

Secondary Publication



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Date of secondary publication: 01.07.2026

Version of Record (Published Version), Conferenceobject

Persistent identifier: urn:nbn:de:bvb:473-irb-115892x

Primary publication

Michels, Leonard; Ochmann, Jessica; Günther, Sebastian; u. a. (2022): Empowering Consumers to Make Environmentally Sustainable Online Shopping Decisions: A Digital Nudging Approach, in: Tung X. Bui (Hrsg.), Proceedings of the 55th Annual Hawaii International Conference on System Sciences: January 3-7, 2022, Honolulu, HI, pp. 4707–4716

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Empowering Consumers to Make Environmentally Sustainable Online Shopping Decisions: A Digital Nudging Approach

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Abstract

An ever-increasing share of people is using online shopping to satisfy their consumer needs. This has led to a vivid discussion regarding the environmental sustainability of e-commerce that also emphasized the role that consumer's decisions can play in mitigating its negative impacts. However, while many individuals state that they are willing to act more sustainably, they often struggle to follow through with their 'green' intentions. We propose digital nudging as an approach to encourage environmentally sustainable online shopping decisions and empower consumers to act in line with their intentions. In an online experiment with 323 participants, we evaluate the effectiveness of three different nudging interventions (defaults, active choice, and self-nudging) to promote environmentally sustainable shipping options in an online store and assess the consumers' ethics and empowerment perceptions of the nudges. We find that all nudges are effective in changing decisions, but default nudges lead to negative perceptions among consumers.

1. Introduction

In the past years, the retail industry has undergone an unprecedented shift from traditional in-store to online retailing. While 6 years ago, selling consumer products over the internet accounted for less than 8% of global retail sales, the e-commerce market now makes up almost one fifth of total retail sales worldwide [1]. Accompanying this rise of online shopping, the number of individual shipments fulfilled by delivery services has also boomed. In 2013, the global parcel shipping volume comprised 36 billion parcels, by 2026, it is predicted to grow up to 316 billion – an almost tenfold increase, not yet taking the COVID-19 pandemic's effects into account [2].

This remarkable growth has led to a lively public, political, and scholarly debate on the environmental impact of e-commerce with regard to different areas such as warehousing, packaging, and shipping. The impact, however, does not only depend on the retailers and logistic services, but also the consumer's individual choices, such as express deliveries, product bundling, or sustainable packaging [3, 4].

While many consumers state favorable attitudes towards pro-environmental behaviors [5] and demand sustainable or 'green' options [6], these sustainable intentions often conflict with convenience and price considerations. In addition, prior research has revealed that consumers, in general, struggle to follow through with their sustainable attitudes and do not necessarily act in line with them – a phenomenon known as the 'attitude-behavior gap' [5, 7]. Consumers should, therefore, be both offered sustainable delivery options and as well be encouraged and supported to select them. This might fill two needs with one deed: reduce the environmental impact of e-commerce and empower consumers to act in line with their green intentions.

Information systems (IS) research could help to accomplish these goals, as IS scholars have recently begun to recognize its role in driving more sustainable behavior, summarized in the research stream of *Green IS* [8, 9, 10]. A promising IS-based approach in this realm is the concept of *digital nudging* [11, 12, 13], that extends the theory of *nudging* [14] to digital application domains. Nudging refers to small changes in the choice environment (e.g., user-interfaces) that lead to predictable changes in human behavior, without forbidding options or significantly changing economic incentives. Prior research has shown that (digital) nudges can, indeed, lead to sizable changes in human decisions [15] and might be a suitable tool to increase the sustainability of consumers' decisions [16, 17, 12, 9]. The effectiveness of digital nudges with regard to sustainable consumer decisions in online shopping

contexts has been largely unexplored [12, 13, 18], however. We, therefore, aim to answer the following research question:

RQ₁: To what extent can digital nudges encourage environmentally sustainable consumer decisions in online shopping contexts?

While prior research indicates promising results regarding the effectiveness of (digital) nudges for behavior change [15], critical voices have pointed out possible ethical issues arising with their implementation, such as paternalism or consumer manipulation [19, 20, 21, 22]. These potential shortcomings of nudges would strictly oppose the goal of consumer empowerment. To overcome them, other less intrusive nudging approaches compared to, for example, default choice options, have been proposed: *active choice mechanisms* [23, 24] and *self-nudging* [25]. So far, their effectiveness in promoting environmentally sustainable consumer choices has not been sufficiently researched in online shopping environments. In addition, the nudged individual's perceptions of the nudge are often overlooked in discussions about the ethics of such behavioral interventions. We, therefore, investigate the behavioral effectiveness of an active choice and self-nudging intervention, compare it to regular nudging interventions, and, additionally, aim to answer the following research question:

RQ₂: How do individuals in online contexts perceive digital nudging interventions promoting environmentally sustainable consumer decisions?

To shed light on our research questions and to test our hypotheses, we conducted a survey-based online experiment with 323 participants. They had the task to shop for clothing items in a fictive online store and were offered three different ecological shipping options. We tested the effects of a default nudge, an active choice mechanism, and a self-nudging intervention on the number of sustainable options selected by the participants and assessed their empowerment and ethics perceptions of the online store implementing the respective digital nudges. Our work, thereby, contributes to ongoing IS research by empirically testing the potential of digital nudges to encourage environmentally sustainable behavior, empower consumers, and, thus, build a sustainable digital economy. In addition, we address potential ethical concerns regarding the use of these digital nudges.

The article proceeds as follows: We first present related work on the environmental sustainability of

e-commerce, digital nudging, and ethical issues associated with digital nudging along with our hypotheses. This section is followed by a description of our experimental design and results. The article closes with a discussion of our findings and the resulting managerial and academic implications.

2. Related work

2.1. Environmental sustainability of e-commerce

In this article we investigate the sustainability of B2C e-commerce from an environmental perspective [26, 27]. In particular, we focus on logistics and the delivery of orders as they are among the main contributors to the environmental impact of online retailing [4, 26, 28] and offer great potential to increase its overall environmental sustainability [3].

Prior research has identified multiple areas in the logistics and delivery domain that impact the environmental sustainability of B2C e-commerce, but mostly focused on the role of logistics service providers to improve it [26, 3]. Recent studies, however, also pointed out that consumers can play an important role by choosing alternative, more sustainable delivery options [3, 4, 29]. Encouraging consumers to select such options in online shopping contexts may, therefore, be a promising approach to increase the environmental sustainability of e-commerce purchases.

For our study, we identified three such sustainable delivery options that could be easily implemented by retailers. First, *longer delivery times* in contrast to next-day deliveries considerably decrease carbon emissions of shipping orders [30, 3, 29]. Second, *reusing packaging material from prior orders* in a circular economy approach, as packaging material contributes significantly to the environmental impact of shipping e-commerce orders [4]. Third, a *carbon offsetting option* that allows consumers to directly offset the carbon emissions generated by shipping their order by donating money to organizations that will reduce the amount of global carbon emissions, as offered by delivery service providers [31], airlines [32], and recently also e-commerce vendors (e.g., Digitec Galaxus, a Swiss online retailer [33]). However, merely offering these options in online stores does not automatically make consumers choose them. On the one hand, many individuals have favorable attitudes towards pro-environmental behavior [5], are generally willing to wait longer for their deliveries to arrive [3], indicate that they would accept reusable packaging options [34], and state that they have used voluntary carbon offsetting in other domains before [35].

On the other hand, prior research has shown that consumers do not necessarily act in line with their intentions when it comes to their actual sustainable and green consumption behavior – a phenomenon known as the ‘green gap’ or ‘attitude-behavior gap’ [7, 5]. To help consumers bridge this gap, multiple different approaches have been proposed in prior research [7]. One of them is the concept of *nudging* [7, 16], which has recently also been adapted by IS research to support consumers in digital choice environments [11, 36].

2.2. Digital nudging and choice defaults

In 2008, Nobel Prize laureate Richard H. Thaler and Cass R. Sunstein first introduced the concept of nudging to a broader audience in their seminal book ‘Nudge’ [14]. Since then, ample scholarly, public, and political discussions have revolved around it. In a general definition, nudging refers to small changes in the choice environment that lead to predictable changes in human behavior that should make the nudged individuals better off, as judged by themselves, without forbidding any choice or significantly changing economic incentives [14, 37]. Nudges, thereby, build on psychological and economic research leveraging heuristics and biases in human decision-making. A well-known and very powerful example of a nudge is the so-called *default choice option* [14, 38], which is an option that is automatically selected unless individuals decide to change it [38, 15].

In light of these promising effects, IS research has recently adopted the concept to information and communication technology (ICT) and digital or online choice environments, coining the term ‘digital nudging’ [11, 36]. Driven by increasing scholarly attention, digital nudging has been broadly defined as the use of ICT to predictably change individual behavior in on- and offline environments – without restricting the individual’s freedom of choice, significantly changing economic incentives or providing rational argumentation [11, 36, 15]. The concept has been proven to successfully change behavior in various domains [36, 15], including online auctioning [39], electronic identification (eID) adoption [40], and environmentally sustainable decisions in online contexts [12, 13, 18, 41]. So far, however, only a limited number of digital nudges in specific contexts have been investigated [18, 12, 41, 13]. To extend prior research and add to the discussion about the effectiveness of ‘green’ digital nudges, we investigate whether pre-selecting the three sustainable delivery options identified in our study as a default leads to a higher number of consumers choosing these options.

As default options have been successful in changing behavior to greater acceptance of specific choice options in sustainability [42] and digital contexts [40, 13, 41]. We, therefore, hypothesize that:

H₁: Employing sustainable delivery options as the default choice in an online store increases the number of sustainable delivery options selected by consumers compared to a control group without a default choice option.

From a consumer perspective, such a digital nudging intervention *could* be seen as empowering as it *might* support individuals to act in line with their sustainable preferences [43, 44, 45, 46]. In addition, an online store providing these empowering structures *would* further represent a customer-centric approach on e-commerce, which is becoming increasingly important in electronic markets [47, 48]. However, the nudge can also lead to more sustainable choices among consumers that do not necessarily have sustainable preferences.

In fact, digital nudges can also be instrumentalized to change consumers’ decisions to be in line with the nudging institution’s best interest (e.g., [39, 49]). This is one of the key reasons why an ongoing scholarly debate has questioned the ethics of nudging [20, 19, 22]. As potential ethical issues undermine the notion of consumer-centricity and empowerment, it is important to investigate them and to identify potential measures to overcome them.

2.3. Ethical concerns regarding digital nudges

Prior research has extensively elaborated on the ethical underpinnings of nudges in general [21, 37, 22, 50] and digital nudges in particular [19, 20, 51, 11]. Among the most commonly raised ethical issues of (digital) nudges is the concern that nudges manipulate people’s behavior by exploiting cognitive biases and, thus, the decisions encouraged by the nudge are not necessarily in the nudged person’s best interest but rather reflect the nudging agent’s tactics [50]. This could seriously harm a consumer’s autonomy and freedom of choice [19, 21, 37]. In addition, it is almost impossible for the nudging institution to identify the consumer’s preferences in order to implement nudges that align with them [19, 52]. Default nudges are especially prone to confirm these concerns. By pre-selecting choice options, they do not take the nudged individual’s preferences into account [23, 53] and could, thus, lead to participants feeling patronized to make a specific choice. Based on this reasoning, we assume that consumers who are nudged by defaults perceive an online store employing them to be less empowering and less ethical

than a regular online store. We, therefore, formulate as our second hypothesis:

H₂: Employing sustainable delivery options as the default choice in an online store leads to consumers perceiving the online store as less empowering and as less ethical compared to a control group without a default choice option.

We also propose two alternative digital nudging approaches that might not suffer from these potential pitfalls and could help to empower consumers: *active choice* and *self-nudging*.

Active choice refers to decisions for which no default is implemented, but consumers have to make an explicit choice instead of being able to just stick to the default option [54, 24, 55]. Active choice mechanisms, therefore, empower consumers to make their own decisions and state their preferences, without influencing them towards a specific alternative. In this way, they overcome the ethical concerns associated with other nudging interventions, especially default nudges [24]. Empirical research has further shown that active choice mechanisms can lead to comparable effects as defaults in the financial domain [24] and to significant increases for online environmental sustainability decisions regarding transportation carbon offsetting [54]. Based on these results, we hypothesize the following:

H₃: Requiring participants to make an active choice to either select sustainable options or not in an online store increases the number of sustainable delivery options selected by consumers compared to a control group in which no choice is required.

In addition, based on the non-intrusive nature of active choice mechanisms which leads to fewer ethical objections associated with them, especially compared to default nudges [54, 24], we hypothesize for the consumers' perceptions:

H₄: Requiring participants to make an active choice to either select sustainable options or not in an online store does not lead to consumers perceiving the online store as less empowering and ethical compared to a control group in which no choice is required.

Another recent approach is the concept of *self-nudging* [25] in which consumers are empowered to nudge themselves towards their desired behavior. In essence, self-nudging aims to explain to consumers, why they might fail to reach their goals or act in line with their preferences and afterwards provide them with information and mechanisms of how to overcome these

barriers. One approach in this realm, that is particularly facilitated by digital technology, is to explain consumers the working mechanism of a nudge (e.g., a default option) and leave it up to them to decide for themselves whether they want it to be implemented or not. Thus, consumers have full control and transparency over the nudging mechanism, which addresses ethical concerns of nudges and empowers consumers to adjust their choice environments according to their needs [43, 44, 45, 46].

As we assume that a large proportion of consumers has the goal to behave in environmentally sustainable ways [5], the self-nudge should be implemented by a large proportion of consumers and, thus, be effective in encouraging sustainable behavior. We, therefore, hypothesize that:

H₅: Offering consumers the option to employ sustainable delivery options as the default choice in an online store increases the number of sustainable delivery options selected by consumers compared to a control group without a nudge.

Consumers should also feel more empowered and perceive the online store as more ethical, as a self-nudge mechanism gives them control over the choice options and the choice environment, and, thus, empowers them to act in line with their preferences. We, therefore, further hypothesize that:

H₆: Offering consumers the option to employ sustainable delivery options as the default choice in an online store leads to consumers perceiving the online store as more empowering and more ethical compared to a control group in which no choice is required.

3. Method

To test our hypotheses, we conducted a survey-based online experiment in the fashion retail domain with 323 participants. We chose fashion retail as clothes are by far the most frequently online purchased goods in the UK [56].

3.1. Experimental design

Our experiment consisted of a fictive online shopping task, in which participants were asked to select the clothing item in a mock-up online store they would most likely buy (assortment of 6 items for females and males respectively, price range £7.50 - £38). They were then asked if they wanted to apply three different 'eco options' for their order. The three options were: eco delivery (extending the delivery time from one working

day to up to three working days), reusing material from prior orders to pack their order, and offsetting the carbon emissions associated with the order for £0.27.

For the experiment, participants were randomly assigned to one of four different conditions. In the *control group* (CG), the eco options were introduced as optional and could be (de-)selected by clicking on a checkbox next to their respective description (e.g., “Use the eco delivery option that saves resources by allowing a delivery time of up to three working days”). In the *default condition* (DN), the eco options were as well marked as optional, but all checkboxes were pre-selected by default. Participants could de-select them by clicking on the respective checkbox of each option. In the *active choice condition* (AC), the eco options were introduced as delivery options, packaging options, and carbon compensation options. The respective option was introduced as a question (e.g., “Do you want to use our eco delivery option that saves resources by allowing a delivery time of up to three working days?”) and participants had to either select ‘yes’ or ‘no’ as an answer. If participants did not select an answer and wanted to checkout, they were reminded that they had to make a selection. In the *self-nudge condition* (SN), participants read, before entering the product selection page, that sustainability and the environmental impact of everyday decisions were currently widely discussed in public and that even people who cared about the environment and wanted to make sustainable choices often fail to do so because they struggle to transfer their intentions into actions. They were then informed that researchers had shown that pre-selecting sustainable choice options could support people in following through with their plans and act more sustainably while still leaving them their freedom of choice. In addition, they were informed that such pre-selections work because people often do not bother changing them, as it is easier to stick to the pre-selected option than to actively choose another option. Lastly, participants were asked whether they wanted the online-store to make all sustainable shipping and packaging options it offered the pre-set choice. If they selected yes, the shopping bag was the same as in the default group, if they selected no, it was the same as in the control group.

Next to every eco option, there was a small mouseover information window that gave participants further information about why selecting the option would help to save resources and reduce the environmental impact of their order. When participants selected the eco delivery option, the estimated delivery was changed, such that it did not show the next working day, but an interval from the next working day to the

third working day after the current. In addition, when participants selected the carbon offsetting, the total of the order was adjusted.

3.2. Measures and scales

To measure the participants’ environmental values and orientations and use them as a control variable for our analyses, we used the environmental societal responsible consumer behavior (RCB-S) and sustainability-focused value orientation (SVAL) subscale of Buerke et al. [57]. The scale showed a very good internal consistency (Cronbach’s $\alpha = .90$). Our main dependent variable was the number of eco options the participants chose, ranging from 0 to 3. In addition, we constructed a consumer empowerment scale by adapting the second item of the experienced empowerment subscale of Füller et al. [43], the privacy empowerment subscale of Van Dyke et al. [45], and the fourth and sixth item of the customer centricity scale of Habel et al. [58]. The seven item scale showed a very good internal consistency (Cronbach’s $\alpha = .88$). Lastly, to cover the consumers’ ethics perceptions of the online store, we used the overall ethics subscale as well as the non-deception subscales of Román [59]. The scale showed a good internal consistency (Cronbach’s $\alpha = .76$).

3.3. Participants

We recruited 323 participants from the UK using the online platform Prolific. Only participants who stated that they, on average, purchase clothing online at least once in a few months were admitted to participate in the survey. Participants were randomly assigned to one of the four experimental conditions at the beginning of the experiment. Due to many participants accessing the survey simultaneously, the randomization did not lead to a fully balanced distribution across the groups. However, there were no significant differences between the groups with regard to demographic characteristics.

Table 1. Demographic summary of participants in experimental groups

Characteristic	CG	DN	AC	SN	
<i>n</i>	99	83	70	71	
Sex	Female	71 (72%)	60 (72%)	49 (70%)	46 (65%)
	Male	28 (28%)	22 (27%)	21 (30%)	24 (34%)
	Other	0	1 (1%)	0	1 (1%)
Age	mean	30.7	33.8	34.7	34.1

4. Results

4.1. Preliminary analysis

As participants in the self-nudging group self-selected themselves to either receive the default nudge or not, we ran a logistic regression predicting their decision based on the participant's age, gender, and environmental values and orientations to identify control variables for our subsequent choice analysis. On a descriptive level, 59 (83.1%) of the participants in the self-nudging group decided to implement the default nudge. Our logistic regression model explaining the individual's dichotomous decision of whether the default nudge should be implemented (yes vs. no) showed that the only significant predictor was the participants' environmental values and orientations ($B = 0.71$ ($SE = 0.30$), $OR = 2.03$ (95%-CI [1.17; 3.93], $z = 2.35$, $p = .019$). This result suggests that participants with higher environmental values and orientations were more likely to wish for the default nudge to be implemented for them.

4.2. Choice analysis

To test our hypotheses H_1 , H_3 , and H_5 with regard to the number of eco options chosen by the participants (see Figure 1 for an overview), we ran a linear regression model. The model included the following independent variables as predictors of the number of eco options chosen (see Table 2): *Nudge* (dummy: 1 if participant experienced the default nudge, either in the default or self-nudging group), *Active choice* (dummy: 1 if participant was in the active choice group), *Self-nudge* (dummy: 1 if participant was in the self-nudging group), the interaction term of $Nudge \times Self-nudge$, and the control variable environmental values and orientations (EVO).

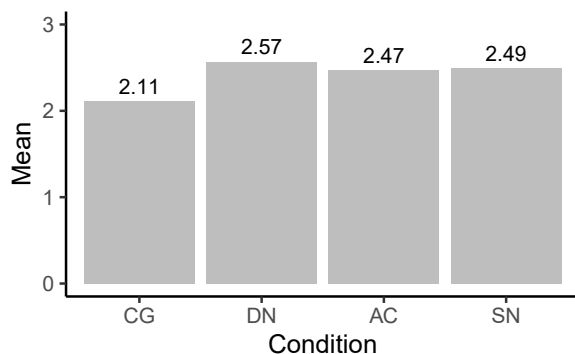


Figure 1. Mean number of eco options chosen per experimental group.

Our model revealed a significant positive main effect of *Nudge*, indicating that the default nudge in which the three eco options were pre-selected (either as a pre-set nudge or when being in the self-nudging condition and deciding for implementation of the nudge) increased the mean number of eco options selected by the participants by almost 0.5. This result is in line with our hypothesis H_1 .

For *Active choice*, the model also revealed a significant main effect. This indicates that participants who had to actively decide against or in favor of each eco option chose on average 0.38 eco options more than the control group. This result is in line with our hypothesis H_3 .

The significant negative main effect of *Self-nudge* suggests that participants in the self-nudging group who did not want to implement the default nudge did choose, on average 0.42 fewer eco options than participants in the control group. For participants in the self-nudge group who chose to implement the default nudge, however, the nudge led to a net positive effect of 0.54 more options chosen than participants in the control group, as indicated by the significant interaction effect of $Self-nudge \times Nudge$. This result is in line with our hypothesis H_5 .

We lastly calculated a one-way between-subject ANOVA to determine whether the four experimental groups differed regarding the mean number of eco options chosen (see Figure 1). The ANOVA revealed significant differences between the groups ($F(3,319) = 6.39$, $p < .001$). A subsequent post-hoc Tukey HSD test showed only significant differences between the nudge groups and the control group (all $p < .05$) and not between the respective nudge groups (all $p > .87$). Thus, one can conclude that the three nudges were equally effective in encouraging more environmentally sustainable behavior.

4.3. Consumers' perceptions

To investigate the consumers' perceptions of the different interventions, we ran two additional regression analyses containing the consumer empowerment and ethics perceptions of the online store scales as the dependent variables and the same independent variables as for the choice analysis.

The regression model (see Table 2) for the participants' consumer empowerment perceptions revealed a marginally significant negative main effect of *Nudge*, which suggests that participants who experienced the default nudge felt less empowered in the online store than participants in the control group. This marginal effect, however, seems to have been

largely driven by the participants in the default nudge group as suggested by the positive, albeit not significant, coefficient for *Self-nudge* and *Nudge* × *Self-nudge*. This result is in line with our hypotheses H₂ and H₄, but not in line with H₆. Interestingly, the model further revealed a significant positive main effect of environmental values and orientations (EVO), suggesting that the higher the participants' environmental values and orientations, the more they felt empowered by the store. All other dependent variables in the regression model did not reach statistical significance.

For the participants' ethics perceptions of the online store, the regression model (see Table 2) revealed a significant negative main effect for *Nudge*, which suggests that participants who experienced the default nudge perceived the online store to be less ethical than the control group. As for the consumers empowerment perceptions, this effect was largely driven by the participants in the default nudge group as suggested by the positive, albeit not significant, coefficient for *Nudge* × *Self-nudge* and the very small negative coefficient for *Self-nudge*. This result is in line with our hypotheses H₂ and H₄, but not in line with H₆. Again, the model further revealed a significant positive main effect of environmental values and orientations (EVO), suggesting that the higher the participants' environmental values and orientations, the more ethical they perceived the online store. All other dependent variables in the regression model did not reach statistical significance.

Table 2. Regression results.

	Eco options	Empowerment	Ethics
Constant	0.56*** (0.16)	4.77*** (0.23)	4.54*** (0.21)
Nudge	0.49*** (0.10)	-0.24* (0.13)	-0.34*** (0.12)
Active choice	0.38*** (0.38)	-0.15 (0.14)	-0.11 (0.13)
Self-nudge	-0.42** (0.20)	0.25 (0.28)	-0.04 (0.26)
Nudge × Self-nudge	0.47** (0.23)	0.07 (0.32)	0.31 (0.29)
EVO	0.32*** (0.03)	0.10** (0.04)	0.11*** (0.04)

Standard errors are reported in parentheses.

*, **, *** indicate significance at 90%, 95%, and 99% level

5. Discussion

With the remarkable growth of the e-commerce market, the individual preferences for pro-environmental behavior and sustainable shipment

options are becoming increasingly relevant. To encourage sustainable consumer decisions in online shopping contexts and empower individuals to follow through with their 'green intentions', our study introduces digital nudges while taking potential ethical concerns regarding their use into account.

We find that a default, active choice, and self-nudge all significantly increase the number of sustainable shipping options selected by consumers. Controlling for environmental sustainability values and orientations, the three nudging options lead to an increase in the number of options selected between 75% and 96%. For our first research question, we, therefore, conclude that digital nudges are very effective in encouraging environmentally sustainable consumer decisions in online shopping contexts.

We do also find, however, that the default nudge leads to marginally significant negative effects regarding the consumers' empowerment perceptions and significant negative effects regarding ethical perceptions in the online store. We do not find such negative effects for the two other nudging interventions, but also no positive effects. With regard to our second research question, we, therefore, conclude that digital nudging interventions promoting environmentally sustainable decisions are not perceived negatively by consumers, except for choice defaults.

These results contribute to the ongoing IS research in multiple ways. First, prior studies investigating the effects of digital nudges on environmentally sustainable behavior have illustrated the potential of these behavioral interventions to increase pro-environmental behavior in various domains [12, 13, 18, 41]. We extended the approach to the general online shopping domain and showed that digital nudges are also effective in encouraging consumers to choose more sustainable shipping options. Our results, therefore, inform research on *Green IS* [8, 9, 10] and emphasize the potential of digital nudges as means to increase the environmental sustainability of e-commerce and electronic markets [27]. Prior research has revealed that ICTs have great potential in driving more energy-efficient behavior [9]. We add to this research and show that incorporating behavioral economic theory [60] in Green IS research can help to encourage individuals to make more environmentally sustainable decisions in online shopping environments. Our proposed digital nudging approach is especially compelling as it is simple to implement and uncomplicated to adjusted for different choice environments.

Second, we contribute to the ongoing discussion regarding digital nudges and their general potential to change behavior in online choice environments [11, 40,

36]. We show that, next to default nudges, active choice and self-nudges are also effective in changing consumer behavior in digital contexts. While the effectiveness of an active choice nudge has been recently reported by Meske et al. [55] in the e-commerce charity domain, its potential has been largely overlooked by past IS research. In addition, we report the results of a self-nudge intervention that enabled consumers to decide for themselves whether they want a nudge to be implemented [25]. Even though this intriguing concept holds great potential to empower consumers and overcome ethical concerns regarding nudging interventions, it has not yet been discussed in IS research and, in general, empirical evidence on the effects of self-nudges is scarce.

Third, we proposed digital nudging as a way to empower consumers to make environmentally sustainable online shopping decisions in online choice environments [43, 44, 45, 46]. While a default nudge is not per se empowering as it could patronize people or nudge them towards choices not in their best interest, active choice or self-nudging approaches are suited for a more human-centric approach in e-commerce that still encourages environmentally sustainable choices [47, 48]. These approaches foster an individual's self-determination (i.e., their ability to make autonomous decisions) and impact, referring to the influence an individual has in the choice situation, which have been deemed key principles of individual empowerment in prior research [46]. Our results suggest that default nudges lead to consumers perceiving themselves as less empowered in the online store. For the active choice and self-nudge, we did not find any effects on empowerment perceptions. This suggests that these alternative approaches might be considered empowering from a theoretical perspective, but are not necessarily perceived as empowering by consumers. Future research should, therefore, shed additional light on the effects of digital nudges on consumers' empowerment perceptions.

Lastly, we are taking up the current discussion about the ethics of digital nudges [51, 11, 20, 19] and directly evaluated the ethical perceptions consumers have with regard to digital nudging. We contribute to prior research by showing that implementing rather intrusive nudges such as default choice options, indeed, leads to consumers perceiving online stores as less ethical. To overcome such ethical objections, additional explanations about the nudge might be necessary, as suggested by prior research [20, 19]. Active choice and self-nudges did not lead to ethical objections and are, therefore, also promising approaches to ethically nudge individuals in online environments, as suggested

by prior research [54, 24, 25]. While we hypothesized that offering a self-nudging option leads to higher ethical perceptions of an online store, our results are not in line with this notion. This might be explained by prior research that has shown that consumers are generally in favor of nudging interventions [61]. Further research is needed to disentangle scholarly and consumers' perceptions of a nudge's ethics in order to get a more holistic understanding of its potential shortcomings.

Next to these theoretical contributions, our paper provides implications for managers and practitioners. The proposed digital nudges give retailers guidance of how to empower customers to act in line with their pro-environmental preferences. In addition, our results can serve as a starting point to address the public debate on the environmental impact of e-commerce proactively, while considering ethical concerns. Lastly, our study identifies easily implementable interventions and choice options, illustrating that encouraging and showing environmental-friendly behavior is not necessarily costly and complex.

5.1. Limitations and future research

Although our research provides valuable results, we want to point out potential limitations of our study. First, the participants in our study were confronted with a hypothetical choice scenario. Choosing any of the eco delivery options did not have real consequences such as waiting longer for their delivery or paying more for the order. This limitation could explain the high average number of options participants chose. Another reason for this might be survey satisficing and social desirability. We, therefore, plan to implement the presented nudges in a field experiment using a real-life online shop supported by an industry partner. In the present study, we also took only a very limited perspective of sustainability in electronic markets into account. It might be that for social sustainability, for example, the nudges have different effects. In addition, we focused only on the transportation and delivery domain of e-commerce, future research should also investigate how consumers could be encouraged to make more environmentally sustainable product choices in e-commerce environments.

5.2. Conclusion

The present study aimed to identify whether digital nudges are an effective measure to encourage more environmentally sustainable consumer decision in online shopping contexts. In addition, we have adopted a human-centric perspective and investigated the consumers' ethical and empowerment perceptions of

such nudging approaches. With respect to our research questions, we found evidence that digital nudges are indeed effective tools to encourage environmentally sustainable consumer decisions in online shopping contexts, highlighting their potential to make the digital economy more sustainable. Moreover, we find that employing default nudges in an online store leads to consumers perceiving the store as less ethical and less empowering. An active choice and self-nudge do not suffer from such negative effects, but do also not improve ethics and empowerment perceptions of consumers.

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