

Digital Nudging: Altering User Behavior in Digital Environments

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Abstract. Individuals make increasingly more decisions on screens, such as those on websites or mobile apps. However, the nature of screens and the vast amount of information available online make individuals particularly prone to deficient decisions. Digital nudging is an approach based on insights from behavioral economics that applies user interface (UI) design elements to affect the choices of users in digital environments. UI design elements include graphic design, specific content, wording or small features. To date, little is known about the psychological mechanisms that underlie digital nudging. To address this research gap, we conducted a systematic literature review and provide a comprehensive overview of relevant psychological effects and exemplary nudges in the physical and digital sphere. These insights serve as a valuable basis for researchers and practitioners that aim to study or design information systems and interventions that assist user decision making on screens.

Keywords: Digital Nudging, Choice Architecture, Behavioral Economics, Human-Computer Interaction, User Interface Design

1 Introduction

Human decision making is imperfect. Research in psychology and behavioral economics has shown that individuals are influenced by various psychological effects during their decision making – consciously or unconsciously [1]. In fact, decisions are highly context-dependent; that is, they are influenced by the choice environment [2]. The reliance on heuristics and the influence of psychological effects such as social norms lead individuals to make predictable mistakes and often decide to their own detriment. Against this background, Thaler and Sunstein introduced the concept of libertarian paternalism as an approach to deliberately design choice environments to affect human behavior while respecting individual freedom of choice. Libertarian paternalism aims at helping individuals make better decisions in their own interest [2]. Choice environments can be designed using so-called nudges, which are relatively minor changes to decision environments. Nudges either attempt to overcome or use specific psychological effects to guide individuals towards a predefined choice option. Nudges refer to “any aspect of the choice architecture that alters individuals’ behavior in a predictable way without forbidding any options or significantly changing their

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economic incentives” [2, p. 6]. Designing choice environments through the purposeful implementation of nudges is called nudging. A prominent example for nudging in the physical sphere is the change of cafeteria design to guide students towards a healthier diet without eliminating unhealthy foods from the menu. This is achieved by positioning healthy food options at eye level, thus making them easier to reach compared to unhealthy options [2]. In research, various disciplines, such as medicine [e.g., 3], psychology [e.g., 4], and different areas from sociology [e.g., 5] have dealt with the concept of nudging. The literature mainly discusses the application of nudging in the development of policies [e.g., 6], encouraging environmentally friendly behavior [e.g., 7], and promoting healthy lifestyles [e.g., 8]. In practice, nudging has been picked up by a number of companies and governments, which increasingly try to influence individuals’ choices [9].

The concept of nudging is increasingly gaining relevance in the digital sphere, as nowadays more and more decisions are taken on screens, such as websites or mobile apps, ranging from the choice of a travel destination to purchases of all types to the right life partner, insurance, or investment. However, in the digital environment, individuals are particularly prone to making deficient decisions. Due to the vast amount of information available on the Internet, individuals often fail to process all the relevant details to reach an optimal choice. Instead, individuals often make decisions on screens in a hasty and automated manner [10]. In this context, nudging can be an effective tool to guide users’ decision making. Compared to physical contexts, digital environments provide several advantages for nudging: the implementation of digital nudges is easier, faster and cheaper; moreover, the Internet provides specific functionalities, like user tracking, which allows personalization of nudges presented to users, making them potentially more effective [11].

While nudging has gained momentum in various fields of research as well as in practice, digital nudging has not gained much attention by information systems (IS) scholars. Against this background, we present digital nudging as a relevant and fruitful research area for IS research and for human-computer interaction (HCI) research in particular. However, prior HCI research has used behavioral economics concepts that focused mainly on a few selected heuristics and biases, such as the endowment effect, loss aversion [e.g., 12], or the status quo bias [e.g., 13]. In behavioral economics, Benartzi and Lehrer [10], and in IS, Weinmann et al. [11] extend the nudging concept to the digital context. Weinmann et al. [11] define digital nudges as user interface (UI) design elements that affect choices and propose a five-step process for developing nudges in online decision environments (see figure 1).

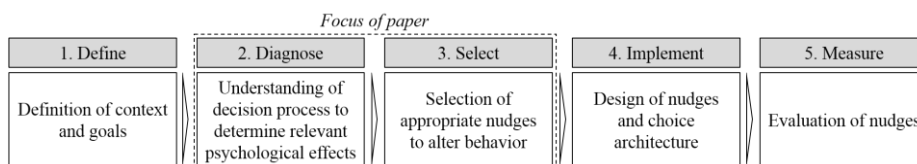


Figure 1. Nudging Development Process [11]

In the present paper, we heed the call of Weinmann et al. [11] for further research to gain a sound understanding of the mechanisms that underlie nudging. To achieve this research goal, we conducted a systematic literature review encompassing research from different disciplines. As a result, we provide an overview of relevant psychological effects that have been discussed in relation to nudging. Moreover, we present examples of digital nudges to illustrate possible approaches in practice. Thereby we address the second and third steps of the nudging development process, i.e., “Diagnose” and “Select”. Based on these steps, concrete nudges and choice architecture can be developed (“Implement”) and tested in lab experiments or in real world settings (“Measure”). With regard to the first step (“Define”), we do not limit our literature review, as well as the nudges presented, to a specific digital context, but provide a broad range of possible application areas.

The contribution of this paper is twofold. First, from a research perspective, we present digital nudging as a relevant and promising research area in the IS, particularly the HCI domain. In this paper, we provide an overview of the body of knowledge regarding relevant psychological effects that underlie nudges in the physical context. Thus, we illuminate the theoretical mechanisms that may also be at play in digital nudging. The psychological effects and nudges presented provide a valuable basis for behavioral researchers who aim to transfer them to the digital context and empirically examine their effects on user behavior. Moreover, our findings can guide design-oriented researchers when designing IS and interventions that assist users in making self-beneficial choices. Second, for practitioners, the concept of digital nudging provides new stimuli for UI and user experience (UX) design. A deeper understanding of the psychological effects at play in human decision making and behavior helps UI designers intentionally develop theoretically based nudges. By doing so, they can either make use of a specific psychological effect to reach a certain goal (e.g., increase sales or transaction speed) or counteract its influence. The exemplary digital nudges provide initial ideas as to how they may be implemented. Moreover, as all UI design decisions influence user behavior, UI designers can use the knowledge about the effects to verify if the current choice environment of their IT artefacts nudges users in the intended way or not.

This paper proceeds as follows. First, we present the theoretical background of behavioral economics, nudging, and HCI. Subsequently, the methodology of the literature review and the results are presented. The paper concludes with a summary, limitations, and proposals for further research.

2 Theoretical Background

2.1 Behavioral Economics and Nudging

Traditionally, economics views the human being as homo economicus, whose decision making is fundamentally rational. However, this view disregards behavioral studies of cognitive and social psychology that have empirically shown that humans do not always behave and decide rationally [2]. Behavioral economics combines psychology and economics to investigate and model human behavior with

consideration for cognitive limitations and complications. Thereby, “behavioral economics increases the explanatory power of economics by providing it with more realistic psychological foundations” [14, p. 1].

According to dual process theories, dominant in the field of social psychology, individuals use different cognitive systems to assess information during the decision making process: on the one hand, there is intuitive System 1, which is fast, automatic, effortless and emotionally charged; and on the other hand, there is reason-based System 2, which is slower, effortful and deliberately controlled [15]. Most empirical studies in the field have concluded that everyday activities are mainly driven by System 1, making human decision making prone to heuristics and biases [15, 16]. Heuristics, i.e., simple rules of thumb, facilitate and accelerate the decision making process by reducing the amount of information processed. Moreover, the external environment, or choice context, is an important parameter in the decision making process [e.g., 17]. For example, different contexts may alter the assessment of trade-offs or comparisons between different options.

Nudging is a concept based on insights from behavioral economics aiming to alter environments in a way that would increase the likelihood of certain behaviors. A nudge is a simple intervention within the choice architecture to steer individuals by addressing specific psychological effects to make use of or overcome them. What differentiates nudges from other forms of intervention is that they are designed to preserve full freedom of choice [2]. Nudges are, for example, notifications that inform individuals of their calorie intake, nutrition labels on food or the automatic enrollment in a pension plan with an opt-out option [18]. Stipulating a certain diet or exercise or enrolling someone without an opt-out option would not be considered a nudge. Transferred to the digital context, digital nudging refers to the "use of user-interface design elements to guide people's choices or influence users' inputs in online decision environments" [11, p. 3]. These UI design elements include graphical design, specific content, wording or small features (e.g., product ratings) [11].

2.2 UI Design in the HCI Domain

Research in the field of HCI studies and designs interfaces facilitating the interaction between users and IT artefacts, such as websites, applications, or devices. UI design aims at maximizing the usability and UX [19]. The usability of an IT artefact refers to its ease of use and efficiency. UX can be associated with various meanings, ranging from “traditional usability to beauty, hedonic, affective or experiential aspects of technology use” [20, p. 91]. According to Hassenzahl and Tractinsky, “UX is about technology that fulfils more than just instrumental needs in a way that acknowledges its use as a subjective, situated, complex and dynamic encounter” [20, p. 95]. It can be described as a consequence of the internal state of the user, including, for example, needs, motivation, expectations, or feelings.

HCI scholars have provided various principles and guidelines for good UI design [e.g., 21, 22]. Those guidelines are based on a sound understanding of individuals’ behavior and needs and acknowledge demographic diversity as a starting point for the design process (e.g., IFIP reference model [23]). Due to the heterogeneity and

changes in how humans interact with IT artefacts, UI design principles do not represent ultimate laws for design. In fact, HCI research continuously tries to advance its approaches to improve interfaces and experiences in relation to technological and user development. In doing so, HCI research often leans on insights from other fields, such as ethnography or even phenomenological philosophy [24]. We claim that behavioral economic insights and the concept of nudging are inspirations for HCI research. First, research is informed by a real-world phenomenon: the imperfection of human decision making and how relatively simple it could be addressed with digital nudges. Second, through this approach, the gap between theory and practice can be bridged by providing a first analysis. Third, it can represent an approach to discover and develop new theories as well as empirical methods or an understanding of how different approaches may complement each other. Overall, a basis for further discussion of underlying issues or support to draw conclusions from experiments with empirical results can be established. Through this approach, HCI researchers may be able to provide UI designers with insights and guidelines to increase performance or user satisfaction and lower error rates [25].

3 Literature Review on Nudging

3.1 Systematic Literature Review

To provide a comprehensive overview of the existing research on nudging, the underlying psychological effects as well as related areas, such as libertarian paternalism and behavioral economics in the digital context, we conducted a literature review in April 2016. Following the methodology proposed by vom Brocke et al. [26], we performed a search spanning multidisciplinary databases providing access to academic journals and conference proceedings. We conducted four searches by applying relevant phrases (see table 1) in the fields title, keywords, and abstract.

Table 1. Results of the literature review

<i>Search Phrase</i>	<i>Nudging / Nudge</i>	<i>Choice Architecture</i>	<i>Libertarian Paternalism</i>	<i>Behavioral Economics AND Online</i>
<i>Database</i>				
ScienceDirect	506	1232	14	13
EbscoHost	167	652	46	4
AISeL	1	21	0	2
Unfiltered results	673	1884	60	19
Sum of relevant articles	65			

From these results, we excluded duplicates and articles not published in journals or conferences. Afterwards, we screened the articles to evaluate if they contributed to this paper. During this process, we excluded articles not topic-related, for example, articles about improving ozone modelling using observational nudging in a prognostic meteorological model or articles about the impact of nudging coefficient for the initialization on the atmospheric flow field and the photochemical ozone

concentration. In a last step, we selected those articles that report on concrete nudges or/and psychological effects. For example, some articles just reported on the acceptance of nudging in society but did not elaborate on the underlying psychology or exhibit examples. After this evaluation, we considered 65 articles to be relevant for this work. Table 1 provides a detailed overview of the results.

3.2 Identified Psychological Effects and Nudges

Through the literature review, we identified a total of 20 psychological effects in the context of libertarian paternalism and nudging. Most articles described the underlying psychological effects and the associated nudges as well as a concrete application or illustrated example. However, some papers only reported psychological effects without providing examples of nudges, while others reported nudges without touching upon underlying psychological effects. In the latter case, we complemented the described nudges with the psychological effects based on gained expertise and insights. Table 2 provides an overview of the identified psychological effects based on the literature review. The frequency of appearance is higher than the number of identified papers because many papers referred to more than one psychological effect.

Table 2. Psychological effects extracted from literature

<i>Psychological effects</i>	<i>Frequency</i>	<i>Works reported on effect</i>
Framing	34	[4], [6-8], [18], [27-55]
Status Quo Bias	30	[3], [6-8], [18], [28], [32], [37], [42], [44], [49-65]
Social Norms	15	[5], [7], [18], [28], [37], [39], [42], [44], [64], [66-71]
Loss Aversion	13	[6], [32], [34], [35], [37], [42], [64], [66], [71-75]
Anchoring & Adjustment	7	[28], [35], [42], [50], [64], [71], [75]
Hyperbolic Discounting	7	[18], [32], [44], [64], [71], [76], [77]
Decoupling	6	[18], [32], [37-39], [77]
Priming	6	[28], [34], [64], [75], [78]
Availability Heuristic	5	[6], [44], [64], [71], [75]
Commitment	4	[6], [18], [36], [64]
Mental Accounting	4	[28], [64], [75], [79]
Optimism & Over-Confidence	4	[35], [64], [71], [77]
Attentional Collapse	3	[18], [32], [77]
Messenger Effect	3	[39], [64], [80]
Image Motivation	2	[45], [64]
Intertemporal Choice	2	[18], [71]
Representativeness & Stereotypes	2	[71], [75]
Endowment Effect	1	[75]
Spotlight Effect	1	[81]

Academic literature has mainly discussed nudging in relation to promoting healthy and environmentally friendly behavior. With regard to health, the authors discuss and empirically investigate nudges that influence food choices through framing effects such as labels, which indicate the healthiness of food [e.g., 30, 47, 48], or the positioning of healthy food options in an easily accessible way in cafeterias and/or

increased visibility [e.g., 41, 53, 54]. With regard to environmentally friendly behavior, research examined nudges using social norms, such as messages that refer to the mass by stating, for example, that 70% of customers purchased at least one ecological product [5]. Furthermore, research discussed nudges based on loss aversion (e.g., subsidizing less polluting or taxing polluting travel options) [66] and anchoring and adjustment (e.g., setting reference points to evaluate eco-friendliness) [35].

The following section describes the identified psychological effects and the associated examples of nudges in more detail. Additionally, we provide examples of possible approaches for nudges in digital contexts. For this purpose, we selected well-known websites. Still, we do not claim that the examples of digital nudges are the result of a purposeful implementation by the UI designers based on the nudging concept. Nevertheless, they carry psychological effects and can be observed as nudges. These examples mainly serve to illustrate how digital nudges may appear in practice. Before providing a detailed description of every psychological effect, it must be mentioned that they partly overlap [2]. Additionally, as highlighted by Thaler and Sunstein, nudges rarely ground on only one specific psychological effect but rather on the interplay of a few different effects [2]. Furthermore, due to the length restrictions of this paper, we focused on the most frequently mentioned psychological effects (i.e., framing, status quo bias, social norms, loss aversion, anchoring & adjustment, hyperbolic discounting, decoupling, priming, and availability heuristic).

Framing. Tversky and Kahneman describe the term framing as the act of designing a decision frame in a way that the “decision-maker’s conception of the acts, outcomes, and contingencies associated with a particular choice” [82, p. 453] is governed through psychological principles. By this means, shifts and outcomes of decisions are more predictable and probabilities are altered. Framing refers to a controlled presentation of a decision problem considering different framing methods regarding one decision problem. In this paper, we follow this definition but focus specifically on accentuation, orientation, and presentation of decision problems. A vivid example retrieved through the literature review shows how to reduce accidents on curvy roads by painting a series of white stripes on the streets (horizontal to the driving direction). The stripes alter the perception of speed for drivers – the driven speed was perceived as faster than it really was. Therefore, the drivers intuitively slowed down, and accidents were reduced [43]. In this example, the perception of speed was framed through a targeted accentuation and different (perceived) presentation of the environment, which altered the probability to reduce the speed. In the digital context, a practical application example can be observed on Amazon.com. On the product pages, Amazon accentuates product-related items. In doing so, the choice architecture is intervened by pulling the attention of the user to related articles. This accentuation may trigger an additional purchase, which was originally not planned by the user.

Status Quo Bias. The status quo bias describes the strong tendency of individuals to remain with the status quo as the disadvantages of leaving the current state loom larger than the advantages associated with a change. Kahneman et al. see the status quo bias as a manifestation of an asymmetry of value called loss aversion, that is, “the disutility of giving up an object is greater than the utility associated with acquiring it”

[83, p. 194]. A prominent example is the Austrian organ donor system, which automatically registers every citizen as an organ donor, while in other countries the opposite is the case. In Austria, individuals need to actively decide against organ donation, which positively influenced the participation [58]. In the digital context, many examples can be found where companies set defaults on their websites, such as insurance options on travel websites or delivery options on e-commerce sites. Another example are online configuration tools for cars (e.g., Tesla.com). The car configurator on the Tesla website is a practical application example for nudging, where a nudge in the form of default settings is implemented. When configuring a model, certain packages and options are chosen by default. This procedure is also applied for software products (e.g., pre-selected installation options).

Social Norms. Social norms influence human behavior and can be described as “rules and standards that are understood by members of a group and that guide and/or constrain social behavior without the force of laws” [84, p. 152]. Social norms emerge from “interaction with others; they may or may not be stated explicitly, and any sanctions for deviating from them come from social networks, not the legal system.” [84, p. 152]. Moreover, individuals tend to orient towards the behavior of others, searching for social proof when unable to determine the appropriate mode of behavior in a given situation. An example for the application of social norms in nudging is the “most of us wear seatbelts” campaign in the USA in 2002 and 2003 by the Montana Department of Transportation, which aimed to promote safe driving behavior [85]. Amazon’s product recommendation systems exhibit an example for calling upon social proof. On the page of a specific product, a recommendation for further products is given, based on what items were bought by other customers (“Customers Who Bought This Item Also Bought”). The group of other customers set a certain standard or a rule for the purchase of a specific product, which the single customer may follow, taking into account the information possessed by others.

Loss Aversion. The psychological principle of loss aversion assumes that losses and disadvantages have greater impact on preferences than gains and advantages [83]. Price benefits can be used to subsidize environmentally friendly options while taxing less environmentally friendly ones [66]. Examples for nudges on Booking.com can be found on the result page of an applied search for a hotel. There, statements such as “Booked 36 times today”, “-45% TODAY!”, “8 people are looking right now”, or “In high demand!” are implemented to trigger the user to not “lose” the offer she found. By giving information about the popularity or limitation, these statements may shorten the purchase decision.

Anchoring and Adjustment. When individuals lack information, they tend to assess or estimate it by using an individual starting point. This initial starting point is either given by the decision frame or the result of a more or less accurate calculation. Consequently, different starting points result in different estimates and are biased toward the considered starting values. Tversky and Kahneman [86] describe this as anchoring and adjustment. For example, the European Energy Label provides information about the energy class and water consumption as well as energy consumption. These labels are used for home electronics, such as washing machines,

televisions, or fridges [42]. The exhibited values provide a reference point (anchor) and may serve for users as a tool for comparison between different choice options. Both online and offline retailers often give different (price) options for a product. Apple, for example, offers the iPhone 6s Plus in three capacity options with different prices. The options are displayed at the same moment, while the lowest and the highest price options serve as anchors. This may lead the user to assess the median option relative to the given reference points (prices) influencing her price perception.

Hyperbolic Discounting. According to the concept of hyperbolic discounting, individuals behave inconsistently in terms of time [87]. They value the present and the near-present stronger than the future. Therefore, individuals prefer options with present effects, even though future effects may be greater or better. Rewards such as direct cash payments, vouchers, or price subsidies may serve as nudges to nudge the user toward the better, yet future, choice or action. These nudges have been implemented to promote healthy activities or discourage unhealthy ones [76]. An example for the application in the online sphere can be observed on the website of Europcar, which uses immediate rewards. The result page of Europcar's rental car search displays the prices, where two prices are given for each result. One price saves 9% on the booking if the customer not only books the car but also pays online. This incentive nudges users toward immediate purchase by providing a financial benefit.

Decoupling. When individuals make a decision, they consider the costs of their choice, but this may not be straightforward. According to Prelec and Lowenstein [88], it is more difficult to evaluate the costs of purchases paid by credit card in contrast to cash, as the payment is decoupled from the consumption. As a result, the perceived costs of the decision decrease. This phenomenon is called decoupling [89]. An approach to overcoming decoupling is the disclosure of costs or effects of decisions. The disclosure of environmental costs with energy use or the full costs of credit cards help individuals to understand future costs in the current decision situation and may help to optimize individuals' choices [18]. Media Markt, Europe's market leading retailer for consumer electronics, offers financing and deferred payment for products on its German website. By this means, the retailer wants to decouple the purchase from the actual payment to lower the decision barrier and make purchase more likely.

Priming. Individuals can be prepared for a situation where a decision takes place. Before the decision is made, specific topics, moods, questions, or information can be introduced, for example, by visualizing the consequences of a decision. An example for priming is the nudge of eliciting intentions, such as "Do you plan to vote?" or "Do you plan to vaccinate your child?", before actions or decisions are taken [18]. Priming can be described as the preparation of individuals for the decision moment by gently leading them to the decision. The priming effect can also overlap with framing and other psychological principles [2]. As a result of our search for illustrative examples of priming in the online domain, we identified the Instagram account of Air France as a tool to prime users for a decision. The exhibited pictures prime the users by visualizing consequences or possible outcomes of a decision – in this case, emotional pictures of travelling and destinations. The pictures may nudge the user toward a specific destination or the decision to travel in general.

Availability Heuristic. Individuals tend to judge probabilities of events based on the ease at which they can be recalled. Easily available and often or regularly occurring events are perceived as more likely than less present events, independent from real probabilities [86]. Media campaigns, for example, can induce the imagination that specific risks are more frequent by exhibiting examples of real cases with fatal outcomes (e.g., deaths caused by smoking, plane crashes). Those visual and frequently displayed cases can alter the judgement of individuals toward vulnerability and increased sensitivity to the specific event [90]. Online banner campaigns are a vivid example of a practical implication of a digital nudge making use of the availability heuristic. In the Google Display Network, advertisers can make campaigns available to users by displaying their campaign on the specific ad spaces. Through tracking the user, they can show the ads repeatedly. In the decision moment, their campaign is at the forefront of their mind, and thus, easily available for the users. This may nudge them toward the option of the advertising firm.

4 Conclusion, Limitations, and Further Research

Given the high proliferation of technology in everyday life, more and more purchases as well as life decisions are made on screens. In digital contexts, users often engage in fast and automated decision making, making them prone to making deficient decisions. Against this background, we presented digital nudging as an effective tool to guide the users' decisions by implementing purposefully designed UI design elements. While nudging has been widely discussed outside the IS and HCI domain, little is known about the psychological mechanisms that underlie digital nudging. To address this research gap, we conducted a systematic literature review and identified twenty psychological effects that were investigated in the physical context and that may be transferred to digital environments. In this paper, we presented nine effects in detail as well as exemplary nudges in the physical and digital spheres.

Our research has several implications for theory and practice. First, by presenting the concept of digital nudging, we aim to encourage both researchers and practitioners to incorporate it into their work leveraging the insights into decision making processes and approaches to alter it. It is our intention to inspire behavioral and design-oriented researchers to conduct further research on the effectiveness of digital nudging and thereby advance this increasingly relevant concept. Moreover, we aim to provide new stimuli to practitioners in private and public organizations to create effective UI that benefit both users and organizations. Second, the identified psychological effects and exemplary nudges contribute to HCI research. While HCI scholars are well aware of human psychology and cognitive science, these new insights enhance the theoretical basis of UI and UX design and can be used in design processes and guidelines. Design-oriented researchers can apply psychological effects and nudges when designing IT artefacts to either leverage or counteract the influence of specific psychological effects. Positioning nudges effectively on UI can increase the usability and UX of IT artefacts. Third, for practitioners, the identified psychological effects and exemplary nudges enhance the understanding of decision

making and cognitive heuristics and biases at play. UI designers can use these insights to design nudges, i.e., simple interventions for a specific use context and goal. As digital nudges are small changes to an existing UI, their implementation is relatively fast and cheap. Moreover, interventions designed based on empirically validated theory may be more effective compared to a trial-and-error approach, which is often used in practice. Furthermore, our findings help practitioners to better assess whether implemented choice environments serve the intended purpose or steer the user toward an unintended behavior.

The main limitation of this work is that the examples of digital nudges were chosen based on the authors' observation of the websites. We were not able to assess whether the UI design elements were the result of a deliberate nudging development process. Furthermore, as mentioned in the literature, psychological effects partly overlap. Consequently, some of the illustrated nudging examples also overlap, and thus, the underlying psychological effects cannot be clearly differentiated.

Digital nudging unlocks a plethora of further research opportunities. As stated in the introduction, this paper addresses the second and third steps of the nudging development process. Design-oriented researchers could focus on the later steps by designing, implementing and evaluating the effectiveness of digital nudges through lab or real world experiments. From a behavioral research perspective, it would be valuable to investigate the psychological effects in digital contexts to determine whether they show similar predictable effects as in physical contexts. Moreover, it appears promising to examine the effects of specific digital nudges on individuals' decision making, in different digital contexts (e.g., PC, mobile devices, digital signage), as well as to consider different user characteristics. The results may allow for tailoring digital nudges to individual users by leveraging user data and targeting technologies, depending on their current use context and their characteristics.

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