. So, even though some participants mention not being influenced by a countdown timer to buy a certain product, they are still influenced by the countdown timer in their product choice itself.

3.8 Regret

A 7-point Likert-type question (Appendix B.4) was used to measure the extent of regret if a participant would have purchased a product on a limited-time discount to find out later that the discount never expired. The feeling of regret was similar across all groups (Mdn = 5) and a Kruskal-Wallis H test revealed no statistically significant differences, H(2) = .464, p = .793. Half of the participants showed a high feeling of regret (a score of six or seven), and over 80 percent indicated moderate or higher regret (a score of four or higher), which illustrates quite negative feelings. Hence, employing deceptive countdown timers could backfire on the wanted result (e.g., an increase in sales) of the retailer that employs the deceptive countdown timer [28], especially when compared to using discounts only.

4 LIMITATIONS, FUTURE WORK AND CONCLUSION

Our exploratory study has some limitations which can be avoided in follow-up research. First, the task of selecting an office chair under experiment-related time pressure (trying to complete the experiment as fast as possible) might have interfered with the 'steering nature' of the discount/timer and our goal to measure urgency. Furthermore, our setup allowed participants to re-enter the study if the first attempt was not finished. Thus, participants who aborted the study could re-enter and deliberately choose a different product. Unfortunately, due to technical issues, the time spent on the

selection process and the number of page reloads were not properly measured. Also, we chose a relatively short duration for the countdown timer. Future research could vary the duration of the timer, as the duration might play a role in the (strength of the) effect is has on users. Finally, we have no means to tell which of our participants noticed that the countdown timer was deceptive. As confirmed by certain responses to our questionnaire, some participants suspected that the timer they saw was deceptive. This means our data reflects the reactions of both participants who consciously experienced a deceptive timer and participants who simply experienced a timer. A follow-up study can include questions to determine whether/how/why/if/ the fake nature of the timer was noticed.

This study is presented as a prequel, to facilitate follow-up research into the effects of deceptive design patterns found in online shopping environments. To this end, we have presented a re-usable setup and first versions of scales to measure relevant constructs such as FOMO. In addition, we have some suggestions for future work: First, while this is a study focused on deceptive countdown timers, future research should conduct similar experimental studies to investigate other deceptive design patterns' effects, as our experimental setup is suitable for re-use (the source code of the experiment will be made available). Examples include deceptive low stock messages (something participants mentioned they would fall for more likely). Second, building a corpus of countdown timers (or any other specific deceptive design) could be done at a much greater scale to analyze different features of countdown timers such as time left, position on the webpage, technology used and deceptiveness. Finally, some participants mentioned that deceptive countdown timers and deceptive design patterns in general make them avoid (e.g., due to skepticism) certain products or websites. We find this very interesting and are curious about the 'backfiring' effects deceptive design patterns may have on those who employ them. For instance, our experiment used a single webshop. A broader study where participants can choose to buy a product on one of several webshops could explore if webshops that use deceptive design are avoided.

This is an exploratory study, but it already answers our research questions, at least partially. Our results indicate that deceptive countdown timers can affect product choice, and induce responses ranging from indifference, to finding them manipulative, deceptive, and feeling negatively impacted by them. With respect to induced feelings of urgency, we have found that deceptive countdown timers increase customers' perceived fear of missing out. For other urgency-related constructs, the effects remain unclear and need to be further investigated.

From a webshop's perspective, discounts without deceptive countdown timers might be a better strategy to nudge customers to buy a certain product. Our results show that both the discount and timer groups selected the discounted product significantly more. However, we observed various negative responses towards deceptive timers, while our quantitative data provided no evidence that timers would have a stronger effect on product choice than discounts alone. Some participants reported that they intentionally avoid websites/offers with a countdown timer, thus harming the online businesses that use such aggressive means.

In conclusion, deceptive countdown timers harm consumers' decisional autonomy and their online shopping experience, and it is not clear whether they are more effective than a simple discount. Websites that use deceptive patterns such as countdown timers for short-term gains may be losing customers' business and confidence in the long term.

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A ONLINE EXPERIMENT

All files used for our online experiment can be accessed at *https://gitlab.science.ru.nl/jtiemessen/thesis-project-darkpatterns*. This repository contains all files for the main experiment. Additionally, the full experiment can be downloaded in PDF format (condition = timer group).

B QUESTIONNAIRE

The questionnaire can also be found in PDF format on *https://gitlab.science.ru.nl/jtiemessen/thesis-project-darkpatterns*. The questionnaire consisted out of five segments, each segment regarding different questions. Below, all questions are written out per segment.

B.1 Control

(1) What product did you purchase?
   (a) Keyboard
   (b) Desk
   (c) Speakers
   (d) Office Chair
   (e) Not sure
(2) Was the purchase made using a work budget?
   (a) Yes
   (b) No
   (c) Not sure

B.2 Product Selection

- Why did you select this chair? (open question)

B.3 Urgency

B.3.1 Fear of missing out. Questions regarding fear of missing out needed to be answered using a 7-point Likert scale consisting out of three questions, ranging from 'Not at all' to 'Very much'.

(1) I feel I would have missed out on a great offer if I waited a couple of hours.
(2) I feel like if I did not buy the product right away, I would regret it later.
(3) I feel that if I did not buy the product right now, the product would become more expensive.

B.3.2 Time Pressure. Questions regarding perceived time pressure needed to be answered using a 9-point Likert scale [21] consisting out of three questions, ranging from 'Not at all' to 'Very much' for the first two questions, and 'Not pressured' to 'Highly pressured' for the third question.

(4) Do you believe you had enough time to make a good choice?
(5) Do you believe you had enough time to carefully evaluate each item available?
(6) How pressured did you feel while making your decision?

B.3.3 Steering towards a certain product. The question regarding being steered towards a certain product needed to be answered using a 7-point Likert-type question ranging from 'Not at all' to 'Very much'.

(7) I felt steered towards selecting one of the two products.

B.4 Dark Patterns In General and Deceptive Countdown Timers

(1) What do you think about Dark Patterns? (open question)
(2) What do you think about fake countdown timers? (open question)
(3) Do you feel influenced by a countdown timer? (E.g., in purchasing speed, decision, satisfaction) (open question)
(4) Have you ever encountered countdown timers before this experiment?
   (a) Yes
   (b) No
   (c) Not sure
(5) I would regret it if I purchased a product on a limited-time discount, to find out later the discount never expired. (7-point Likert-type question ranging from 'Not at all' to 'Very much')

B.5 Demographics
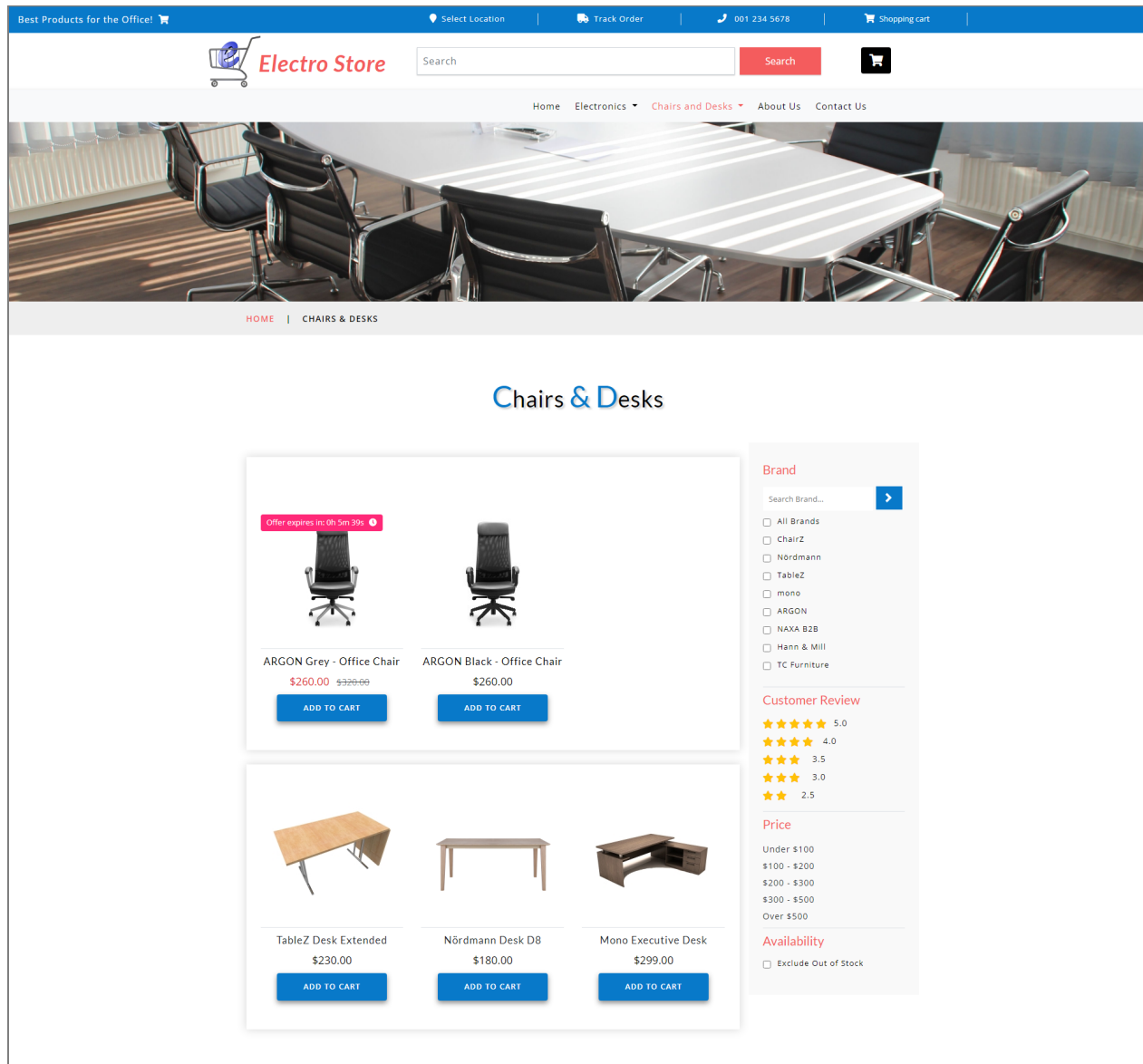
(1) As what gender do you identify?
   (a) Female

Figure 4: Snippet of the Chairs & Desks overview on our fictional webshop 'Electro Store'

    (b) Male
    (c) Other
    (d) Prefer not to say
(2) What is your age?
(3) From which country are you participating in this experiment?
(4) What is the highest degree or level of education you have completed?
    (a) Some High School
    (b) High School
    (c) Bachelor's Degree
    (d) Master's Degree
    (e) Ph.D. or higher

    (f) Prefer not to say
(5) I shop online... (7-point Likert-type question ranging from 'Never' to 'I buy everything online')
(6) I knew about Dark Patterns before this study.
    (a) Yes
    (b) No
    (c) Not sure
(7) If I encounter dark patterns again in the future, I will behave differently. (7-point Likert-type question ranging from 'Strongly disagree' to 'Strongly agree')
(8) Were all websites and questionnaires of the study displayed correctly?
    (a) Yes

(b) No

C   EXPERIMENTAL PROCEDURE

Figure 5 shows our experimental procedure.

D   MEASUREMENTS TABLE

Table 2 summarizes the tests conducted in this study.

E   QUALITATIVE ANALYSIS

In this study we qualitatively analyzed answers participants provided on the open questions. Here, we explain briefly how these results were analyzed using using ATLAS.ti Windows [3]. Please note that in most searches we made use of ATLAS.ti it's function to include inflected forms. In order to code documents that mentioned the 'offer', we analyzed for 'offer', 'discount', 'deal', 'sale', or 'promotion'. We searched for color using: 'color', 'colour', 'grey', or 'black'. To find reasons mentioning the 'only option' we used the former and 'option' or 'available'. To find comments regarding perceived value, we used the search terms: 'value', 'better', 'quality', 'perceived value', and some manual adjustments were made. Finally, most other queries issued used single terms and most results were manually examined.
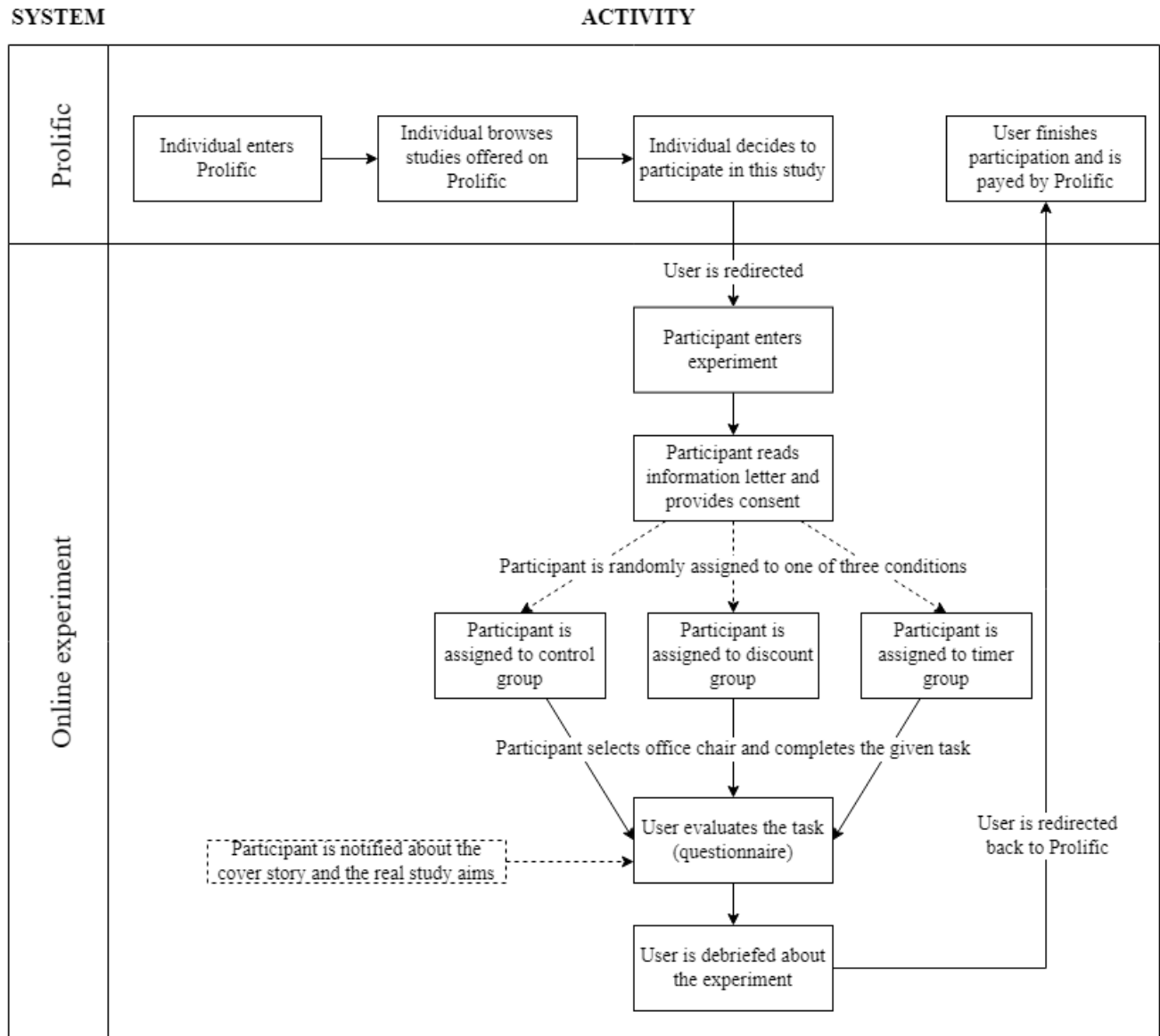
SYSTEM

ACTIVITY

Figure 5: Experimental procedure visualized

Chi-Squared Test – Product Selection

Variable	Black chair	Grey chair	Expected cell counts	p (post-hoc analysis; z test two prop. w. Bonferroni corr.)
Control	62 (82.7%)	13 (17.3%)	>5	<0.05 (significant)
Discount	40 (44%)	51 (56%)	>5	>0.05
Timer	43 (54.4%)	36 (45.6%)	>5	>0.05

One-Way ANOVA – Fear Of Missing Out

Variable	Mean	SD	Examination of boxplot/QQ plot	Levene (homog. of variances)	F	d.f.	p
Control	2.69	1.40					
Discount	3.86	1.68	No outliers	.457	5.266	2	0.07
Timer	4.44	1.73					

Welch F2 Test – Percieved Time Pressure

Variable	Mean	SD	Examination of boxplot/QQ plot	Levene	Statistic	d.f.1	d.f.2	p
Control	6.82	1.64						
Discount	6.73	1.75	No outliers	.002	2.049	2	156.658	.132
Timer	6.20	2.24						

Kruskall-Wallis H Test – Steering Towards Products and Feeling of Regret

Variable	Median	Examination of boxplot	H	d.f.	p
Control - Steering	4				
Discount - Steering	5	No outliers	.421	2	.810
Timer - Steering	5				
Control - Regret	5				
Discount - Regret	5	No outliers	.421	2	.793
Timer - Regret	5				

Table 2: All measurements and tests conducted in this study. For each main test, we also report assumption checks and post-hoc tests.