

# Overt or Covert? The Effect of Different Digital Nudges of OCS Intermediate Option

*Completed Research Paper*

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## **Abstract**

*More and more vendors are building and optimizing their own online customization system (OCS). Although the design of OCS is important aspects of IS research, little attention has been paid to the effect of emerging digital nudging on OCS. Following Felsen et al. (2013) study, we divide digital nudges into the “overt digital nudges (ODN)” and the “covert digital nudges (CDN)”. Through a 2 (ODN: yes / no) × 2 (CDN: yes / no) factorial online laboratory experiment, we explore how ODN and CDN influence on consumers’ choice of intermediate option. We found that both ODN and CDN significantly increased the number of selections of the intermediate option in consumers’ final package, and there was an interaction between them. If ODN and CDN were applied simultaneously, the effect was stronger than CDN only, but there’s no significant difference compared to ODN only. In addition, ODN had stronger effect than the CDN. Important theoretical and managerial implications are also discussed.*

**Keywords:** Online customization system, Overt Digital Nudge, Covert Digital Nudge, Intermediate option

## **Introduction**

With the popularization of internet technologies and the rapid development of e-commerce, Online Customization (OC) as an important means for vendors to improve their competitiveness has shown an increasing trend (Westphal et al. 1997; Wang and Benbasat 2009; Bockstedt and Goh 2014). To fulfill consumers’ heterogeneous preferences and unique needs, many vendors (e.g., Dell, Nike, etc.) have built their own online customization systems (OCS). However, these OCS require users to clarify their own preferences and express themselves clearly, which is possibly difficult for consumers, especially for novice (Awad and Krishnan 2006; Arora et al. 2008; Çil and Pangburn 2017; Bellis et al. 2015). The requirement of a large amount of time and effort hinders the development of OC (Dellaert and Dabholkar 2014; Franke et al. 2013; Hildebrand et al. 2014). How to simplify the OC process by improving the design of OCS has been the common concern for both enterprises and academics (Buechel et al, 2014; Randall et al. 2007; Valenzuela et al. 2009; Tam and Ho 2005). Although many studies have found many factors could influence consumers’ choice and attitude (Franke and Schreier

2007; Franke et al. 2010), however, little attention has been paid to what vendors can do proactively to help consumers choose. Digital nudging, an emerging stream, may be helpful to solve this problem.

Digital nudging is a powerful tool in choice architect's toolbox by changing the design of the user interface (Johnson et al. 2012; Schneider et al. 2018). Specifically, it works by either modifying what is presented (i.e. the content of a choice) —or how it is presented (i.e. the visualization of a choice) (Dolan et al. 2012; Tversky and Kahneman 1981; Schneider et al. 2018). Depending on the nature of the influence of nudge on decision-making, Felsen et al. (2013) propose a typology of offline context that distinguishes the "overt nudges" and the "covert nudges". Following their study, we distinguish the "overt digital nudges (ODN)" and the "covert digital nudges (CDN)" in digital context. ODN means that e-commerce vendors explicitly show their expectation for consumers' behavior change in OCS, which is a conscious process (Felsen et al. 2013; Dianoux et al. 2019). Correspondingly, if e-commerce vendors don't explicitly show their expectation and the nudge process is subconscious, then it is CDN. In our study, we get ODN and CDN by setting default option and presenting vendor recommendation information in OCS.

In order to clarify the effect of the two kind of digital nudges on consumer decision-making, we choose intermediate options as the control object of digital nudges. A large number of studies have empirically demonstrated the existence of a compromise effect (i.e., consumers prefer to choose intermediate options, Drolet et al. 2000; Simonson and Tversky 1992). Compared with extreme options, nudging the intermediate option is more difficult for vendors. Nudging to increase the number of selections of the intermediate option will have important business value for vendors. Here, we focus on two important research questions. First, can digital nudges (i.e., ODN and CDN) increase the number of selections of the intermediate option in consumers' final package? Second, how combining ODN and CDN change the effect of nudge?

Through a 2\*2 factorial online laboratory experiment, we empirically investigated the effects of ODN and CDN on consumers' customization choices. We randomly divided subjects into four groups: "no digital nudge (Non-ODN/Non-CDN)", "only overt digital nudge (ODN/Non-CDN)", "only covert digital nudge (Non-ODN/CDN)" and "combining overt digital nudge and covert digital nudge (ODN/CDN)". The number of selections of the intermediate option for four groups are collected and analyzed.

The current research will contribute to literature in following aspects. First, our research firstly focuses on the impact of digital nudge design on consumer decision-making in OCS research. It opens up a new direction of OCS and Nudge researches and is helpful for relative researchers. Second, following Felsen et al. (2013), this research proposes a new typology for digital nudges. We explore and compare the effects of ODN and CDN. Thirdly, previous studies haven't studied the effects of the combination of ODN and CDN. Our research explores the combined effects of them and gives the possible explanations for underlying mechanism, which provides a reference for future researches on combining effects of different kinds of nudges.

This research also has important marketing implications. First, through digital nudging, the potential defect of OC such as excessive options can be reduced. Vendors should exert more digital nudges to optimize their OCS. Second, since the potential profitability of the intermediate options are the best, the digital nudge design of the intermediate options will lead more consumers to choose intermediate options, which can increase the profits of vendors.

The following parts of this article will be constructed as follows. We will make a review on relevant literature and propose research hypotheses. Next Section is devoted to make research design. After that, we will analyze the result of the study. Finally, we discuss the contribution and managerial implications, future research direction, and limitations of the research.

## **Literature review and hypothesis**

### ***Overt Digital Nudge (ODN)***

Numerous studies in behavioral economics and behavioral decision-making have shown that human isn't fully rational, but boundary rational and exhibit many predictable biases in decision-making (Ariely, 2008; Tversky and Kahneman 1974), such as status-quo bias (Kahneman et al. 1991). In the online context, consumers' choices are influenced by choice presentation (Johnson et al. 2012; Hansen and Jespersen 2017; Henderson and Liu 2017). Due to the explosion of online information and limited consumer attention, for design of customization systems, the choice architect can nudge consumers' decision-making by changing information content and format (Bellis et al. 2016; Etkin and Ghosh 2017; Wisdom et al. 2010). Schneider et al. (2018) proposed four steps for designing choices to nudge users from a system design perspective: define the goal, understand the users, design the nudge, and test the nudge. Although the researchers have not paid attention to how to improve the design of OCS to nudge consumers (Goh and Bockstedt 2013), lots of researches have many insights on the user's attitude and behavior when using the OCS (Levav et al. 2010; Nagpal et al. 2015; Nolan et al. 2008; Park et al. 2000).

Felsen et al. (2013) distinguish "overt nudges" from "covert nudges". The overt nudge which uses conscious processing effects by explicitly showing the expected change in behavior and the ways in which it is likely to be produced. The covert nudge which is subconscious processing does not show this, and individuals cannot understand what the expected behavior is (Felsen et al. 2013; Dianoux et al. 2019; Münscher et al. 2015). Following their study, we divided digital nudges into the "overt digital nudges (ODN)" and the "covert digital nudges (CDN)". Next, we introduce the relevant research on the impact of OCS design on consumers from these two kinds of digital nudges, and choose representative tools as the operational tools of ODN and CDN.

ODN primarily influences decision-making by providing consumers with different information content or by adding information input (Felsen et al. 2013; Moreau et al. 2011). Early researches focused on changes in content of information triggered by changes in the number of options (Bharadwaj et al. 2009). By dividing the product into several attribute based on its component, attribute-based customization system provides consumers with more options than product-based customization system. Therefore, users can perceive that the system is useful and entertaining and feel more satisfied (Randall et al. 2007; Kamis et al. 2008; Valenzuela et al. 2009). However, in the process of using attribute-based customization systems, consumers face more dilemmas and prefer to choose compromise options (Valenzuela et al. 2009).

Recent researches focused on the impact of information input from customization communities, peers and vendors (Goldstein et al. 2008; Hildebrand et al. 2013; Dellaert and Dabholkar 2009; Coker and Nagpal 2013). Vendors can provide visualization, enhance salesperson interaction, and provide post-purchase product adaptation in customization systems to effectively increase consumers' perception of mass customization products, control, and enjoyment, while reduce perception of complexity. In order to increase the willingness of online customization (Dellaert and Dabholkar 2009), the recommendation information provided by the vendors will adjust option framing effects (Coker and Nagpal 2013).

Here, we choose present vendor's recommendation as for ODN. ODN, in present study, makes consumers receive more overt system information which will be added into their own decision process. Consumers pay more attention to the options' 'quality', compared with prices (Hardie et al. 1993; Heath et al. 2000). With ODN, consumers who prefer low prices will have more reasons to raise their target price, thus the number of intermediate options will increase. Those who usually prefer intermediate price options will stick to their original choice. Those who usually prefer high price options will pay more attention to option quality and stick to their original option rather than choose lower-price option recommended by vendors. (Coker and Nagpal 2013). Concluded from all three types of consumers, it is reasonable that the average number of choosing intermediate options will increase in the final customized package. We propose that:

*Hypothesis 1: Consumers will choose more intermediate options in ODN condition than in Non-ODN condition.*

### ***Covert Digital Nudge (CDN)***

Unlike ODN changing information content to influence consumers' decision, CDN alters the presentation of information to influence consumers' decision rather than altering the number and content of the options (Schneider et al. 2018; Felsen et al. 2013). It has been revealed that typical presentation of highlight, bold, number and color (Thaler and Sunstein 2008) will influence the attention allocated by consumers on the screen thus increases the possibility of getting picked.

The most common way of CDN is to set up a default option. Consumers' decision-making process changes from searching the most suitable option among all to judging whether the default option suits them well and whether default option is better than other ones. This change makes default option prominent to consumers. Since default option setting has no requirement for the size of choice set pool, it has been applied quite widely (Schneider et al. 2018). Consumers are prone to maintain their status quo rather than altering default option (Valenzuela et al. 2009; Benartzi et al. 2017). Although in the option framework effect studies researchers have tried to set up the highest and lowest price as default option, it has to be noticed that these researches haven't given enough attention to the influence CDN solely have on consumers' preference. They only focus on the impact of the order in which the options are presented. The impact of CDN on consumers' preference is not taken into consideration.

CDN may can increase the number of choosing intermediate options in final customized package. During the decision-making process, if the preferred option is not the default option, consumers have to reject the CDN option and make another choice. However, the process of rejecting will suffer consumers as it is tough one (Jin et al. 2012; Coker and Nagpal 2013). In the light of this statement, some consumers whose target option is not clear will accept the default option due to the fear of pains coming by the rejection. We propose that:

*Hypothesis 2: Consumers will choose more intermediate options in CDN condition than in Non-CDN condition.*

ODN, offering information input, play a similar role of CDN. Consumers with ODN will have to make a compare between their original option and ODN option. In the light of this statement, consumers will accept ODN option due the pain of rejection. ODN seems to share the similar mechanism in nudging people to make a choice and particularly lead consumers to pay more attention to the quality, which makes ODN's influence more powerful than CDN. We propose that:

*Hypothesis 3: Consumers will choose more intermediate options in ODN/Non-CDN condition than in Non-ODN/CDN condition.*

### **Combining ODN and CDN**

When ODN and CDN are combined with each other, consumers will receive a 'website recommendation' tag as well as a default option. Consumers can see the default option setting and the vendor recommendation information at the same time, it is obvious that the vendor wants to nudge consumer to select the option. Since ODN and CDN are simultaneously set in the same option, and the impact of ODN/Non-CDN is greater than that of Non-ODN/CDN, consumers may consider the CDN as part of the ODN operation, ignoring CDN's impact (Coker and Nagpal 2013).

Studies have also shown that although consumers are affected by bounded rationality in decision-making, they produce heuristic thinking and bias (Kahneman et al. 1991). However, this degree of arousal is regulated and influenced by a variety of conditions (Schneider et al. 2018; Johnson et al. 2012), and is closely related to the personal traits of consumers (Nagpal et al. 2015). Therefore, not all consumers' choices will be affected by digital nudges, that is, there is a ceiling effect (Thaler and Sunstein 2008).

Under the influence of these two mechanisms, those who prefer low price options will pay more attention to quality and alter their choice, which increase the number of choosing intermediate options. Those who prefer intermediate price options will stick to their original choice. Those who prefer high price options will pay more attention to quality and stick to their original choice. We propose that:

*Hypothesis 4: Consumers will choose more intermediate options in ODN/CDN condition than in Non-ODN/CDN condition.*

## Research design

### Stimuli, experimental procedure and subjects

This study used 2 (ODN: yes / no) × 2 (CDN: yes / no) manipulated between subjects. The web design was modified based on the customization material used by Jin et al. (2012). In order to prevent the subjects from directly perceiving our experimental purposes, we informed the participants before the experiment as follows:

*“We are a website making customized traveling-guideline. Our main business is to provide travel planning services for tourists. You only need to express your basic travel needs and preferences and our high-ranking travel planners will carefully customize your own traveling plan for you. Since our products are still in the test optimization stage, now we offer 100 free planning places and provided participation rewards to get more user feedback and evaluation. We will design your own travel guidebook based on your needs and preferences for this trip and send it to your email address within one week.”*

We hope that in this way, the choice of the subject would be as real as possible. Participants were asked to express basic needs such as destinations, days of travel, number of sightseeing spots, places to visit, transportation, accommodation and dining standards, meals and preferences, tour guides, pick-up and drop-off services, shopping times and insurance, as shown in Figure 1. For each question they had 5 levels to choose from.



Figure 1. ODN/CDN stimuli used in the study

The study was held in a laboratory at a university in Beijing, China. There are 10 test stations, each equipped with a desktop computer and separated by partitions to avoid mutual interference. After the subjects entered the laboratory, the researcher told them that the experiment was an online questionnaire experiment. The experiment process was a unidirectional. Once the selection was made, it could not be returned to the modification. Experiment links containing four different sets of designs were randomly sent to participants. The randomization process was automatically run by the Qualtrics. The number of participants in each condition was showed on Table 1 to manifest that the randomization process took effect. The participant clicks on the link and enters the participant welcome interface. Click the questionnaire start button and the participant can start the experiment. Asking the participant's gender,

age, and income after they complete the customized task. After the experiment was completed, participants were told the true purpose of the experiment. 126 undergraduate and graduate students participated in the experiment, 2 of which were unfinished and we got 124 valid data. More than 80% thought that the purpose of our experiment was to improve the design of the customized product and provide guidebook, which indicates that our manipulation was successful.

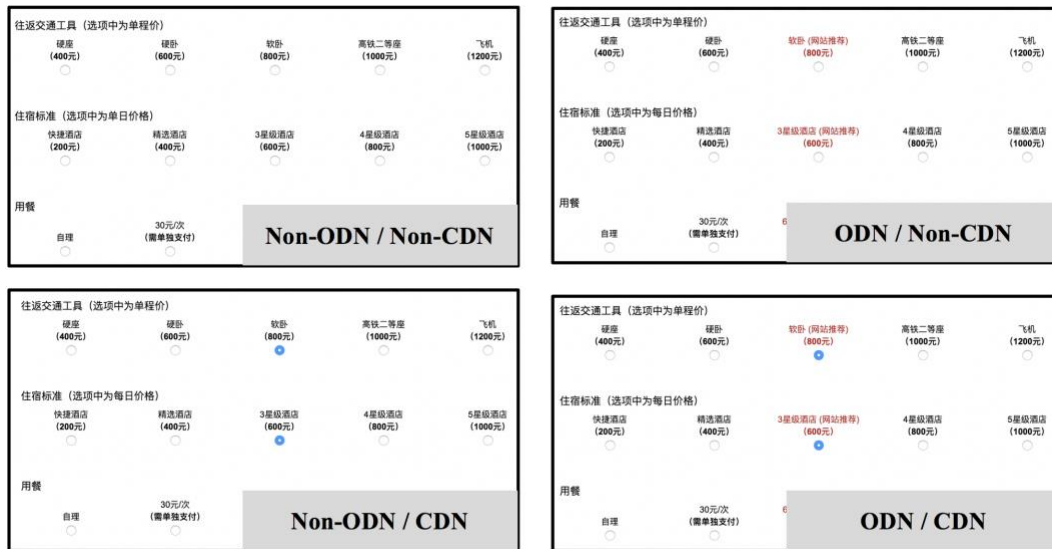
**Table 1. Statistics of ODN and CDN**

		N	Mean	SD	F(p)
CDN	Non-CDN	61	2.31	1.99	6.21(0.014)
	CDN	63	3.52	2.24	
ODN	Non-ODN	61	1.93	1.83	24.32(<0.001)
	ODN	63	3.89	2.10	

**Independent variables**

**ODN.** ODN was manipulated between subjects. For participants in the ODN condition, in the link they see the third option (intermediate option) of each question is followed by the word “website recommendation”; Participants in the Non-ODN condition has no “website recommendation” in the link.” The other content is exactly the same. An example of the ODN condition and Non-ODN condition can be seen in Figure 2.

**CDN.** CDN was also manipulated between subjects. In the link, as show in Figure 2, participants in the CDN condition sees the third option (intermediate option) of each question is the button- selected state; For participants of No-CDN condition, they see no button-selected default options. The other content is exactly the same.



**Figure 2. Example of stimuli for four groups**

**Dependent variables**

*Number of intermediate options selected:* After the experiment, count the number of intermediate options (IOs) selected among the nine attributes about destinations, days of travel, number of sightseeing spots, transportation, accommodation and dining standards, tour guides, pick-up and drop-off services, shopping times and insurance for each participant. Compared the potential mechanism, here, we are more concerned whether these two kinds of digital nudges affect the choice of consumers. In this study, we did not measure the other variables which probably is relative with underlying mechanisms. Of course, in the future research, we certainly explore its mechanism.

### Control variables

Age, gender and incomes range were collected in our research as covariates in our research model. Among the 124 students, 75% are women(N=93) and 25% are men(N=31), with an average age of 22 years (SD=2.58 years). The majority (35%) of the participants had incomes ranging from 1201 to 1800 yuan (N=44). 29.8% of participants had incomes ranging from 1801 to 2800 yuan (N=37).

### Results analysis

#### Manipulation check

In order to avoid any participants effect caused by the manipulation check items, we conducted manipulation check in a pretest. We followed the similar questionnaire design as in procedure which added two manipulation check items. The difference was that we recruited 108 participants by online distribution. Both manipulation check items were presented after participants finished the customization. We used one item to check whether our manipulation of ODN works: On what extent do you agree that the business men want you to choose the intermediate (the third) option overtly and clearly? The results of independent t-test analysis showed that participants in non-overt condition (M=3.47, SD=1.82) reported significantly less agreement with the item than those in overt condition (M=4.49, SD=1.63;  $t(106)=-3.06, p=0.03$ ). We used one item to check whether our manipulation of CDN works: On what extent do you agree that the business men want you to choose the intermediate (the third) option covertly and secretly? The results of independent t-test analysis showed that participants in non-overt condition (M=3.5, SD=1.78) reported significantly less agreement with the item than those in covert condition (M=4.56, SD=1.60;  $t(106)=-3.24, p=0.02$ ). The results suggested that our manipulation of overt and CDN did work.

#### Hypothesis test

To check whether ODN and CDN work we conducted a two-way analyses of variance (ANOVA) with the number of IOs as dependent variable and ODN and CDN as independent variables. Tests of mean differences were based on two tail tests using the error terms from the respective overall ANOVA.

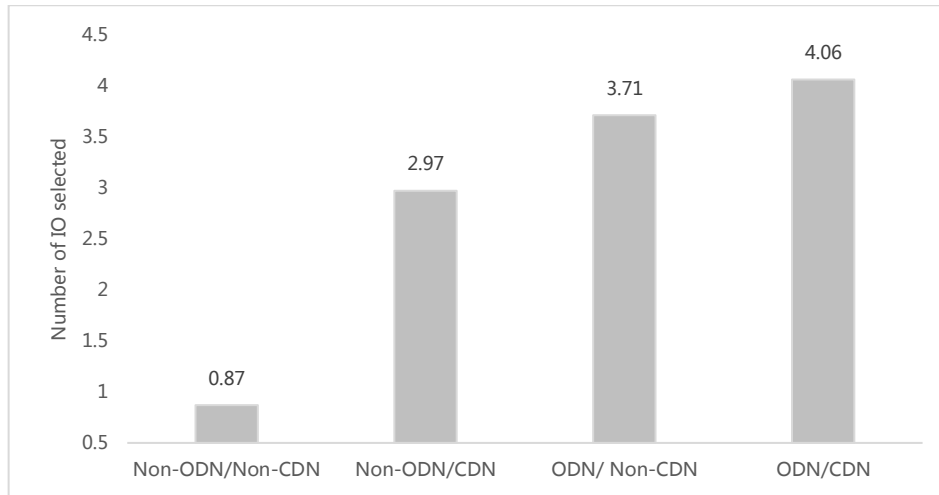
Results showed that there was a significant main effect of ODN on the number of intermediate options selected ( $F(=1,117)=35.439, p<0.001$ ). Participants in ODN condition (M=3.89, SD=2.103) choose more of intermediate options than in Non-ODN condition (M=1.93, SD=1.834). Hypothesis 1 was supported. There was a significant main effect of CDN on the number of intermediate options selected ( $F(=1,117)=12.52, p<0.001$ ). Participants in covert condition (M=3.52, SD=2.235) choose more of intermediate options than in non-CDN condition (M=2.31, SD=1.996). Hypothesis 2 was supported. Statistics of ODN and CDN can be seen in Table 1.

**Table 2. Statistics of four groups**

	N	Mean	SD
Non-ODN/Non-CDN	30	0.87	0.900
Non-ODN/CDN	31	2.97	1.923
ODN/ Non-CDN	31	3.71	1.755
ODN/CDN	32	4.06	2.409

Results showed that there was a significant interaction effect between ODN and CDN ( $F(1,117)=23.40, p=0.01$ ). We further conducted a simple slope analysis to explore the interaction effect. As shown in Figure 3, when under CDN condition, participants in ODN condition (M=4.06, SD=0.33) choose significantly more intermediate options than non-ODN condition (M=2.97, SD=0.33;  $F(1,120)=5.57, p=0.02<0.05$ ). When under Non-CDN condition, participants in ODN condition (M=3.71, SD=0.33) choose significantly more than non-overt condition (M=0.87, SD=0.34;  $F(1,120)=36.36, p<0.001$ ). When under non-ODN condition, participants in covert condition (M=2.97, SD=0.33) choose significantly more intermediate options than in non-covert condition (M=0.87, SD=0.34),

$F(1,120)=19.859$ ,  $p<0.001$ ). When under ODN condition, participants in CDN condition ( $M=4.06$ ,  $SD=0.33$ ) did not choose significantly more intermediate options than in Non-CDN condition ( $M=3.71$ ,  $SD=0.33$ ,  $F(1,120)=0.578$ ,  $p=0.448>0.1$ ). In general, the influence of ODN is more powerful than CDN. Hypothesis 4 was supported. Figure shows the average number of intermediate options selected in each condition. Participants in the combination condition chose more intermediate options than covert condition. Hypothesis 3 was supported. Statistics of four groups can be seen in Table 2. Table 3 shows the results of ANOVA.



**Figure 3. Experiment results**

**Table 3. Results of ANOVA**

Dependent Variable: Number of IOs selected

Source	df	Mean Square	F	Sig.
Corrected Model	6	33.267	9.860	.000
Intercept	1	17.636	5.227	.024
Gender	1	.031	.009	.924
Age	1	3.487	1.034	.311
Income	1	9.026	2.675	.105
CDN	1	42.235	12.518	.001
ODN	1	120.048	35.582	.000
CDN* ODN	1	23.397	6.935	.010
Error	117	3.374		
Total	124			
Corrected Total	123			

a. R Squared = .336 (Adjusted R Squared = .302)

## Discussion

### *Main findings and contributions*

To fulfill consumers' heterogeneous preferences and unique needs, many vendors (e.g., Dell, Nike, etc.) have built their own online customization systems (OCS, i.e., online customization websites). However,



these OCS require users to clarify their own preferences and express themselves clearly, which is possibly difficult for consumers (Awad and Krishnan 2006; Arora et al. 2008; Çil and Pangburn 2017; Bellis et al. 2015). Digital nudging, an emerging stream, may be helpful to solve this problem.

Following Felsen et al. (2013), we divided digital nudges into the “overt digital nudges (ODN)” and the “covert digital nudges (CDN)”. We get ODN and CDN by setting default option and presenting vendor recommendation information in OCS. In order to clarify the effect of the two kind of digital nudges on consumer decision-making, we choose intermediate options as the control object of digital nudges. Through a 2 (ODN: yes / no) × 2 (CDN: yes / no) factorial online laboratory experiment, we empirically investigated the effects of ODN and CDN on consumers’ customization choices.

Results showed that consumers will choose more intermediate options in ODN condition than in Non-ODN condition. ODN can truly help nudging consumers’ customized choice. Consumers will choose more intermediate options in CDN condition than in Non-CDN condition. CDN can also nudge consumers’ customized choice. It has also been revealed that consumers will choose more intermediate options in ODN condition than in CDN condition, which means ODN is more powerful than CDN. Besides, we found that when combining both ODN and CDN (i.e., ODN/CDN), consumers will choose more intermediate options than CDN only and it showed no significant difference between ODN only which means the combination of both methods is better than CDN rather than ODN.

### ***Theoretical implications***

This current research will contribute to literature in following aspects. First, our research is the first to focus on the impact of digital nudges design on consumer decision-making in OCS research. It opens up a new direction for OCS researches and is helpful for relative researchers. Second, following Felsen et al. (2013), this research proposes a new typology for digital nudges. We explore and compare the effects of ODN and CDN. Thirdly, previous studies haven’t studied the effects of the combination of ODN and CDN. Our research explores the combined effects of them and gives the possible explanation for underlying mechanism, which provides a reference for future researches on combining effects of different kinds of nudges.

Nudge is a tool that influences the decision-making of others in the form of “liberal moderate authoritarianism” proposed by Richard Thaler, the 2017 winner of the Nobel Prize in Economics (Thaler and Sunstein 2008; Benhassine et al. 2015). In digital context, digital nudging works by changing the design of the user interface (Johnson et al. 2012; Schneider et al. 2018).” Digital nudges have been well applied in massive contexts, such as e-health systems, social media apps, environment, education (Schneider et al. 2018; Duffy and Verges 2008; Benhassine et al 2015). Our research shows that digital nudges can also play a good role in the OCS context. It opens up a new direction for OCS researches which explore how to use digital nudges to nudge consumer choice and the effect of different digital nudges.

Second, following Felsen et al. (2013), this research proposes a new typology for digital nudges. We explore and compare the effects of ODN and CDN. The typology helps to compare the different mechanisms and interactions of different digital nudges. Our research also shows that the effects of different digital nudges are different, and ODN may have a stronger effect than CDN, which is a very useful supplement to the study of digital nudges.

Option design was a tiny part of customization system research. However, our research shows that typical option design has its own value. Intermediate options design through overt and CDN does have an impact on consumers’ decisions. Further research could compare different nudge methods and different option design to explore their differences which would deepen our knowledge of system options.

### ***Implications for marketers***

The development of IS has made it possible for consumers to tailor their own products through OCS. However, due to the desire of consumers to make the best choices for themselves, vendors often let

consumers make their own decision. In this condition, vendors have to introduce more production lines, and at the same time face high demand uncertainty, which causes a large cost. The result of our study shows that digital nudges can alleviate these problems to some extent. On the basis of sufficient market survey, vendors can initiatively adjust the option settings, and change consumers' choices. The fluctuations and uncertainties of consumer demand decrease with it. Therefore, vendors can formulate commodity production and sales strategies in a targeted manner.

In order to help more consumers to choose the products that they prefer and suit their own, companies pay a lot of financial and temporal costs. Therefore, ensuring the expected product that perfectly matches customer's need is particularly important (Coker and Nagpal 2013). Whether the option of the vendors' nudges can ultimately be selected and purchased by the user is an important criterion for judging the effectiveness of the vendors' nudges investment (Johnson et al. 2013). In our study, both ODN and CDN show good nudge effects, and ODN has better effect than CDN. In addition, we found that combining ODN and CDN did not produce better results than ODN. Therefore, with ODN, OCS designers may not have to work hard to design a CDN.

In marketing practice, consumers prefer to choose intermediate options compared with extreme options (Drolet et al. 2000; Simonson and Tversky 1992) which makes companies put the most profitable products in the middle. Companies could apply these two methods to nudge consumers to choose more intermediate options.

### ***Limitations and future research***

First, our research focused only on consumers' customization behavior and did not analyze their attitude. It offers chance for researchers to explore the perception of satisfaction to the customization process, customization products, evaluation and willing to pay.

Second, In this study, the source of recommended information of ODN is the vendors, however, previous studies suggest that different sources of recommendation (e.g., friends, customization community) may have different effects (Senecal and Nantel 2004). Future research can test whether the result of this study would change with nudging information from different sources.

Finally, lab studies need more validation in real-life circumstances. Furthermore, we concluded only travel package customization in our study and more contexts should be explored..

### **Conclusion**

As a critical means of competing, online personalized customization is applying to more and more contexts. However, the complexity of customization system hinders its development. Many researches have explored how to improve online personalized customization system design and help consumers customize decisions. There still remains room for digital nudging method to help architect typical options. In the light of this statement, present research explores the two digital nudges' influence on consumers' preferences: CDN and ODN. Results are of great value to deepening the study of online customization system design and choice architect.

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