Addressing Inertia in Pro-Environmental Behavior through Nudges: A Review of Existing Literature and a Framework for Future Research

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Abstract

To counteract global warming, individuals must adopt pro-environmental behaviors, but many prefer their established behaviors because of inertia. This paper analyzes how we can address the inertia that hinders pro-environmental behavior using digital nudges. Our structured literature review finds 19 out of 20 studies that show how decision information nudges like feedback overcome behavioral inertia. Most of the habitual patterns we identified could be attributed to private household behaviors like inefficient energy or water consumption. We contribute a framework for how the three dimensions of inertia—behavioral, cognitive, and affective inertia—are best each addressed using informational, structural, and assistance nudges, respectively.

Keywords: Green IS, Pro-Environmental Behavior, Inertia, Nudging, Literature Review.

1. Introduction

People often find that acting in line with their intentions when it comes to behavior that impacts the environment is challenging (Fraj-Andrés et al., 2022). For example, many people want to eat less meat, but when faced with the decision to choose a dish, they tend to favor the status quo (e.g., eating meat) and disfavor options that are more in line with their intentions (e.g., eating vegetarian food). Psychological research has named this phenomenon the status quo bias. In decision-making situations, the status quo bias occurs when an existing option competes with novel alternatives and people choose the existing option (Anderson, 2003; Samuelsson & Zeckhauser, 1988). The status quo bias often manifests as inertia, which is defined on the individual level as the "attachment to, and persistence of, existing behavioral patterns (some of which are habituated) even if there were better alternatives and incentives to change" (Polites & Karahanna, 2012, p. 24). Inertia is studied in information systems (IS) regarding its adoption (e.g., Lee & Joshi, 2017), in management concerning organizational change (e.g., Besson & Rower, 2012), and in psychology regarding inertia's underlying mechanisms (e.g., Kahneman et al., 1991). Inertia has already been identified as a barrier to pro-environmental behavior (PEB)—that is, behaviors that aim to minimize the environmental impact of decision-making and behavior (Lindner et al., 2022).

Nudges are proposed as a psychological instrument to overcome the deeply ingrained behavioral patterns that do not serve current environmental challenges (Lindner et al., 2022). We refer to *green nudges* when speaking of nudges that use heuristics and biases (i.e., psychological mechanisms) to facilitate PEB (Carlsson et al., 2020). Inertia's influence on PEB has not received much attention in the green IS literature, although inertia is a strong psychological mechanism in decision-making. The lack of attention around inertia and nudging stands in contrast with the potential value of understanding how green nudges can address individual-level inertia. How green nudges target inertia in individuals' decision-making is unclear since the extant literature tends to report on the designed nudge artifact (e.g., feedback), not the psychological mechanism (e.g., inertia). In addition, since certain types of nudges do not link exclusively to one psychological mechanism (Münscher et al., 2016), a void in the assessment of the causal relationship between the heuristic or bias and the nudge artifact remains. For example, inertia can be exploited through a default nudge or counteracted by providing feedback. Current research proposes various types of nudges to overcome inertia (Hedlin & Sunstein, 2016; Tiefenbeck et al., 2018) but does not yet explain which type of nudge is suitable to address which form of inertia.

Clarifying the relationship between the types of digital nudges and how they can address various forms of individual-level inertia may generate insights that can help IS scholars and practitioners to design more effective nudges that target the psychological mechanisms of inertia. To realize this potential, we review the current literature and analyze how extant studies address inertia to investigate how nudges can

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facilitate PEB. Therefore, we ask: *How can digital nudges help to overcome inertia and support PEB?*

We contribute to scholarship in two primary ways. First, our review results help to clarify the relationship between inertia and nudging mechanisms. Second, our results serve as the foundation for future research, as we propose a framework that points out research gaps and areas to explore in the relationship between inertia and nudging. Enhancing what we know about this relationship might allow researchers and practitioners to increase the quality of nudge designs by addressing the behavioral patterns they are intended to change.

The rest of the paper proceeds as follows. Section 2 introduces the theoretical underpinnings of PEB, inertia, and nudging, while Section 3 describes the process of our literature analysis. Section 4 presents the results of the literature review before Section 5 discusses our findings and the developed framework. We close the paper by describing the study's limitations and outlining its practical implications.

2. Background

2.1. Pro-Environmental Behavior

Unsustainable behaviors like flying, eating meat, and commuting by car are significant drivers of greenhouse gas emissions. For example, the average carbon footprint of a US citizen is currently 16 tons per year, while a global average of 2 tons per year is needed to have a chance of staying under a 2°C temperature increase globally (The Nature Conservancy, 2022). Although most people (60%) acknowledge humans' contributions to climate change (Flynn et al., 2021), indications that the knowledge translates into behavior are rare (IPBES, 2019), and people continue to behave in the ways to which they are accustomed. If the status quo projects into the future, there is a 50 percent chance of an 1.5°C increase in temperature compared to1990 levels within the next five years (WMO, 2022), which would have devastating environmental consequences.

Given the current climate-related challenges, the need for PEBs to be widely established includes a variety of domains, such as transportation, food consumption, energy conservation, and waste reduction. For example, conserving energy, eating vegetarian meals, and commuting by bike or public transportation are common PEBs that can have large environmental impacts over their unsustainable counterparts (Vita et al., 2019).

2.2. Inertia and Pro-environmental Behavior

A core reason for the continuing use of unsustainable behavior is inertia, which results in behavioral patterns that do not serve the goal of keeping the global temperature rise under 1.5°C (Johnson, 2016; Lindner et al., 2022).

The concept of inertia is investigated in the study of organizational change and transformation on the individual, organizational, and societal levels (Besson & Rower, 2012; Haskamp et al., 2021). Much of the research on inertia focuses on the organizational level, investigating the structural, technical, and cultural elements that undermine organizational change and lead to stickiness when confronted with change (Besson & Rower, 2012). On the individual level and in decision-making contexts, current research investigates inertia by referring to concepts like the status-quo bias (Sautua, 2017). Inertia also appears in discussions on cognitive flexibility (Laureiro-Martínez & Brusoni, 2017) and knowledge inertia (Liao et al., 2008).

Individual-level inertia in the IS literature focuses on inertia in the context of technology adaptation, defining inertia as a "user attachment to, and persistence in, using an incumbent system (i.e., the status quo), even if there are better alternatives or incentives to change" (Polites & Karahanna, 2012, p. 24). Polites and Karahanna (2012) identify a behavioral, cognitive, and affective dimension of individual-level inertia, explaining behavior-based inertia as the "use of a system [that] continues simply because it is what the individual user has always done, and therefore without giving it much, if any, thought" (Polites & Karahanna, 2012, p. 24). Polites and Karahanna (2012, p. 24) understand cognitive inertia—also referred to as mental inertia—as "individuals' tendency to keep making similar decisions despite the presence of new information," and affective inertia as appearing "when an individual continues using a system because it would be stressful to change, because they enjoy or feel comfortable doing so, or because they have otherwise developed a strong emotional attachment to the current way of doing things."

While individual inertia is explored in the IS domains of decision-making in the context of strategic renewal (Laureiro-Martínez & Brusoni, 2017; Simons, 1994) and online marketing (Gupta et al., 2007), to our knowledge, investigations of individual inertia in the context of PEB in IS are absent. Further, the link between digital nudges as a way to mitigate individual-level inertia in PEB is not yet established in the IS literature.

2.3. Nudging and Pro-Environmental Behavior

Nudging is defined as "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008, p. 6). Nudges are grounded in the concept of libertarian paternalism (Thaler & Sunstein, 2003), which proscribes prohibiting or banning options from the choice pallet—for example, banning meat dishes from the cafeteria is not nudging. Nudges are cost-efficient, easy-to-implement, and effective behavioral interventions (Mertens et al., 2021), which make nudging an attractive tool for organizations and policymakers worldwide.

Nudges transferred to digital environments are described as user interface design elements that influence behavior by leveraging heuristics and biases (Weinmann et al., 2016). Digital green nudges are investigated, for example, as ways to increase enrollment in green energy programs (Hedlin & Sunstein, 2016), increase electrical energy conservation (Loock et al., 2013), encourage vegetarian diets (Krpan & Houtsma, 2020), and drive fuel conservation (Dahlinger et al., 2018a).

Nudging is grounded in psychological research that divides decision-making into two operating systems (Kahneman, 2013): System 1 refers to reflexive decision-making, which is fast, intuitive, and error-prone. Since System 1 thinking uses heuristics and biases, it can distort rational choice. System 2 refers to reflective decision-making, which is effortful, rational, and precise. Nudges can either exploit System 1 thinking or counteract System 1 thinking by activating System 2.

Nudges can also be classified by psychological mechanisms or nudge artifacts. Nudging studies predominantly describe nudge artifacts (Loock et al., 2013), classifying types of nudges into three categories: (i) nudges that provide information for a decision, (ii) nudges that structure the decision environment, and (iii) nudges that provide decision assistance (Table 1). Decision information nudges counteract System 1 and activate System 2 by providing information (e.g., social normative feedback). For example, the status quo bias is counteracted by making feedback visible to the decision-maker so the decision-maker is more likely to act on the information, regulate behavior, and not blindly follow habits. Decision structure nudges also exploit System 1 but do so by rearranging the choice environment to make a predetermined target behavior more likely. For example, decision structure nudges exploit the status quo bias by preselecting a default option so the decision-maker is more likely to stick with the pre-selected option. Finally, decision assistance nudges counteract System 1 and activate System 2 by providing assistance (e.g., in the form of goals and reminders). For example, decision assistance nudges counteract the status quo bias by nudging the decision-maker to set a goal so the decision-maker receives orientation and direction from the goal and is not easily guided by previous decision routes.

3. Method

As part of a larger literature review project, we investigated in this study how digital nudges target inertia in PEB. We followed recommendations for literature reviews (Rowe, 2014; Vom Brocke, 2015) and, based on the PRISMA statement, structured our process into four steps: identification, screening, eligibility, inclusion (Moher et al., 2009).

Identification: To include the domains of IS, psychology, and management, we searched for green and digital nudging studies in the databases AIS eLibrary, Ebsco Host Business Source Premier, and APA PsyNet with "nudg* OR intervent* OR (behavio* AND change)" coupled with "digit* OR information system OR technolog*", and "environm* OR sustainab* OR green* OR ecology*." We limited the search to papers published no later than 2008 because it was then that nudging was first introduced to the literature (Thaler & Sunstein, 2008).

Table 1. Classification of Nudge Types (adapted from Münscher et al., 2016).

Category	Technique (and Nudge Type Examples)
A: Decision Information	A1. Translate Information (e.g., framing, simplification)
	A2. Make information visible (e.g., feedback)
	A3. Provide social reference point (e.g., descriptive norms, opinion leader)
B: Decision Structure	B1. Change choice defaults (e.g., default, prompted choice)
	B2. Change option-related effort (e.g., increase effort)
	B3. Change range or composition of options (e.g., change categories, grouping)
	B4. Change option consequences (e.g., benefit/cost, social)
C: Decision Assistance	C1. Provide reminders
	C2. Facilitate commitment (e.g., self-related, public)

Screening: We screened 2,511 hits from our initial request for their titles, abstracts, and keywords and added another 507 hits from closely related review articles (Byerly et al., 2018; Caraban et al., 2019; Henkel et al., 2019; Lehner et al., 2016; Mirsch et al., 2017; Soomro et al., 2021; Zimmermann et al., 2021), resulting in 3,018 entries. After removing 87 duplicates, we screened 2,931 articles and found 174 empirical green nudging studies for further assessment.

Eligibility: We used several inclusion criteria to select the articles for our sample from these 174 articles. Articles had to test nudges in an experimental setting (i.e., one that compared a nudge against an unmanipulated control condition). Then, to distill effective nudge interventions, we excluded publications with non-significant results for nudge interventions compared to a control group. In addition, since the papers deal primarily with external outcomes (i.e., behavior), not internal factors (i.e., affect or cognition), we focused on the behavioral dimension of inertia and understood the phenomenon as non-conscious habitual behavior (Gupta et al., 2007). To identify habitual patterns, we relied on the behavior change outcomes (Oinas-Kukkonen, 2013) of *reinforcing*, *forming*, and *altering*. *Altering* a behavior (i.e., replacing an ingrained behavior with an altered one) was the only category that required a strong behavioral pattern to be established beforehand. We therefore excluded papers that addressed *reinforcing* behaviors like purchasing sustainable products (Berger et al., 2020) or printing double-sided (Degirmenci & Recker, 2018), and those that addressed *forming* new behaviors like choosing green energy programs (Hedlin & Sunstein, 2016) or purchasing a premium sustainable product (Bull, 2012).

Inclusion: After these exclusions, we included 18 papers and added two from backward and forward searches (Webster & Watson, 2002), resulting in 20 publications for our analysis.

Analysis: We analyzed the literature according to a framework that accounted for inertia and nudging. To account for inertia, we analyzed the outcome behaviors performed by the control group (e.g., inefficient consumption of energy) and the nudged group (e.g., conservation of electrical energy). Since the control group was not influenced by the nudge intervention and relied on habitual behavior, we operationalized it as *status quo behavior*, while the behavioral outcome from the experimental condition was named *nudged behavior*. To determine how the nudge overcame behavioral inertia, we structured the type of intervention according to whether it influenced behavior by presenting *decision information*, rearranging the *decision structure*, or providing *decision assistance* (Münscher et al., 2016).

4. Results

Green nudging is an interdisciplinary topic, so the 20 publications were dispersed among several outlets: Seven studies were published in journals like *MIS Quarterly*, which are associated with the IS domain (e.g., Loock et al., 2013), seven in outlets that focus on energy, buildings, and transportation like *Nature Energy* (e.g., Tiefenbeck et al., 2019), four in outlets like *Management Science* that deal with management and economics (e.g., Tiefenbeck et al., 2018), and two in psychology journals like *Journal of Applied Social Psychology* (e.g., Graham et al., 2011). Thirteen of the papers were published in 2018 (4), 2019 (4), 2011 (3), and 2016 (2), while 2013, 2014, 2015, 2017, 2020, 2021, and 2022 had one publication each.

Next, we describe our findings on these papers address nudges affect behavioral inertia. Since we focused on publications that adhere to our definition of behavioral inertia, we first describe how an unmanipulated status quo behavior manifested in the control condition. Then we present how the experimental studies overcame behavioral inertia using a decision information nudge, a decision structure nudge, and/or a decision assistance nudge in the choice environment. Table 2 summarizes our analysis.

4.1. Manifestations of Behavioral Inertia in Green Nudging Publications

The papers in our sample usually manifest behavioral inertia in behaviors related to the private household and residential living domain. The behavioral patterns found in the literature could be clustered into four categories regarding the inefficient consumption of electrical energy (e.g., Aydin et al., 2018), heating energy (e.g., Kroll et al., 2019), water (e.g., Schultz et al., 2016), and driving fuel (e.g., Graham et al., 2011).

Each category entails certain target behaviors. First, 12 studies focus on electrical energy consumption. Common sources of inefficient consumption stem from behavioral patterns associated with keeping old appliances (e.g., light bulbs), leaving appliances on permanently or on standby (e.g., WiFi routers), setting appliances incorrectly (e.g., refrigerators), or using energy-intensive appliances (e.g., air conditioners; Ghesla et al., 2019). For example, Agha-Hossein et al. (2015) investigate two populations, one in an office building where inefficient electricity use was caused by workers taking the elevator instead of the stairs, and the other in students' residency hall where inefficient electricity was caused by students' keeping lights on when not present in the room. Additional information regarding students' motivation was found in an Emeakaroha et al.'s (2014) survey, which revealed that

80% of students had no motivation to conserve energy, a result that the authors attributed to lack of knowledge and feedback for electrical energy consumption.

Another manifestation of status quo behaviors is described in Grønhøj and Thøgersen (2011), which used interviews of 20 families prior to designing a digital feedback system for electrical energy conservation. The authors report on three types of energy-related behaviors: *high attention and established electricity-saving strategies* (i.e., a few families who already followed best practices), *little attention and careless electricity consumption* (i.e., a few families who had minimal or no knowledge about energy conservation), and *unsystematic attentiveness and lack of direction* (i.e., the majority of families who tried to conserve energy but lacked structure behind their actions). In the search for barriers to PEB, Klege et al. (2022) use interviews, focus groups, and site visits to identify six challenges for office workers regarding their energy-efficient behavior: *diffused responsibility* (i.e., unsure about who is responsible for turning off appliances), *moral justification* (i.e., considering work as their sole contribution to the environment), *unit confusion* (i.e., inability to see their individual contributions), *limited attention* (i.e., forgetting to turn off appliances), *identity* (i.e., lack of translation of efficiency behaviors from the private environment to the workplace), and *social norms* (i.e., no social reference points). These six challenges point to a connection between behavioral inertia and its cognitive (e.g., limited attention) and affective (e.g., diffused responsibility) counterparts, thus portraying how habitual patterns are accompanied by internal processes and attributions.

Wemyss et al. (2019), who investigate the long-term impact of a behavior change intervention one year after an experiment was conducted, find that the positive effect on conservation during the administration period vanished, although participants reported sticking to PEB. The gap between self-reported behavior and consumption data shows an incongruence between perception and reality that calls for further investigation.

The category of inefficient heating consumption is closely related to the first cluster of electricity consumption since both clusters deal with energy conservation. Two studies investigate heating behavior; whereas one experiment looks only at heating behavior (Wendt et al., 2020), the another looks at general energy conservation behavior in the form of heating and electrical consumption (Kroll et al., 2019). Heating consumption is represented by behaviors like the

Table 2. Analysis of Behavior and Nudge Types to Facilitate Pro-Environmental Behavior.

Publication	Behavior		Nudge Types		
	Status Quo	Nudged	A	B	C
Agha-Hossein et al. (2015)	Inefficient electrical energy consumption	Conserving electrical energy	X		
Aydin et al. (2018)			X		
Emeakaroha et al. (2014)			X		
Ghesla et al. (2020)			X		X
Graml et al. (2011)			X	X	X
Grønhøj & Thøgersen (2011)			X		
Klege et. al (2022)			X		
Loock et al. (2013)			X	X	X
Lossin et al. (2016)			X		
Staples et al. (2017)					X
Tussyadiah & Miller (2019)			X		
Wemyss et al. (2019)			X		
Kroll et al. (2019)	Inefficient heating energy consumption	Conserving heating energy	X		X
Wendt et al. (2021)			X		X
Schultz et al. (2016)	Inefficient water consumption	Conserving water	X		
Tiefenbeck et al. (2018)			X		
Tiefenbeck et al. (2019)			X		
Dahlinger et al. (2018a)	Inefficient fuel consumption	Conserving fuel	X		
Dahlinger et al. (2018b)			X		
Graham et al. (2011)			X		

Note: A = Decision Information, B = Decision Structure, C = Decision Assistance (Münscher et al., 2016).

thermostat level and airing (e.g., tilted windows; Wendt et al., 2020). Inefficient habitual patterns regarding heating including heating without closing the doors or using multiple heating elements (e.g., electric blankets, fan heaters), and airing without windows wide open but leaving them tilted (Wendt et al., 2020).

Inefficient water consumption is investigated in three papers in our sample, two of which investigate showering (Tiefenbeck et al., 2018, 2019) and one investigates general water consumption in private households (Schultz et al., 2016). Survey data shows that individuals have only a vague idea of how much water they are using while showering and that high water-users underestimate how much water they use (Tiefenbeck et al., 2018).

Three publications focus on inefficient fuel consumption, two papers focus on addressing habitual behavior by nudging people toward more efficient driving (Dahlinger et al., 2018a, 2018b), and one study nudges people to avoid driving (Graham et al., 2011). The undesirable behavior in Graham et al.'s (2011) paper was unnecessary driving, that is, car trips that could be avoided. The authors refer to literature that focuses on driving habits (Graham et al., 2011) as a class of behavior that is driven by ingrained patterns, which fulfills the requirements of behavioral inertia.

4.2. Overcoming Behavioral Inertia with Nudges

In the literature we analyzed that the nudged behaviors resembled a reduction of the intensity and frequency of the behavior such that inefficient energy consumption would turn into energy conservation. Next, we provide an overview of how people were nudged using decision information nudges, decision structure nudges, and decision assistance nudges.

Most of the nudging studies in our sample use decision information nudges to facilitate PEB. Decision information was provided in the form of personal feedback (e.g., Agha-Hossein et al., 2015)—often combined with social references (e.g., Schultz et al., 2016)—and frames (e.g., Ghesla et al., 2020). High-frequency feedback about electrical energy consumption via in-home display led to an energy reduction of around 20 percent (Aydin et al., 2018) and, in another study, 8.1 percent (Grønhøj & Thøgersen, 2011). In nudges related to reducing driving, the most effective treatment was a combination of two feedback frames, one showing the CO_2 pollution avoided and the other the gas money saved in US Dollars (Graham et al., 2011). Real-time feedback in the form of a visual persuasive feedback web interface that displayed electrical energy consumption in kilowatts (kWh), cost (£), and carbon emissions (kg) led to savings of around 90 kWh during a four-week test period in student halls (Emeakaroha et al., 2014). Two other studies that investigates real-time feedback via a digital display in the shower show 22 percent savings in water consumption in private households (Tiefenbeck et al., 2018) and 11.4 percent for uninformed hotel guests (Tiefenbeck et al., 2019). The shower displays also had a larger conservation effect on high users, even despite low environmental attitudes (Tiefenbeck et al., 2018). Two publications assess the positive effect of feedback on eco-driving (saving fuel) by using symbols (i.e., a tree), rather than numbers (Dahlinger et al., 2018a), and using abstract rather than concrete feedback (Dahlinger et al., 2018b).

Interactive feedback from an electronic poster (i.e., after a person touched the poster, a tree grew) encouraged office workers to conserve energy by taking the stairs instead of the elevator (Agha-Hossein et al., 2015). Office workers have no incentivize to conserve energy since they do not suffer financial consequences from their behavior (Klege et al., 2022). However, when the floors in a large building were put in competition with each other through weekly social feedback, energy savings of 8–13 percent resulted (Klege et al., 2022), especially during off-hours by nudging office workers to switch off appliances and lights. Social feedback (in the form of individual water usage reports compared to the neighborhood's average) saved up to 26 percent on water consumption in the week following the nudge intervention (Schultz et al., 2016). Another scenario-based study investigates the effect of social feedback by a virtual assistant or a robot on the PEB intentions of US and UK hotel consumers (Tussyadiah & Miller, 2019). The study finds that the perception of another agent (i.e., virtual assistant) in the hotel room evoked intentions to conserve water and energy.

Ghesla et al. (2020) gave participants in their study differently framed goals (control, goal, goal + gain-frame, goal + loss-frame) for conserving energy, with weekly tips on energy conservation. Only with the loss-framing was the incentive goal reached. The loss-framing read, "[...] we plan to plant a tree in your name. However, if you fail to reach the 5% saving target, the tree will not be planted" (Ghesla et al., 2020, p. 28). Lossin et al. (2016) reveal the impact of different framings on a utility company's system usage by showing that strong non-monetary incentives (i.e., awards) are as strong as weak or strong monetary incentives (i.e., 25 CHF, 75 CHF, respectively). Hence, the study shows that active system use is related to users' ability to be nudged toward energy conservation.

Behavioral inertia was addressed with decision structure nudges as well. However, in one study, on which both Graml et al. (2011) and Loock et al. (2013) report from different angles, the default option took a supporting role in goal-setting (i.e., decision assistance). The researchers provide three default goal options for reducing electrical energy consumption by 0 percent, 15 percent, or 30 percent, and the default goals significantly influenced the sizes of the subsequent self-set goals (3.95%, 12.22%, and 19.36%, respectively; Graml et al., 2011).

The studies in our sample also target behavioral inertia by means of decision assistance nudges—specifically goal-setting. Four of these five publications combine goal-setting with decision information nudges (i.e., feedback) on goal attainment (Loock et al., 2011). Loock et al. (2011) identify a moderating role of feedback in the relationship between goal attainment and goal choice, so, after receiving feedback on the progress toward an ambitious 30 percent default goal (which resulted in a 19% self-set goal), the participants corrected their goals downward to match a realistic outlook (resulting in an 11% self-set goal). One publication finds that goals alone facilitated PEB, that the implementation plans provided with the goals did not add additional benefit, and that visualizing goal attainment may help to overcome barriers (Staples et al., 2017).

5. Discussion

We set out to investigate the relationship between inertia and nudges toward PEB. Most of the studies in our sample are situated in the domain of household conservation practices and deal with behaviors like energy and water consumption. While our literature review allowed for an in-depth assessment of inertia's behavioral dimension and confirmed the presence of deeply ingrained habitual patterns regarding PEB, we found indications that affective and cognitive components accompany inertia's behavioral counterpart. Nineteen of the 20 publications in our sample successfully address behavioral inertia by providing decision information nudges (most of them in the form of feedback), leading to the conclusion that providing information is likely the best strategy for counteracting behavioral inertia.

5.1. Framework and Propositions for Addressing Inertia with Nudges

We identified two mechanisms by which inertia is addressed in the literature: Either the nudge exploits inertia by structuring the decision environment or the nudge counteracts inertia by providing decision information or decision assistance. We also classified three choice architectures with which to influence behavior (Münscher et al., 2016) and three dimensions of inertia (Polites & Karahanna, 2012), resulting in a framework of types of digital nudges that can address inertia in PEB (see Figure 1).

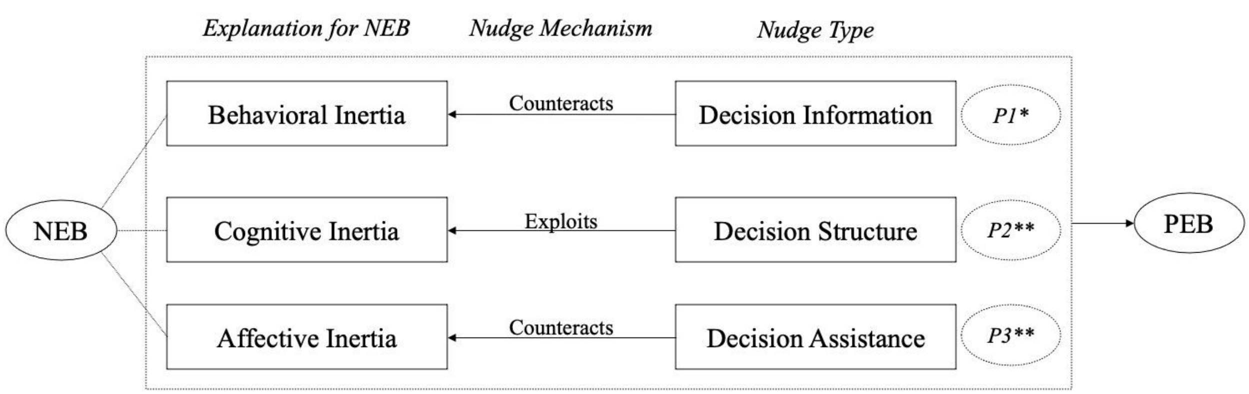
From this research, we derived three propositions, the first backed by our empirical research, and the second and third pointing to a research gap that should be explored in future studies.

Proposition 1: *Providing information about a decision mitigates behavioral inertia, as decision-related information activates System 2 decision-making.*

Behavioral inertia is constituted of habits and deeply ingrained behavioral patterns (Polites & Karahanna, 2012). Habits are perpetuated by environmental cues and follow a process of context

Figure 1

Framework of Digital Nudge Types Addressing Inertia in Pro-Environmental Behavior (PEB)



Note. NEB = Non-Environmental Behavior; P = Proposition; * = supported by current empirical research; ** = to be explored.

cues, habitual responses, and outcomes (Wood & Rünger, 2016). While habit formation is strongly driven by the outcome's value of the outcome, strong, ingrained habits gradually decouple from their outcomes, resulting in unconsciously executed "mindless" behavior. (Wood & Rünger, 2016). The findings from this literature review clearly show that decision information is the most appropriate tool for choice architects to counteract behavioral inertia and influence PEB. Behavioral inertia is a psychological mechanism driven by System 1 (reflexive) decision-making (Gupta et al., 2007; Kahneman, 2013), so by providing relevant information (e.g., real-time feedback) to the decision-maker, System 2 (reflective) thinking is sparked and personal behavior is more consciously processed and adjusted (e.g., lowering water consumption; Tiefenbeck, 2019). As another example, social references inform the decision-maker of social norms (what most people do), so if most people consume less heating energy than an individual does, that individual is pressured by social norms to adjust his or her behavior toward the norm (Wendt, 2021). Behavioral inertia is grounded in ingrained behavioral patterns that work unconsciously (Gupta et al., 2007). Therefore, decision-related information in the form of feedback, social references, or framing can disrupt patterns and provide a novel context in which to evaluate one's own behavior.

Proposition 2: *Changing the decision structure using a digital nudge exploits cognitive inertia by exploiting System 1 decision-making.*

Cognitive inertia is related to the perception of the costs associated with alternative options. Cognitive inertia also relies on behavioral patterns despite novel information (Laureiro-Martínez & Brusoni, 2017). Decision structure nudges (e.g., default nudges) exploit these cost-related perceptions by presenting the pre-selected option as the best, as costs result from switching to the alternative. Cognitive inertia can be addressed by exploiting System 1 decision-making (Kahneman, 2013) by changing the structure of the environment (e.g., defaults). People tend to follow the option favored by the structure of the decision architecture, that is, the "standard" default option (Ebeling & Lotz, 2015).

Proposition 3: *Providing assistance during decision-making through digital nudges counteracts affective inertia by dampening negative effects and relying on System 2 thinking.*

Since we understand affective inertia as negative affective states of individuals expressed and explained as loss or stress, decision assistance nudges might dampen these negative affective states by means of structures that create a sense of comfort and safety. Affective inertia is then counteracted by reflective (System 2) thinking (Kahneman, 2013). For example, a realistic goal to consume 15 percent less electrical energy, combined with continuous feedback on goal achievement, may have the best energy-conservation effect (Loock et al., 2013).

6. Conclusion

Our research question asked how digital nudges can help individuals overcome inertia and embrace PEB; our literature review revealed three ways in which nudges address behavioral inertia. We explain how inertia is addressed by three types of nudges. We also derive three propositions on the relationship between types of nudges and the three forms of inertia.

Our findings contribute to explaining the relationship between inertia and nudging. We address research gaps in the relationship between cognitive and affective forms of inertia and nudges. Our three propositions can assist future research, as they can be tested and validated.

In terms of limitations, we derived the types of inertia from the analysis, not from explicit mentions in the publications. While we addressed the behavioral dimensions of inertia, future studies should investigate the affective and cognitive components of inertia as well (Polites & Karahanna, 2012). Future research could also determine the effects of combined nudges on inertia-related outcomes.

7. References

* Publication from the literature review.

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