

Pre-Purchase Nudging: Digital Nudging Efficacy in the Pre-Purchase Stage of the Customer Journey

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The President:

Prof. Dr. Bernhard Ehrenzeller

Preface

The process of writing this dissertation has taught me more about resilience, how small one is, and how rewarding it can be to focus and learn. One of my most humble lessons during this process can be stated with a famous quote of Isaac Newton:

“If I have seen further, it is by standing on the shoulders of Giants.”

While I was privileged to gain new insights and broaden my horizons in conducting this dissertation, all of this would not have been possible without the incredible support from my family and, most importantly, my wife, Sabina. I express my deep gratitude and admiration to her for putting up with the highs and lows of my publishing processes while tirelessly motivating me at every step.

I want to thank Prof. Dr. Katarina Stanoevska-Slabeva, who supervised this dissertation and supported me throughout the process. My appreciation also goes to Dr. Caroline Dalmus who has always had time to advise and analyze reviewers’ rejections while still motivating me to persevere. Prof. Dr. Christian Hildebrand is thanked for his feedbacks and insights during several doctoral colloquium sessions. Last, while this journey has been challenging and a lot of work has gone into this dissertation, it is just a small contribution toward better understanding how a simple nudge can change a decision and affect a person’s life. I hope these insights of behavioral economics research can result in humanity making better decisions.

Domat/Ems, June 2022

Armando Schär

Research Papers

- Research Paper 1** Schär, A., & Stanoevska-Slabeva, K. (2019). Application of Digital Nudging in Customer Journeys – A Systematic Literature Review. Twenty-Fifth Americas Conference on Information Systems, 1–10.
- Research Paper 2** Schär, A. (2021). Digital Nudge Efficacy and the Influence of Personality in Pre-Purchase Information Research. International Journal of Applied Behavioral Economics (IJABE), 10(4), 21–41.
- Research Paper 3** Schär, A. (2021). Social Pressure on Heavy Thinkers? - The Influence of Need for Cognition on Pre-Purchase Social Norm Nudges. Twenty-Seventh Americas Conference on Information Systems, 1–10.
- Research Paper 4** Schär, A., Dalmus, C., Stanoevska-Slabeva, K. (2022). Is there a Social Impact Paradox in Cross-Channel Communication? A Management Perspective. Academy of Management Proceedings 2022, 1–35.

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Abstract

More and more of an individual's daily decisions are being made on screens. Behavioral economics have come up with theories that support individuals in decision-making situations. In decision making, psychological effects such as loss aversion and social norming are used to lead recipients toward a specific decision. In the digital context, this is also referred to as digital nudging. Existing studies confirm these nudging principles in specific contexts (e.g., environmental topics, financial industry). This dissertation broadens the understanding of digital nudges and links nudging with customer journey perspectives and the influence of an individual's personality traits. This research therefore focuses on the context of pre-purchase decision situations and potential influencing factors. While studies have demonstrated that digital-nudging principles are generally effective, evidence shows that various moderating factors influence a person's decision and the effectiveness of digital nudges. Such factors may explain the great variance in the strength of digital nudging effects. One study within this dissertation shows that extroverts are less likely to be influenced by loss aversion nudges. Another experiment showed that the individual's need for cognition has a significant negative influence on the effect of social norm nudges within the pre-purchase customer journey stage. Furthermore, it was found that customers that previously consumed social media, respond better to social norms nudges than customers who did a web search prior to being nudged. Therefore, this dissertation expands the research scope of digital nudges in the early stages of a customer journey. It shows that the efficacy of digital nudges is influenced in many ways. As a consequence, even a trial-and-error approach to design a nudge must be used with great care, especially regarding previous user activities and the control of their psychological traits. This dissertation shows that, in addition to the previously known dimensions of nudge type and context of use, other factors such as personality traits and previous social media usage also influence the effectiveness of nudges. These new findings, allow digital nudges to be used more precisely in order to help the recipients make decisions that best serve their interests.

Kurzfassung

Immer mehr der täglichen Entscheidungen des Individuums werden am Bildschirm getroffen. Die Verhaltensökonomie hat Theorien entwickelt, die Individuen in Entscheidungssituationen unterstützen. Bei der Entscheidungsfindung werden psychologische Effekte wie Verlustaversion und soziale Normen genutzt, um den Empfänger zu einer bestimmten Entscheidung zu bewegen. Im digitalen Kontext wird dies auch als Digital Nudging bezeichnet. Bestehende Studien bestätigen diese Nudging-Prinzipien in spezifischen Kontexten. Diese Dissertation erweitert das Verständnis von Digital Nudges und verknüpft Nudging mit der Customer Journey-Perspektive und dem Einfluss von Persönlichkeitsmerkmalen eines Individuums. Die vorliegende Forschung konzentriert sich auf Entscheidungssituationen vor dem Kauf und dessen Einflussfaktoren. Studien haben gezeigt, dass die Prinzipien des Digital Nudging im Allgemeinen wirksam sind, aber es gibt auch Hinweise darauf, dass verschiedene moderierende Faktoren die Entscheidung einer Person und die Wirksamkeit von Digital Nudges beeinflussen. Solche Faktoren können die grosse Varianz in der Stärke der digitalen Nudging-Effekte erklären. Eine Studie im Rahmen dieser Dissertation zeigt, dass extrovertierte Menschen weniger wahrscheinlich von Nudges beeinflusst werden, die auf dem Effekt der Verlustaversion aufbauen. Das Kognitionsbedürfnis des Individuums hat einen signifikant negativen Einfluss auf die Wirkung von Nudges durch soziale Normen in der Phase vor dem Kauf. Darüber hinaus wurde festgestellt, dass Kunden die vorab soziale Medien konsumierten, besser auf einen Social Norms Nudge reagieren als jene, die zuvor eine Websuche tätigten. Diese Dissertation erweitert den Forschungsbereich des digitalen Nudgings in den frühen Phasen einer Customer Journey. Sie zeigt, dass die Wirksamkeit digitaler Nudges in vielerlei Hinsicht beeinflusst wird. Bei der Gestaltung digitaler Nudges muss mit grosser Sorgfalt vorgegangen werden. Insbesondere im Hinblick auf frühere Nutzeraktivitäten und die Kontrolle ihrer psychologischen Eigenschaften. Die Dissertation zeigt, dass zusätzlich zu den bisher bekannten Dimensionen des Nudge-Typs und des Nutzungskontexts auch andere Faktoren wie Persönlichkeitsmerkmale und frühere Nutzung sozialer Medien die Wirksamkeit von Nudges beeinflussen. Diese neuen Erkenntnisse tragen dazu bei, dass digitale Nudges gezielter eingesetzt werden können mit dem Ziel, dass deren Empfänger im Pre-Purchase Kontext Entscheidungen treffen, die ihren Interessen am besten dienen.

Introduction

This dissertation examines how daily life decisions are made and influenced on user interfaces such as mobile phones, computers, and tablets. The focus centers on behavioral economic research and its application in the digital realm, which has been named *digital nudging* (Weinmann et al., 2016). The aim of this dissertation is to contribute to the body of knowledge on digital nudging with a specific focus on digital nudges in pre-purchase customer journey stages and interacting variables.

Grounded in a systematic literature review, this dissertation considers three major aspects: pre-purchase customer behavior, digital nudge efficacy, and moderators of digital nudges. Narrowed down further, the focus is on the most frequently studied digital nudge: social norms (Hummel & Maedche, 2019).

Digital nudging has been studied and applied in numerous contexts such as health, environment, finances, energy, and policy-making (Djurica & Figl, 2017; Eigenbrod & Janson, 2018; John & Blume, 2017; Székely et al., 2016). Most studies focus on studying decision behaviors within purchase contexts (Schär & Stanoevska-Slabeva, 2019), where customers focus on decisions related to the order process. Since customers consult online resources early in their customer journeys, it is important to understand how nudges play a role in pre-purchase experiences of the customer journey.

The efficacy of nudges has been demonstrated in many studies, covering a vast stretch of industries and nudging types. Still, effect sizes vary substantially (Hummel & Maedche, 2019). These differences in efficacy are not sufficiently explained by the chosen nudge type and industry context. Researchers suspect that several moderating variables influence effect sizes (Hummel & Maedche, 2019; Jung & Mellers, 2016). Still, practitioners are left with the method of trial and error when implementing digital nudges and cannot rely on a set of rules to achieve a predicted outcome because such moderators are not yet sufficiently studied (Schneider et al., 2018).

This dissertation aims to shed further light on potential interactions of digital nudges in a pre-purchase context and therefore contributes toward a better-informed implication of digital nudges and more predictable effects when using nudges. These considerations can be expressed through the following overarching research question:

How do digital nudges influence decision making in the pre-purchase customer journey stage, and how are these effects influenced?

The research agenda comprises four research papers that contribute to this research question. The first conducted study focused on representing the status quo in research on digital nudging in the different stages of the customer journey.

Evidence from the research on behavioral economics and digital nudging shows that besides the nudge type and nudging context (e.g., financial services, policy-making, or environmental topics), a customer's personality can potentially moderate the efficacy of applied digital nudges (Maas et al., 2018; Weinmann et al., 2016). Therefore, the second study investigates the influence of five generic personality traits (Costa & McCrae, 1988) on the efficacy of five common digital nudging principles (Mirsch et al., 2017).

Since studies have shown several digital nudges to be effective in the pre-purchase stage, the third and fourth papers investigate the use and effects of social norm nudges within pre-purchase stages of the customer journey. The focus is on social norms because this nudging principle is one of the most applied digital nudges and has been demonstrated to be highly effective in early customer journey stages (Hummel & Maedche, 2019). Building upon new research on moderating influence of personality, the third paper focuses on the interaction of the specific personality trait "need for cognition" (NFC) on social norm nudges. NFC serves as a stable trait to describe an individual's tendency to "engage in and enjoy effortful thinking" (Cacioppo & Petty, 1982, p. 130), which has been linked to influence a nudge's effectiveness (Ingendahl et al., 2020).

Finally, the fourth contribution to the research on moderators of digital nudges shed light on cross-media user behavior and its moderating influence on the efficacy of social norms nudges. The specific focus is on analyzing what happens to the nudging effect when users browse social media right before entering the choice architecture on a website that contains the nudge.

Motivation and State of Research

Digital devices and applications are omnipresent in our lives. While making decisions on these screens, we enter artificially crafted choice environments (Johnson et al., 2012; Tversky & Kahnemann, 1985). Behavioral economics has demonstrated that people do not always decide in a rational way and that individuals' decisions are heavily influenced by various heuristics and biases (Thaler et al., 2010). Research has shown various ways to present information to enable people to make optimal decisions. Thaler and Sunstein (2003) named their concept *nudging* and described it as “[...] an approach that preserves freedom of choice but that authorizes both private and public institutions to steer people in directions that will promote their welfare” (p. 179). Their early experiments demonstrated, for example, how people tend to choose healthier food alternatives if those options are available in close proximity.

The adoption of nudging to the digital realm is denoted as digital nudging and is described by Weinmann et al. (2016) as “the use of user-interface design elements to guide people’s behavior in digital choice environments” (p. 433).

Various fields of research have emerged around the topic of digital nudging. These investigate numerous aspects of the phenomena, including ethical implications (Sunstein, 2014), the design of digital nudges (Datta & Mullainathan, 2014; Gregor & Lee-Archer, 2016; Schneider et al., 2017), psychological effects used as digital nudges (Djurica & Figl, 2017; Eigenbrod & Janson, 2018), and customer insights (Esposito et al., 2017; Hall & Towers, 2017). Research has shed light on how digital nudges work in specific contexts, how they should be designed, and how people reflect on their usage. The different adopted research streams show that the concept of *digital nudging* is being extensively studied, with most studies focusing on the application of digital nudging in a specific area. Nudges are often studied in an applied decision-making context focusing on nudging a user toward making a conversion (e.g., Djurica & Figl, 2017; Eigenbrod & Janson, 2018; Esposito et al., 2017). Although nudging in conversion-oriented contexts is important, it could also make an impact in earlier and later customer journey stages such as the pre-purchase stages (i.e., campaigns to create awareness of products) or post-purchase stages (i.e., after-sales support).

Furthermore, in multi-channel, multi-owner customer journeys (i.e., own

website and search engine or social media), there is an increasing need to guide users through various digital touchpoints along all stages of the customer journey. As the purchase stage of a customer journey receives a lot of attention and the post-purchase stage is covered by studies around the usage of digital products, the present study focuses on the pre-purchase stage.

Current Research

In their comparison of 100 empirical nudging studies, Hummel and Maedche (2019) have shown that the effect sizes of nudges are influenced by context and nudge category. They discussed that some studies foreshadow moderation effects on the effectiveness of nudging and explicitly point out an individual's political preferences (Fellner et al., 2013) and personality traits (Jung & Mellers, 2016; Stutzer et al., 2011). Maas et al. (2018) showed a moderating effect of cognitive-reflection abilities in their study across multiple stages of the customer journey. Similarly, Hansen and Jespersen (2013) drew on Tversky and Kahnemann's (1985) dual process theory and split the different digital nudging types into system 1 nudge and system 2 nudge groups. That classification of nudges into central or peripheral decision routes, as postulated by the elaboration likelihood model theory (Petty & Cacioppo, 1986), also hints toward further moderating factors, like an individual's need for cognition (Cacioppo & Petty, 1982). This research strand has attracted the interest of researchers (Ingendahl et al., 2020).

Research has shown digital nudging to be effective in various applications. Most studies focused on a specific context, like a certain nudge (Székely et al., 2016) or different nudges for one product or offer (Esposito et al., 2017). Comparisons of effectiveness throughout different stages in the customer journey, like Maas et al.'s (2018) study, are scarce.

The undertaken literature review has shown a need for in-depth analyses on digital nudge efficiency in the pre-purchase stage of a customer journey. Furthermore, there has been little research investigating the efficacy of digital nudges and potential cross-channel interactions between company-owned media (more control) and externally owned media (less controlled).

The overall objective of this dissertation is to determine how individuals with different personality traits react to digital nudges in the pre-purchase stage of the

customer journey. The focus on the pre-purchase stage stems from the relative absence of research studying direct effects of digital nudges during pre-purchase behaviors like need recognition, consideration, and search. The pre-purchase stage is of significant importance to the customer journey, as customers inform themselves about potential products and suppliers to satisfy their needs. A thorough understanding of what influences a nudge's efficacy during the pre-purchase stage can help shift potential customers from the pre-purchase phase into the purchase stage, where the focus lies on the order and main buying process.

Figure 1 shows the underlying agenda of this dissertation. The figure visualizes the assumption that individuals decide differently depending on the used digital nudge, their personality (as illustrated with the five levers in the person icon), and the stage and context of the customer journey they are in. Consequently, applying the right nudge to the right customer at the right moment in the customer journey may have a positive effect on the customer journey when guiding a user to the journey's next stage.

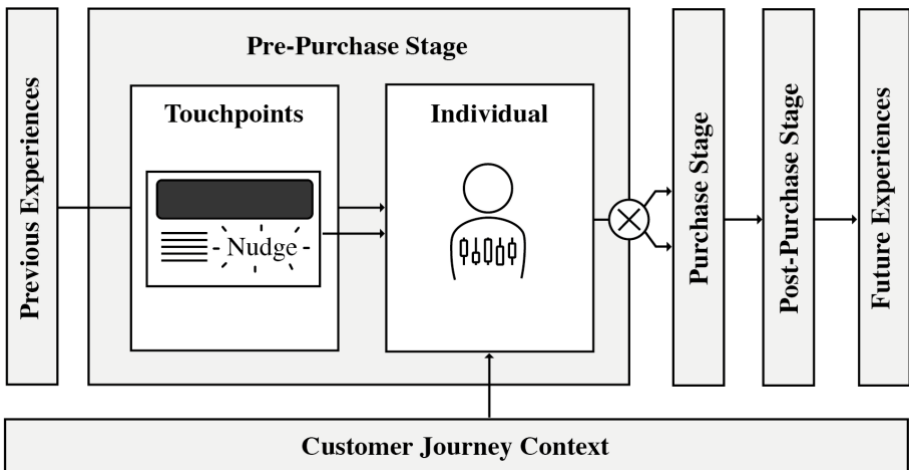


Figure 1. Theoretical Concept of Nudging in the Pre-Purchase Stage

In sum, the current body of knowledge shows that numerous variables have an influence on the digital nudge's efficacy throughout the customer journey. Figure 1 shows the assumed moderations of the digital nudging effect on decision making within the pre-purchase stage. Prior experiences, such as the previous use of a social media network, may influence customers in decision making later (Hildebrand & Schlager, 2019; Kwahk & Ge, 2012) and consequently might moderate a digital nudge's effect. Within the current customer experience, the effect of nudges may also vary depending on the specific touchpoint. For example, users in the pre-purchase stage may react differently to nudges when they are on a company-owned channel (e.g., their website) or on partner, customer-owned, or social touchpoints (e.g., the social media profile of an influencer; Hummel & Maedche, 2019; Lemon & Verhoeff, 2016). The resulting decision within the given pre-purchase choice architecture is also influenced by an individual's values, cultural heritage, or personality, for example (Jung & Mellers, 2016; Korhonen, 2020; Oyibo & Vassileva, 2019).

Research Objectives and Questions

There are various research streams investigating decision making on digital platforms. Research on digital nudging attempts to explain how digital nudges take effect in different contexts. The following items are research perspectives on digital nudging:

- Analyzing different contexts where digital nudges are applied, such as the contexts of the environment, financial decisions, or the current stage of a customer journey (Hummel & Maedche, 2019; Maas et al., 2018)
- Evaluating the efficacy and design of different nudges in digital environments (Datta & Mullainathan, 2014; Gregor & Lee-Archer, 2016; Hummel & Maedche, 2019; Mirsch et al., 2018; Schneider et al., 2018)
- Further examining potentially interacting effects on digital nudges because effect sizes vary strongly and cannot yet be explained by the current categorization of context and nudge type (Hummel & Maedche, 2019; Jung & Mellers, 2016)

These perspectives show that strongly varying effect sizes and trial-and-error guidelines demand a more in-depth analysis of effects in relevant dimensions to

maximize the predictable effect and make nudging more predictable to practitioners.

Research Questions

Following the aforementioned theorizations, the first research question aims to gain insights into the state of digital nudging in context of the three major stages of the customer journey.

RQ1: What is the current state of research regarding the application of nudging along customer journeys?

The research goal of RQ1 is to broaden the perspective on the application of digital nudging by summarizing the relevant literature regarding the application of nudging along customer journeys.

Although many studies have focused on purchase-related instantiations of digital nudging, there is a research gap investigating the use and efficacy of nudges in the pre-purchase stage and valuable insights can be gathered for scientific as well as practical use. The pre-purchase stage is defined by user behavior such as need recognition, search, and consideration (Lemon & Verhoef, 2016). Especially the aspect of information search is of interest for further investigation, since information plays an important role with regard to later purchase decisions (Tsiotsou & Wirtz, 2015). Therefore, the second research question focuses on information-gathering behavior in the pre-purchase stage.

RQ2: Which digital nudging principles are more effective when considering information in a pre-purchase context?

Hummel and Maedche's (2019) statement on potentially moderating personality traits leads to the third research question.

RQ3: Do personality traits influence the efficacy of digital-nudging principles in the pre-purchase context?

Investigating different contextual dimensions is important to gain more know-how on what influences a nudge's efficacy. Building on Mass et al.'s (2018) customer journey perspective on digital nudging, it is relevant to understand how previous user behavior and channel usage might affect a nudge's efficacy. Researchers have demonstrated that the use of a social media channel before entering a choice environment on a website has an effect on user behavior (Hildebrand & Schlager,

2019). This implies that the previously used channel is important to predict if a nudge has a positive or negative influence on the desired decision behavior. Therefore, the fourth research question is as follows:

RQ4: How is the efficacy of a digital nudge influenced by the previous use of different channels of a customer journey?

Scientific Contribution

The literature review in Research Paper 1 has shown that various research streams investigate the topic of digital nudging as well as on customer journeys. In digital nudging, researchers have investigated various perspectives, from examining 17 underlying psychological effects, to specifying 5 cohesive digital-nudging principles (Mirsch et al., 2017). Other researchers have analyzed nudge designs (Datta & Mullainathan, 2014; Gregor & Lee-Archer, 2016; Schneider et al., 2018) or have focused on various digital nudges in specific experimental settings. Current studies have further focused on investigating the effects of nudging within purchase-related choice architectures. As this dissertation investigates customer behavior and decision making within pre-purchase stages, it will lead to a better understanding on how customers decision making is influenced by nudges within behaviors like need recognition, consideration, and search.

The scientific contribution of this dissertation offers better insight into which digital nudges are effective in a customer's pre-purchase stage. This research endeavor is expected to lead toward a set of rules or a model to make better approximations on a digital nudge effect on decisions taken within pre-purchase customer journey stages. It broadens the view on digital nudging efficacy beyond the mere type of nudge or psychological effect and context. Broadening scientific insight into the influence of the decision-makers' personality and previous behavior is expected to further explain the large span of nudge efficacy in current applications.

Practical Contribution

This dissertation aims to support practitioners in enabling a more goal-oriented use of digital nudges within the important pre-purchase phase of a customer journey. Working toward a rulebook for when to use which digital nudge within early customer journey stages promises a better guidance of users toward more efficiently finding and processing the information they need in the pre-purchase stage.

These published studies can therefore help identify which digital nudges under which circumstances have a greater positive effect on the early stages of a customer journey. The research results enable marketers and policy makers to optimize their digital advertising efforts by applying the most effective digital nudges at various user contexts in the customer journey, while helping potential customers making better decisions.

Research Approach, Methodology and Results

The research strategy follows the main research question. First, a systematic literature review addresses the underlying theories by focusing on the customer journey and digital nudging studies. The literature review elaborates the current state of knowledge and defines the research agenda more precisely. This first study was accomplished in the publication “Application of Digital Nudging in Customer Journeys – A Systematic Literature Review” (Schär & Stanoevska-Slabeva, 2019).

Analyzed studies applied various methodical approaches to conduct research in the field of digital nudging. These included eye tracking, open questionnaires, field experiments, surveys, lab experiments, and qualitative approaches like interviews and diaries. Most authors chose to test their hypotheses using online experiments and case studies.

Maas et al.’s (2018) highly relevant study, titled “Nudging Along the Customer Journey,” was conducted through an online experiment. Experiments that were set on a specific context and varied the digital nudges as independent variables, like Schneider et al. (2017), also used experimental methods. Other authors (Huang et al., 2018; Lieberoth et al., 2018; Wijland et al., 2016) were able to study digital-nudging effects in field studies.

The broad use of case studies and online experiments demonstrates the value of experimental research design on studying digital nudging effects. As existing research in the digital nudging field has shown, experimental research is both common and suitable to examine effects around digital nudging. Thus, this dissertation focuses on conducting experimental research.

Although many studies in the literature review have considered psychological effects, they have often been applied without specifically mentioning nudging effects

or frameworks. Differences in decision making due to personality or other individual characteristics have not been thoroughly examined on their effect on digital nudges. Furthermore, there is no connection being drawn between the use of a nudge within different contexts in customer journeys (e.g., comparing the effectiveness between pre-purchase, purchase, and post-purchase stages of a journey as described by Lemon & Verhoef, 2016). There is also no consideration of synchronizing and using nudges across the three stages, with two conversions (i.e., from pre-purchase to purchase and from purchase to post-purchase). Further still, none of the studies explored potential differences of nudging on brand-owned, externally owned, and partner-owned touchpoints.

To focus on these specific user contexts, each context is investigated in a separate experiment and published as individual contributions to achieve the set research objective of gaining further insight into the interacting variables on the efficacy of digital nudges during the pre-purchase customer journey context. Table 1 shows the studies of this dissertation.

Table 1. Overview of Theoretical and Methodical Perspectives of the Dissertation

	Article 1	Article 2	Article 3	Article 4
Research Objectives	Present the status quo of digital nudging research	Demonstrate nudge efficacy in pre-purchase customer journey stage and the influence of personality	Investigate social norms nudge in information search context and the influence of personality	Investigate social norms nudge and the influence of previous social media consumption
Common Themes	Behavioral economics, digital nudging, customer journey			
Research Question(s)	RQ1: What is the current state of research regarding the application of nudging along customer journeys?	RQ2: Which digital nudging principles are more effective when considering information in a pre-purchase context? RQ3: Do personality traits influence the efficacy of digital-nudging principles in the pre-purchase context?	RQ3: Do personality traits influence the efficacy of digital-nudging principles in the pre-purchase context?	RQ4: How is the efficacy of a digital nudge influenced by the previous use of different channels of a customer journey?
Literature Focus and Research Streams	Nudging, choice architecture, customer experiences	Nudging, choice architecture, psychological literature on personality	Nudging, choice architecture, psychological literature on personality	Consumer research, choice architecture
Research and Data-Generation Method	Structured literature review	Online experiment	Online experiment	Two online experiments
Publication Title	Application of Digital Nudging in Customer Journeys – A Systematic Literature Review	Digital Nudge Efficacy and the Influence of Personality in Pre-Purchase Information Research	Social Pressure on Heavy Thinkers? The Influence of Need for Cognition on Pre-Purchase Social Norm Nudges	Is there a Social Impact Paradox in Cross-Channel Communication? A Management Perspective
Publication Status	Published	Published	Published	Published

Article Summary and Key Implications

Research Paper 1: Application of Digital Nudging in Customer Journeys – A Systematic Literature Review

Armando Schär, Katarina Stanoevska-Slabeva

This first research paper paves the way to broaden the knowledge on digital nudging. After a structured literature review, this paper gathers, structures, and analyzes the roots of the digital-nudging phenomena. The research is motivated by the necessity to gain in-depth knowledge on how digital nudges are used and scientifically investigated within different stages of the customer journey. It follows Research Question 1 and seeks insights into the current state of research regarding digital nudging in the different states of the customer journey.

The literature review reveals that nudging has been considered in customer journey-related literature, but so far with little explicit cross-referencing to nudging and behavioral economics research. The scientific contribution of this paper comprises a synthesis of existing research, identification of research gaps, and a research agenda to study the application of digital nudging along the customer journey.

In sum, emerging research on this topic mainly analyzes digital nudging on companies' own websites. Lemon and Verhoef (2016) described that customer experiences are multi-channel, multi-owner customer journeys. Of the relevant studies that explored implementations of digital nudges, 10 studies considered pre-purchase user experiences, 14 studies involved purchase stage user experiences, and 5 had studied digital-nudging principles in post-purchase user contexts. Of all the literature considered, only one study (Maas et al., 2018) focused on digital nudging within different stages of the customer journey.

Users have access to a plethora of different media channels and offerings. They browse social media, use search engines, and visit company's websites. That demonstrates the increasing need and aspirations of companies to guide users through various digital touchpoints along all stages of the customer journey. Implementing digital nudges along the way represents one opportunity of guiding users from one stage of the customer journey to another. This research aims to study which types of

nudges are more efficient in which customer journey stage. Furthermore, it seeks to develop a holistic view on the use and efficiency of digital nudging across the various aspects of digital nudging, including aspects like customer journey stage, context, or nudge type.

The first research paper contributes to the overall research question by shedding insights into the status quo of scientific research on digital nudging within the customer journey, while showing options for a further research agenda.

This paper has been published as a conference proceeding of the 25th Americas Conference on Information systems, that was held in Cancun, Mexico, in 2019.

Research Paper 2: Digital Nudge Efficacy and the Influence of Personality in Pre-Purchase Information Research

Armando Schär

Paper 1 aims to understand the efficacy of digital nudges in the customer journey context. Then, this second research paper analyzes digital nudging in the early stages of the customer journey. While many studies have already focused on purchase-related nudging contexts, analyzing the effect of the different digital-nudging principles on decision behavior within the pre-purchase stage is new and of high relevance. As customers recognize their needs, they search for and consider potential solutions. Because information research is a major part of the pre-purchase stage of the customer journey, this study focuses on information research in the pre-purchase stage by using an experimental approach to investigate the influence of digital-nudging principles on decision making. The experimental design builds on a search task on educational programs to operationalize a choice environment where information gathering is important to make a decision.

The conducted online experiment shows significant impact for three of the five digital-nudging principles and greatly varying effect sizes. Social norms, anchoring and adjustment, and status quo nudging principles have a substantial impact when used in the pre-purchase stage. Loss aversion and hyperbolic discounting nudges have not shown a significant influence on choice behavior.

Following Research Question 3 of this dissertation, the experimental design allowed measurement of hypothesized interactions of participants' personality traits

on the efficacy of the five digital-nudging principles. Results show that extraverted individuals display significantly less behavioral change when confronted with a loss-aversion nudge, thus equalizing the overall effect of the loss-aversion nudge. The results of Research Paper 2 confirm vastly varying effect sizes of the different digital-nudging principles on decision behavior. The study demonstrates that the personality of a nudged user can have an impact on a digital nudge's efficacy. It does not however, provide evidence to derive a set of rules on the influence of personality on digital nudging.

This study suggests that practitioners carefully consider the chosen nudging principle and the target groups' personalities when implementing digital nudges and start a novel discussion on the usage of digital nudges in the pre-purchase stage of the customer journey. It broadens the view on potentially moderating variables on digital nudges within the pre-purchase stage and leads to the question of how other personality traits influence specific nudging principles. This second paper contributes to the overarching research question by proving the efficacy of the status quo, social norms, and anchoring and adjustment nudges within a pre-purchase customer journey stage context. It builds on research by Hummel and Maedche (2019) as well as Jung and Meller's (2016) on the proposed influence of personality traits on digital nudging. Furthermore, it specifically demonstrates that extraverted individuals are less susceptible to loss-aversion nudges in this pre-purchase context.

This research paper has been published in the *International Journal of Applied Behavioral Economics* (Vol. 10, Issue 4, 2021).

Research Paper 3: Social Pressure on Heavy Thinkers? - The Influence of Need for Cognition on Pre-Purchase Social Norm Nudges

Armando Schär

As Research Paper 2 has shown that some of the big five personality traits (Costa & McCrae, 1988) significantly moderate the effect of digital nudges in the pre-purchase phase, Research Paper 3 aims to dig further into how an individual's personality affects the efficacy of certain nudges. This paper follows Research Question 3, asking "Do personality traits influence the efficacy of digital-nudging principles in the pre-purchase context?" Investigating in more depth, this research focusses on the most-often studied digital nudge (Hummel & Maedche, 2019), social

norms. This investigation elaborates on the influence of the need for cognition. This study builds on the work of Ingendahl et al. (2020) and elaborating on the influence of need for cognition can add further insights into the potential moderators of digital nudges.

The paper specifically investigates the influence of an individual's need for NFC on the effectiveness of a digital social norms nudge. Several cognitive theories have studied which personality traits influence human decisions. The hypothesized influence grounds on the elaboration likelihood model of persuasion that offers a dual-process theory that tries to explain individual decision making (Petty & Cacioppo, 1986; Morris et al., 2005; Tam & Ho, 2005). This theory states that an individual who is motivated and has the ability to process central variables of a decision will process given information in more depth. In contrast, the person's thinking and decision-making process will follow a peripheral route when the need for cognition is not given. Research indicates that social-norm nudges have a larger impact on an individual's attitudes and decision behavior on the peripheral decision route compared to the central decision route (Hansen & Jespersen, 2013). NFC is an individual's intrinsic motivation to think about information before making a decision (Cacioppo et al., 1984). NFC serves as an important and stable individual personality trait that moderates behavior in a wide range of domains (Petty et al., 2009). Therefore, NFC serves as a suitable concept to elaborate on the research question investigating the influence of personality on nudge efficacy.

Research Paper 3 follows an experimental study design. Building on the results from Research Paper 2, this study also operationalized an information research task for further education offerings. The results show that users with a higher need for cognition are 29.1% less likely to select the nudged option. The findings align with theoretical findings and complement the study of Ingendahl et al. (2020) by demonstrating significant moderation effects within the pre-purchase setting. It demonstrates the need for a careful consideration of users' personality traits when using digital nudges in persuasive systems.

Research Paper 3 contributes to the overarching research question with additional insights on the interactions of digital nudges and deepens the current scientific discussion by adding the perspective of customer journey stages.

This paper has been published on the 27th Americas Conference on Information

Systems in 2021, Montreal.

Research Paper 4: Is there a Social Impact Paradox in Cross-Channel Communication? A Management Perspective.

Armando Schär, Caroline Dalmus, Katarina Stanoevska-Slabeva

This final research paper sheds light on the interaction of digital nudges from another perspective. Whereas Research Papers 2 and 3 focused on the personality traits of recipients, this study draws from the fact that customer journeys can not only be separated into different stages. They also likely visited a vast array of different channels before entering the choice architecture containing a digital nudge. Researchers have demonstrated that different nudges show different effects on desired decision behavior. Furthermore, it has been shown (e.g., in Research Papers 2 and 3) that the characteristics of the nudge recipients, like personality traits, have a moderating influence on the efficacy of specific nudges. Adding yet another dimension to consider, this paper focuses on the interface between different media types. It aims to show the need for a holistic view on digital nudges as stated in Research Paper 1 and contribute toward a better understanding of what kinds of variables influence the effect of digital nudges within a customer journey.

Within the pre-purchase stage, customers use multiple channels to inform themselves about products and services before making a purchase decision. As companies provide information on their platforms, their customers experience a multi-channel journey on their way to the company website. While companies try to nudge potential customers into consuming provided information, potential effects of previous customer experiences (such as social media browsing) on the effect of digital nudges (i.e., social norms) and the perception of such guidance are not yet thoroughly investigated. One study implies that customers react differently to nudges depending on their previous channel experience (Hildebrand & Schlager, 2019). Research Paper 4 contributes by focusing on digital nudging during the pre-purchase phase of the customer journey.

Two online experiments examined previous social media usage as a potential moderator of the social norms nudge efficacy as well as the influence of previous social media usage on the perception of social norm nudges. Results show that previous social media usage influences perception as well as the efficacy of a social

norms nudge on a company website in certain circumstances. While this research paper demonstrates that social norms do not always affect user behavior, it shows that users who used social media before seeing a social norms nudge have an altered perception of these nudges. Paradoxically, users who browse social media before being nudged are susceptible to nudges; they perceive the nudge more critically than users without previous social media experience.

This paper's practical contribution shows once again that a choice architecture implementing digital nudges must carefully consider various effects when applying nudges on their user interfaces. The fourth research paper contributes to the overarching research question by shedding light on the influence of multi-channel customer journeys on the effect of a social norms nudge.

Research Paper 4 has been accepted for the Academy of Management proceedings 2022 and is currently developed to be published in the *International Journal of Interactive Marketing*.

Synthesis and Managerial Relevance

The result of the literature review and conducted experiments show how social norm nudges influence decisions within the pre-purchase stage of the customer journey. The studies provide deeper insights into how the social norms digital nudge can be moderated.

This dissertation followed the overarching research question on how digital nudges influence decision making in the pre-purchase customer journey stage and how these nudges are being moderated. The four research papers demonstrated that digital nudges are methods of behavioral psychology that are subject to many influences. In addition to the distinctions made by various authors according to the nudge type and application context, there are also influences of recipients' personality traits and the current customer journey stage. Even within the customer journey stages, the effectiveness of a digital nudge is influenced by the types of media previously visited.

Research has shown that the current insights into how digital nudges take effect allows one to make predictions regarding which direction a nudge might take. There are still many unanswered questions that do not make a strong prediction possible.

The undertaken studies have shown that nudges—especially social norms, status quo, and anchoring and adjustment nudges—are effective within information-gathering pre-purchase contexts. Regarding personality traits, Research Papers 2 and 3 demonstrated significant moderation effects of the personality trait extraversion on the digital nudge loss aversion and the need for cognition on social norm nudges. A social norm nudges effect has further been proven to be influenced by previous social media usage.

These findings open avenues for future research. Further investigation regarding the influence of applied digital nudges on the perception of a brand might add another dimension to be carefully considered by practitioners. While personality traits moderate nudges within the pre-purchase context, they might also moderate in other customer journey stages. The undertaken studies demonstrate the influence of various moderators; they also show that gaining a holistic view of moderating on digital nudges still has a long way to go. Providing practitioners with a rulebook on digital nudges that allows for a better prediction of a nudge's effect does not seem realistic at the current time. Furthermore, developing trial-and-error guidelines (Schneider et al., 2017) on how to design, test, and implement nudges might be tempting for practitioners, as the testing part ensures a positive overall effect. As has been shown in the conducted research, a recipient's personality and previous media consumption can have an influence on the efficacy of a nudge. Hence, while a nudge might be effective overall, specific user groups can be negatively affected by the nudge. In one of his studies, Sunstein (2019) concluded, "Experimentation, with careful controls, is a primary goal of the nudge enterprise" (p. 3). While writing on the importance of experimentally testing the effects of nudges, he pointed out the consideration of controlling variables. Confirming Sunstein's (2019) findings, the results of the conducted studies emphasize the importance of selecting relevant control variables when experimenting with nudges.

Finally, in the implementation of a digital nudge, the immediate effect might be positive, but the perception of the nudge by the customer can still be negative and thus potentially have an impact on the perception of the brand or the company.

While all these findings contribute toward a better understanding of pre-purchase nudges, several potential research endeavors are suggested. While this dissertation focused on nudging during the pre-purchase customer journey stage,

further research could expand these insights toward purchase and post-purchase stages. The social norms nudge was the focus of two of the papers, but other nudging principles may show other effects and other moderating factors. This conducted research has included some of the most obvious moderating effects. Other moderators may be worth investigating, especially regarding the differing effects on specific target audiences. One last but important research question to draw attention to are cultural differences of the recipients. Some studies have indicated different efficacy between North American and Nordic European cultural settings.

In conclusion, digital nudging in the pre-purchase stage of a customer journey can be described as efficient but influenced by multi-dimensional variables like the user's personality and previous media consumption. Regarding the theoretical concept drawn in Figure 1, it can be stated that previous experiences such as the nudge type as well as the individual personality traits all do influence the efficacy of digital nudges. However, these influences are not yet studied thoroughly enough to postulate specific rules on when to use which nudge for which individual, while also considering which media channel the person has utilized immediately before making a decision. This result shows the need to further study moderating effects as well as to broaden the research to examine the indirect effects of nudging such as the perception of a brand or company that implemented the nudge.

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Research Paper 1: Application of Digital Nudging in Customer Journeys – A Systematic Literature Review

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Application of Digital Nudging in Customer Journeys

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A Systematic Literature Review

Completed Research

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Abstract

More and more decisions are made on screens. Digital nudging attempts to guide users' decisions on these screens. One relevant application area of digital nudging are customer journeys. Emerging research on this topic mainly analyses digital nudging on companies' owned conversion screens (i.e. websites). However, in a multi-channel, multi-owner customer journeys (i.e. own website and search engine or social media) there is increasing need to guide users through various digital touchpoints along all stages of the customer journey. This paper examines existing research on the application of digital nudging throughout customer journeys. The literature review reveals that nudging has been considered in customer journey-related literature, but so far with little explicit cross-referencing to nudging and behavioral economics research. The scientific contribution of this paper comprises a synthesis of existing research, identification of research gaps and a research agenda to study the application of digital nudging along the customer journey.

Keywords

Digital nudging, Customer journey, Literature review, Nudging pipeline, Application of nudging.

Introduction

The concept of nudging has been discussed intensively amongst researchers during the last years (Mirsch et al., 2017). It is based on the findings in psychology and behavioral economics that people not always decide in a rational way and that individuals' decisions are heavily influenced by various heuristics and biases (Thaler et al., 2010). It is furthermore derived from the libertarian paternalism theory. Thaler and Sunstein (2003) describe nudging as “[...] *an approach that preserves freedom of choice but that authorizes both private and public institutions to steer people in directions that will promote their welfare.*”.

With the rise of the digital economy, decisions are increasingly being made on screens (Weinmann et al., 2016). Consequently, research regarding decision-making has moved towards digital phenomena. The adoption of nudging to the digital realm is denoted as digital nudging and described by Weinmann et al. (2016) “... *as the use of user-interface design elements to guide people's behavior in digital choice environments.*”. One important research and application area of digital nudging is the design of customer journeys. Customer journeys typically refer to a process, path, or sequence of touchpoints (i.e. screens) through which companies attempt to guide a customer to get to know, access or use their services and products (see for example Følstad and Kvale, 2018 or Wolny and Charoensuksai, 2014)

In the context of customer journeys, research has so far focused on nudging a user towards making a conversion (e.g. Esposito et al. 2017; Eigenbrod et al. 2018; Djurica and Figl 2017). While nudging in conversion-oriented contexts is important, it could also make an impact in earlier and later customer journey stages such as the prepurchase stages (i.e. campaigns for awareness creation for products) or postpurchase stages such as after sales support. Thus, the leading research question of this paper is: What is the current state of research regarding the application of nudging along customer journeys? The main research goal is to broaden the perspective on the application of digital nudging by summarizing relevant literature regarding application of nudging along customer journeys.

The literature analysis reveals that some research related to nudging and customer journeys is emerging (Maas et al. 2018), but not in a sufficient manner yet. Based on identified research gaps, this paper suggests a research agenda in two

directions: 1) Design, application and evaluation of nudging within single stages or touch points of the customer journey. One research question in this context might for example be to test the effectiveness of different nudges (on own or third party owned screens) in the initial stage of customer journeys aiming to create awareness for a product. 2) Design, application and evaluation of nudging-pipelines with the aim to guide users across different touchpoints and stages of the customer journey.

While this study has a clear focus on the application of digital nudging along customer journeys, the broadness of the underlying research fields (nudging, behavioral economics and customer journeys) has led to many research streams that are closely linked. Related fields such as persuasive design (i.e. Fogg, 2003), the human computer interface field, the customer experience research field and marketing in general were not included into the research and are out of the scope of this study.

The content of the paper is structured as follows: The chapter *Theoretical Background* introduces the basic theoretical concepts of nudging and customer journey. The chapter *Methodology* describes the applied methodology for the literature analysis. The chapter *Findings* summarizes the results of the literature review and the chapter *Conclusion, Limitations and Further research*, concludes the paper with a summary and outlook to future research.

Theoretical Background

Definition of Digital Nudging

As research shows, individuals do not always take decisions in their best interests. Exploring this phenomena in the field of behavioral economics, Thaler and Sunstein (2003) proposed the concept of libertarian paternalism with the goal of designing choice environments that affect human behavior (Mirsch et al., 2017). Libertarian Paternalism is defined as an approach “*that authorizes both private and public institutions to steer people in directions that will promote their welfare*” (Thaler and Sunstein, 2003). To denote this approach of steering people, Thaler and Sunstein (2009) coined the term nudging. Nudges, as described by the authors, contain “*any aspect of the choice architecture that alters individuals behavior in a predictable way without forbidding any options or significantly changing their economic incentives*” (Thaler and Sunstein, 2009).

The findings of Thaler and Sunstein (2009) have been applied in various fields, including public policies where trials in nudging have helped improve tax compliance or voter registration. The application of libertarian paternalism in a digital decision-making context is introduced in literature as digital nudging. By referring to the original definition for nudging, several authors proposed a specific definition for digital nudging mainly with the aim to explain the “digital” aspect of it. Gregor and Lee-Archer (2016) define “*digital nudge*” as nudges facilitated by information technology and understand the use of digital nudging as leveraging of predictive analytics within digital government frameworks. According to these authors, digital nudges pave the way from reactive to dynamic social security (Gregor and Lee-Archer, 2016). Weinmann et al. (2016) define digital nudging as the use of user-interface design elements to guide people’s behavior in digital choice environments. Thus, they define digital nudging from a human-computer-interaction (HCI) point of view and connect the generic definition for nudging from Thaler and Sunstein (2009) with the context in which digital nudging takes place – digital user interfaces. Mirsch et al., (2018) define digital nudging by referring to Hansen (2016) as “*... the attempt to influence decision-making, judgment, or behavior in a predictable way by counteracting the cognitive boundaries, biases, routines, and habits that hinder individuals from acting to their own benefit in the digital sphere. Digital nudging does*

not forbid or add any rational choice option, change incentives significantly, or provide rational argumentation.” Other authors (Esposito et al. 2017; Li et al. 2018; Lieberoth et al. 2018; Maas et al. 2018) are exploring nudging in digital environments by referring to the original definition of Thaler and Sunstein (2009) without explicitly pointing to specific characteristics of digital nudging. Even though the definition of Weinmann et al. (2016) can be assumed to be the first definition of digital nudging and is widely cited, it seems to be too narrow by restricting digital nudging to the use of user-interface design elements. In the future, communication in digital spaces might not be mediated by conventional user interfaces (for example communication with robots, or bots). Thus, a combination of the definition of Gregor and Lee-Archer (2016) and the definition of Mirsch et al. (2018) is proposed and will be used as a basis for the analysis in this paper: *“Digital nudging is nudging facilitated by information and communication technology and is an attempt to influence decision-making, judgment, or behavior in a predictable way by counteracting the cognitive boundaries, biases, routines, and habits that hinder individuals from acting to their own benefit in the digital sphere. Digital nudging does not forbid or add any rational choice option, change incentives significantly, or provide rational argumentation.”*

Definition of Customer Journey

According to Følstad and Kvale’s (2018) literature review, existing literature comprises various attempts to define the customer journey phenomenon. The different approaches and points of views of various authors from different research fields led to an incoherent use of terminology for customer journeys. Nevertheless, the literature review of Følstad and Kvale (2018) shows that the term customer journey is typically used in reference to a process, path, or sequence of touchpoints through which a customer gets to know, accesses or use a service (see also Wolny and Charoensuksai, 2014). Most definitions also highlight the customer-centric character of the customer journey by referring to it as service processes as seen by customers.

(Følstad and Kvale 2018) also point out that not only definitions of the term customer journeys differ across publications, but also its scoping. Proposed scoping of customer journeys differ from clearly delimited journeys that have a defined start and end (see for example the well-known AIDA model comprising the attention-interest-desire-action stages (Lemon and Verhoef 2016; Wolny and Charoensuksai, 2014) to open-ended journeys such as the transitions from “never-a-customer to

always-a-customer” (Følstad and Kvale 2018). By summarizing research from several authors, Lemon and Verhoef (2016) propose a generic customer journey model consisting of three stages: prepurchase, purchase and postpurchase stage. These three stages differ with respect to goals and activities that are pursued by companies within them.

According to the findings of Følstad and Kvale (2018), opinions of researchers also differ regarding the degree to which customer journeys span multiple touchpoints, channels and service providers. In this context, the proposed range goes from customer journeys within a single website to such that comprise multiple channels and service providers. Lemon and Verhoef (2016) distinguish in this context brand owned, partner owned, customer owned and social/external touchpoints that can be part of the three customer journey stages. The different ownership of touchpoints results in different opportunities and challenges for companies. For example, brand owned touchpoints are under complete control of companies and decision situations can be designed embedded in a known context. Partner owned touchpoints are not under full control of companies and less is known about the context under which decisions are designed.

Overall, this process-based character of customer journeys allows for an investigation of decision-making and application of nudging in different stages of a customer journey.

Digital Nudging in Customer Journeys

Following the discussion above, digital nudging in customer journeys can be described as follows: Customer journeys are understood as a series of touchpoints or steps in a customer purchasing decision-making process. On this journey, a customer typically experiences a pre-purchase, a purchase and a post-purchase stage. Throughout these stages, choice architectures can be purposefully designed to guide people’s behavior towards a favorable outcome. In a digital context, the choice architect can therefore design user-interface design elements to nudge customer’s behaviors into a desired direction. Not only the application of nudging in each of the three stages of the customer journey are of relevance, but also nudging the customer across the three stages along the customer journey. An interrelated nudging pipeline from the pre-purchase, to the purchase, and the post-purchase stage of the customer

journey might be necessary. Such nudging-pipelines need to consider also touchpoints with different ownership.

Methodology

In order to gain an overview of the existing research, a systematic literature search has been conducted in May 2018, October 2018 and January 2019. The analysis followed the approach for systematic literature review as suggested by vom Brocke et al. (2009). The search for relevant (peer-reviewed) academic publications was based on multi-disciplinary literature databases: EbscoHost and ScienceDirect. To assure triangulation of search results and consideration of recently published articles and conference proceedings, the database search was complemented with an additional Google scholar search. Table 2 provides a summary of the search results.

Table 2. Results of Literature Research

Search Phrase Database	Digital Nudge Nudging	/	Digital Nudging AND Customer Journey	Digital Nudging AND Marketing	Customer Journey	Customer Journey AND Digital
EbscoHost	90		0	-	1391	→ 135
ScienceDirect	777	→	22	150	-	-
Google Scholar	12700	→	3370	5520	351000	→ 99900
Unfiltered Results from databases						397
Sum of relevant articles databases						33
Sum of additional relevant articles from Google scholar						10
Total						43

The search was initiated using the two main terms digital nudging and customer journeys. Further searches were conducted with the following terms: “digital nudge”, “digital nudging”, “digital nudging” AND “customer journey”, “digital nudging” AND “marketing”, “customer journey” as well as “customer journey” AND “digital”. Search queries with a large amount of hits were narrowed down by adding

complementary search terms (as indicated with an arrow in Table 2). The search from the two databases resulted in an initial list of 397 publications. After removal of 98 duplicate articles found multiple times, the titles and abstracts of the remaining articles were screened. 266 articles that did not relate to the research topic presented in this paper were excluded. These were for example articles related to business model innovation paradigms or other research areas (i.e. management of water resources with nudging). After the initial screening, 33 articles remained as relevant on the list.

All search terms were also used in Google scholar. The Google scholar search results were screened until the 10th result page. This search led to ten additional conference papers, including one highly relevant journal paper that was published in a marketing journal not listed in the two literature databases considered. The resulting 43 articles were studied in depth and synthesized. A backward search on the most relevant findings provided underlying theoretical background.

The analysis of the resulting papers involved two researchers: the first author who was the main reader and coder of the papers and the second author who read the papers and checked the coded analysis results. Differences in assessing the papers and coding were intensively discussed until a common decision was reached. 23 of the analyzed papers studied digital nudges in an assignable customer journey context and were used in table 3. Seven articles only implicitly referenced digital nudging approaches and did not apply attributable nudges. The remaining 13 papers defined digital nudging or customer journeys and were used to define the two phenomena under research in more depth.

Findings

Overview of Generic Digital Nudges and Approaches Nudge Design

The core concepts of nudging and digital nudging were defined and elaborated in depth in 13 of the 43 considered papers. In continuation of the initial definition of nudging presented in the chapter *Theoretical Background*, the analysis of these papers allowed for a more extended elaboration on nudging as well as identification and definition of related phenomena. Of relevance for the further literature analysis was in particular the identification of generic nudges and existing approaches for design of nudges.

Generic Nudges

As already mentioned in the *Introduction*, people do not always decide in a rational way. Individuals' decisions are heavily influenced by various heuristics and biases (Thaler et al., 2010). The outcome of any choice is influenced not only by rational or irrational deliberation of available options but also by the design of the choice environment (Weinmann et al., 2016). The way in which available choices are presented to users in digital environments, can subconscious influence the choice outcome (see for example Thaler et al., 2010 or Weinmann et al., 2016).

Nudges are specific design approaches for choice environments, i.e. attempts to influence peoples' judgments, choice or behavior in a predictive ways that either attempt to overcome or use specific psychological effects (i.e. cognitive boundaries, biases, routines and habits in individual and social decision-making (Hansen, 2016)) to guide individuals towards a predefined choice option (Mirsch et al., 2017). Thus, a nudge can be considered as a combination of a specific choice design that provokes a given psychological effect. For example, the generic nudge "Loss Aversion" can often be observed on the hotel booking platform booking.com. One form of implementing this nudge is to publish the statement "Only one room left" near the offer that is displayed to the user. The addition of this statement to the choice environment of booking a room triggers a spontaneous reaction of users to quickly book in order not to lose the last room available. Based on findings from research in psychology and behavioral economics generic types of nudges have been proposed in literature that are based on similar combinations of specific choice designs and foreseeable or intended psychological reactions. Based on the 13 analyzed papers (i.e. Thaler et al., 2010; Mirsch et al., 2017; and Weinmann et al, 2016), 20 generic nudges were identified: Framing, Status Quo Bias, Social Norms, Loss aversion, Anchoring & Adjustment, Hyperbolic Discounting, Decoupling, Priming, Availability Heuristics, Commitment, Mental Accounting, Optimism & Over-Confidence, Attentional Collapse, Messenger Effect, Image Motivation, Intertemporal Choice, Representativeness & Stereotypes, Endowment Effect, and Spotlight Effect. This list of generic nudges was used to analyze and code the 23 articles dedicated to application of nudging in customer journeys.

Approaches for Nudge Design

Several reviewed papers propose approaches for designing and implementing digital nudges: Gregor and Lee (2016) propose to design digital nudges by mapping the context (i), designing the nudge (ii), and experimenting and evaluating (iii) it. Schneider et al., (2018) derive a cycle model from Datta and Mullainathan (2014) and Ly et al. (2013) that consists of the following steps: define the goal (i), understand the users (ii), design the nudge (iii) and test the nudge (iv). Mirsch et al., (2018) propose a similar framework with the following design steps: Definition of the digital nudge context (i), digital ideation and design (ii), digital nudge implementation (iii) and digital nudge evaluation (iv). Compared to Schneider et al. (2018), they also consider the context of the nudge, which is related to the technical and application context for which the nudge is implemented. Overall, all suggested design approaches for digital nudging refer to a set of similar core steps: identification of the context, definition of the goal, design of the nudge, digital nudge implementation and evaluation.

Overview of Application of Nudging along Customer Journeys

Synthesizing the found articles showed that connections between the nudging theory and customer journeys have yet to be explicitly investigated. Within the reviewed literature, some studies made explicit use of nudges in their application of customer journeys; others used nudging approaches without explicitly mentioning them. By referring to the identified generic forms of digital nudges and related psychological effects (see for example Mirsch et al., 2017) mentioned in the previous chapter, selected publications were coded and classified according to the used generic type of nudge and the stage of the customer journey in which the nudge was used. The following Table 3 classifies the publications according to these two criteria.

Table 3. Application of Digital Nudging in Customer Journey Studies

Applied Nudges	Customer Journey Stage		
	Pre-Purchase Stage	Purchase Stage	Post-Purchase Stage
Framing	(Cheng et al. 2018), (Roscoe et al. 2016), (John and Blume 2017), (Hall and Towers 2017), (Ostländer and Koch 2017), (Maas et al. 2018)	(Roscoe et al. 2016), (Esposito et al. 2017), (Wolny and Charoensuksai 2014), (Hall and Towers 2017), (Kim et al. 2018), (Székely et al. 2016), (Eigenbrod et al. 2018), (Djurica and Figl 2017), (Maas et al. 2018), (Pahuja and Tan 2017), (Huang et al. 2018), (Schneider et al. 2017)	(Schöning et al. 2019), (Maas et al. 2018), (Wijland et al. 2016), (Okeke et al. 2018)
Anchoring & Adjustment	(Cheng et al. 2018), (Larsen 2016)	(Esposito et al. 2017), (Székely et al. 2016),	
Social Norms	(Cheng et al. 2018), (Moran et al. 2014), (Wolny and Charoensuksai 2014), (Hall and Towers 2017), (Gursoy 2018), (Maas et al. 2018)	(Pauwels et al. 2016), (Hall and Towers 2017), (Eigenbrod et al. 2018), (Djurica and Figl 2017), (Maas et al. 2018)	(Gupta et al. 2017), (Maas et al. 2018)
Priming		(Esposito et al. 2017), (Székely et al. 2016), (Eigenbrod et al. 2018)	(Wijland et al. 2016)
Status Quo Bias	(Maas et al. 2018)	(Székely et al. 2016), (Eigenbrod et al. 2018), (Djurica and Figl 2017), (Maas et al. 2018),	(Maas et al. 2018), (Wijland et al. 2016)
Loss Aversion		(Eigenbrod et al. 2018)	(Wijland et al. 2016)
Availability Heuristic		(Djurica and Figl 2017)	

The findings related to the use of nudging in the three stages of customer journeys can be summarized as follows:

Pre-Purchase Stage

Ten of the reviewed articles make use of digital nudging in a pre-purchase context of the customer journey. The studies serve varying purposes in the pre-purchase stage that covers aspects of the customer's interaction with the brand, category, and environment before a purchase transaction (Lemon and Verhoef 2016). Cheng et al. (2018) for example, investigate the customers online search for service companies with an empirical analysis. Larsen (2016) evaluated how the merging of offline and online data, and an omni-channel, data-driven approach substantially increased Ford Denmark's marketing performance. Moran et al. (2014) discuss a new "Moment of Truth" model, that integrates variables such as shared brand experience and searchable electronic word of mouth and explains how marketers can manage these "Moments of Truths".

These studies show that digital nudges have been used in very different customer contexts within the pre-purchase stage. While one study uses branded keywords in a search context to nudge, another uses retargeting methods to anchor their prospects. Such differences in touchpoint contexts are found in all the analyzed articles and show that not only stage and applied nudge-type, but also the context of the touchpoint take effect in customer journeys. A noteworthy detail to the pre-purchase stage is the difference in how strongly a nudge attempts to take prospects to the next stage of the journey. The successful implementation of the "low-frequency" targeting in the Ford-Study (Larsen 2016) implies that effectiveness of nudges varies across different types of nudges and customer contexts. This raises the need for a holistic view on when to use which nudges.

Purchase Stage

The majority of found papers make use of digital nudging in purchase stages of a customer journey. These 14 papers and conference proceedings focus on customer interactions with the brand or its environment during the purchase itself (Lemon and Verhoef, 2016). The studies allocated to this stage also show a plethora of varying customer contexts and services where digital nudging effects were applied. For example, in their paper about marketing stimulating different word-of-mouth content

to drive online and offline performance, Pauwels et al. (2016) quantify interactions among marketing, online word-of-mouth content, search, online and offline store traffic for an apparel retailer. The authors point out that marketing can have a direct and an indirect performance effect by nudging the customer closer to purchase. Their findings show that tracking of electronic word-of-mouth content is highly important to drive performance. Roscoe et al. (2016) studied effects of web search stance in online information search and decision making. Other studies looked into making nudging in a purchase stage more effective in general. For example Maedche et al. (2018) as well as Djurica and Figl's (2017) research design for improving digital nudging using eye-tracking technology.

The research within the purchase stage shows that context, like which channel a customer uses, how a customer can be approached (push- or pull marketing) as well as control over the channels, has an influence on which nudges can be used and how effective they can be implemented.

Post-Purchase Stage

The post-purchase stage holds customer interactions with a brand and its environment after a purchase (Lemon and Verhoef, 2016). Only five of the analyzed studies were assigned to this stage. Gupta et al. (2017) studied the emotional connection of customers to a brand and conclude that (study)-respondents are rather emotionally connected with a brand they have mentioned than with rational benefits. Their investigation shows that a repurchase with a brand occurs more likely, if there is a good experience with it. Shankar et al. (2016) conducted their study on nudging in mobile shopping environments and discuss issues, current insights and future research opportunities.

The relative absence of papers in a post-purchase stage can be explained by the current research's focus on conversional contexts. In order to gain a comprehensive insight into using digital nudging in customer journeys, further research should include post-purchase touchpoint of a customer.

Methodologies Applied in Nudging Research

The analyzed publications applied different research methods. These include literature reviews, eye tracking, open questionnaires, field experiments, surveys, lab experiments and qualitative approaches like interviews and diaries. However, in most articles authors chose to test their hypotheses using online experiments and case studies.

In order to show how nudges can be used along the customer journey, Maas et al. (2018) designed an Amazon Mechanical Turk experiment. It consisted of four different nudges based on common behavioral biases and/or other cognitive limitations. Using the same platform, Schneider et al. (2017) set up an experiment to test five experimental conditions on nudging participants into online verification of a fictional carsharing service. Other online experiments use various customer journey contexts like flight booking screens to test willingness to pay for CO₂-compensation (Székely et al. 2016), user profiles to test racial stereotyping in the sharing economy (Pahuja and Tan 2017) or mobile apps for health bonus programs to investigate readiness to provide personal health data (Schöning et al. 2019).

Real-life case studies involved testing nudges in banking apps (Wijland et al. 2016), engaging the active use of bus passes (Lieberoth et al. 2018), or social sharing of content of educational websites (Huang et al. 2018). The broad use of case studies and online experiments show the value of experimental research design on studying digital nudging and should be considered in the research agenda.

While these studies have considered psychological effects in their studies, they have often been applied without specific mentioning of nudging effects or frameworks. Furthermore, there is no connection being drawn between the use of a nudge within different contexts in customer journeys, for example comparing its effectiveness between pre-purchase, purchase and post-purchase stages of a journey as described by Lemon and Verhoef (2016). There is also no consideration of synchronizing and using nudges across the three stages, i.e. from pre-purchase to purchase and from purchase to post-purchase. None of the studies explored potential differences of nudging on brand-owned and partner owned touchpoints.

Conclusion, Limitations and Further research

The literature analysis revealed that research related to application of nudging along customer journeys is just emerging and relatively immature. The overview and classification of published applications of nudging in customer journeys shows that existing research concentrates mainly on the purchase stage. Furthermore, out of 20 published generic types of nudges, only seven types have been found in literature related to their application in customer journeys. However, these first published results show that these new research field is promising and that further research can provide significant contributions for science and practice. Marketers will be able to allocate efficiently their resources on the right digital nudges within a customer's journey. Furthermore, practitioners in the human-computer-interaction field will profit from research results that will give guidance how to design digital screens in a way to guide user's behavior in a desired way. While nudging has proven to be effective in different contexts, such as social security administration, marketing or health concerns, there are little guidelines as to when to implement which nudging effect in a customer journey.

Research Agenda

Research has shown up to 20 different psychological effects that can be considered for digital nudging (Mirsch et al. 2017). To develop digital nudges, Schneider et al. (2018) have created a framework, that spans goal definition, gaining an understanding of the user, designing the nudge and testing it. This enables researchers and practitioners to apply digital nudging in various contexts. Further studies need to investigate, if specific digital nudges can be assigned to the three stages of the customer journey.

Therefore, we propose a research agenda that is aimed at studying which types of nudges have a bigger impact at which customer journey stage. The following figure combines the customer journey perspective with Schneider et al.'s (2018) design model for digital nudges. It implies that proposed research could investigate effective nudges within and between these stages.

Digital Nudging in Customer Journeys

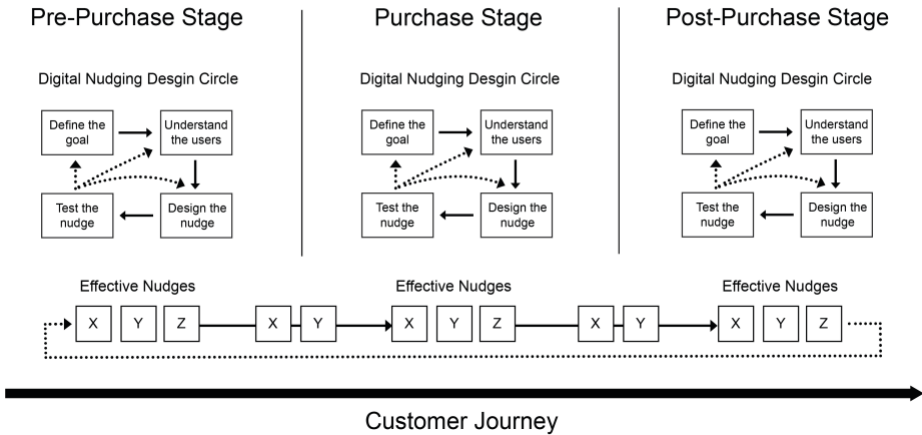


Figure 2. Digital Nudging along the Customer Journey

(based on Schneider et al., 2018) and Lemon and Verhoef, 2016).

Investigating the applications of digital nudges in customer journeys, promises a better understanding of when to use which digital nudge to best support a customer to make an efficient and rational decision. Goal of such research is to find out, which nudges to implement to take a customer one-step further in a customer journey process. The result of such research may be a nudging pipeline as a holistic view on interrelated nudging across various stages. A nudging pipeline could enable nudging users from one stage of the customer journey to another and combine nudges depending on stage of the customer journey as well as the context in which the nudging takes place (i.e. brand or partner owned touchpoints). Outcomes could give evidence, which nudge to use in a purchase stage after a prospect has positively reacted to a “status quo bias”-nudge in an awareness phase or allow to set the right nudging context on a landing page after converting on a “hyperbolic discounting”-nudge on a social media channel.

Limitations

The undertaken structured literature review focused on the existing research in the area of digital nudging that touches customer journey topics. Therefore, keywords around the two terms were used and the results systematically analyzed. While the

research on the keywords was broad, exhaustiveness cannot be claimed. Furthermore, related research fields like persuasive design (see Tam and Ho 2005), smart nudges (Guthrie 2013), human-computer-interaction and other streams of behavioral economics were not considered in this paper. Furthermore, the ownership of screen on which nudging takes place is another dimension of digital nudging that has not been considered in this research. Nevertheless, this study was able to show that there is a need for further research to thoroughly understand how nudges can be implemented along the customer journey.

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Research Paper 2: Digital Nudge Efficacy and the Influence of Personality in Pre-Purchase Information Research

Title	Digital Nudge Efficacy and the Influence of Personality in Pre-Purchase Information Research
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Digital Nudge Efficacy and the Influence of Personality in Pre Purchase Information Research

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Abstract

This study analyses digital nudging in the early stages of the customer journey. The experimental approach investigates the influence of digital nudging principles on decision making when searching for educational programs. The online experiment shows significant impact for three of the five digital nudging principles and greatly varying effect sizes. Social norms, anchoring & adjustment, and status quo nudging principles have a substantial impact when used in the pre-purchase stage. Loss aversion and hyperbolic discounting nudges have not shown a significant influence on choice behavior. Furthermore, extraverted individuals show significantly less behavioral change when confronted with a loss aversion nudge. These results imply a careful consideration of the chosen nudging principle and the target groups personalities when implementing digital nudges and start a novel discussion on the usage of digital nudges in the pre-purchase stage of the customer journey.

Keywords

Digital Nudging, Experiment, Customer Journey, Information Search, Decision-Making, Empirical Research

JEL Classification

C93, D91, M31, L86

Introduction

“Three other site visitors are looking at the last two hotel rooms available!”

This is the type of message that confronts users on websites and e-commerce shops to quickly make a purchase. Companies take advantage of their customers’ heuristics and biases, while utilizing various strategies to convert a browser to a buyer. Researchers have studied these effects and established the term *digital nudging*. Digital nudging is described by Weinmann, Schneider, and von Brocke (2016) as “the use of user-interface design elements to guide people’s behavior in digital choice environments” (p. 433). Various studies have investigated which nudge has the bigger effect on guiding users toward a desired outcome. While many empirical studies have proven digital nudges to be effective, effect sizes vary significantly across the use of nudge category (e.g., defaults, social cues) and context (e.g., environment, finances, policy making) (Hummel & Maedche, 2019).

Previous research has studied decision making and choice architectures, with a focus on the purchase transaction (Schär & Stanoevska-Slabeva, 2019). Taking a holistic view on the process of making a purchase (i.e., the customer journey), digital nudging can also be of value to the customer and the company in other stages of that journey. One previous study for example (Maas et al., 2018) has compared four nudges in different stages of the customer journey context and found significant differences between effect sizes.

One of these customer journey stages is the pre-purchase stage. Here, potential customers recognize their needs, search for how to satisfy those needs, and consider possible solutions. The effectiveness of digital nudges during this stage has not yet been thoroughly examined. (Lemon & Verhoef, 2016). Furthermore, the effectiveness may vary depending several foreshadowed moderation effects, such as personality traits (Hummel & Maedche, 2019).

The underlying goal of this study is to shed more light on the influence of a user’s personality on digital nudges within early purchase stage decisions.

Therefore, the study builds on existing research by examining the effect sizes of all five digital nudging principles (as classified by Mirsch et al. (2017)) within a persistent experimental and customer journey context. Investigating the effectiveness of these digital nudging principles in the pre-purchase context sets a novel foundation

to further examine decision behavior such as moderating effects or the influence of context on effect size of the nudging principles.

The effect sizes of the digital nudging principles as well as potential moderators within the pre-purchase stage will be elaborated on, by conducting an online experiment using a single-factor between-subject design.

This study is structured by first giving insight into the theoretical background of digital nudging, its application in customer journeys and then discusses how personality potentially moderates nudging effects. Subsequently hypotheses are derived, and the experimental setup is explained. Following the experimental design chapter, the raised data is analyzed. Its implications on the research questions are discussed and their implications as well as limitations to the study are documented before a final conclusion.

Theoretical Background and Hypotheses

Digital nudging is grounded in behavioral economics research and is derived from the libertarian paternalism theory. Thaler and Sunstein (2003) described nudging as “[...] an approach that preserves freedom of choice but that authorizes both private and public institutions to steer people in directions that will promote their welfare” (p. 179). In past years, research has evolved toward digital phenomena. The adoption of the nudging theory is described by Weinmann et al. (2016) as the use of user-interface design elements to guide people’s behavior in digital choice environments.

Research on digitally applied nudges has focused on nudging a user toward making a conversion (Schär & Stanoevska-Slaveva, 2019). Although the use of nudging principles in transaction-oriented contexts is important, nudging could also make an impact in earlier or later customer touchpoints, such as in online public relations campaigns, after-sales support, and during the use of the service or product. Thus, the application of nudging within and across activities of customer journeys is of increasing interest for practitioners and scientists alike.

Definition of Digital Nudging

In contrast to the neoliberal perception of the individual, people do not always make rational decisions. Thaler and Sunstein (2003) postulated the concept of

libertarian paternalism, which has the objective to design choice environments that affect human behavior (Mirsch et al., 2017) and should aim to promote people's welfare (Thaler & Sunstein, 2003). This approach to guide people is called *nudging*. Nudges contain “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). Although “choice architects” are meant to design environments for users to make decisions that promote their welfare, these tools can also be used to support marketing activities. In the applications of digital nudging, researchers have defined the term *digital nudging* using different nuances. Based on the original definition of *nudging* provided by Thaler and Sunstein (2008), specific definitions for *digital nudging* mainly aim to explain the “digital” aspect of nudging:

Gregor and Lee-Archer (2016) defined *digital nudges* as nudges facilitated by information technology, which are used to leverage predictive analytics technology in a digital government framework. Their use of digital nudging covers the support of a social investment policy approach toward better social outcomes.

Weinmann et al. (2016) described *digital nudging* from the perspective of human–computer interactions in which user-interface design elements guide people's behavior in digital choice environments. In their view, digital choice environments consist of user interfaces where users make decisions.

Mirsch, Lehrer, and Jung (2018) referred to Hansen's (2016) definition of *digital nudging* as “...the attempt to influence decision-making, judgment, or behavior in a predictable way by counteracting the cognitive boundaries, biases, routines, and habits that hinder individuals from acting to their own benefit in the digital sphere. Digital nudging does not forbid or add any rational choice option, change incentives significantly, or provide rational argumentation” (p. 3).

Some researchers have explored nudging by referring to Thaler and Sunstein's (2008) original definition and without pointing to specific characteristics of digital nudging (Esposito et al., 2017; Li & Lim, 2018; Lieberoth et al., 2018; Maas et al., 2018). Others have adopted the definition proposed by Weinmann et al. (2016), which has been the first specific definition for digital nudging (Djurica & Figl, 2017; Maedche et al., 2018; Schneider et al., 2018). Although the definition of Weinmann et al. (2016) has been widely cited, it seems to restrict digital nudging to “the use of

user-interface design elements to guide people's behavior in digital choice environments" (p. 433) In the future, communication in digital spaces might not be mediated by conventional user interfaces (e.g., voice interfaces). To examine nudging, this research uses the combination of definitions provided by Gregor and Lee-Archer (2016), Mirsch et al. (2017), and Schär and Stanoevska-Slabeva (2019):

Digital nudging is nudging facilitated by information and communication technology and is an attempt to influence decision-making, judgment, or behavior in a predictable way by counteracting the cognitive boundaries, biases, routines, and habits that hinder individuals from acting in their own self-interest in the digital sphere. Furthermore, digital nudging does not forbid or add any rational-choice option, change incentives significantly, or provide rational argumentation. (p. 3)

Digital Nudging in the Pre-Purchase Customer Journey

Digital nudging occurs in various decision contexts. These can be the decision environments, such as the underlying industry (e.g., health, financials) or the stage of the customer journey (pre-purchase, purchase, or post-purchase stage (Lemon & Verhoef, 2016)). Maas et al. (2018) have shown that the efficacy of different nudges vary throughout the different stages of the customer journey in a health insurance context. Additional dimensions are user context (i.e., which device they are using) and control over content (see purchase touchpoints in Lemon & Verhoef (2016)). This study focuses on the time dimension and investigates nudges during a customer's pre-purchase stage.

Hummel and Maedche (2019) have conducted a quantitative review of 100 studies that analyze the effectiveness of nudging. Although their morphological box gives extensive insight into eight dimensions, such as setting or application context, there is no insight into how effect sizes change across the three stages of the customer journey. Their meta-study shows significantly varying effect sizes in the analyzed studies for each of the nudges.

In a literature review, Schär and Stanoevska-Slabeva (2019) have classified 29 studies into three customer journey stages and shed several insights into the effectiveness of the various nudges in the pre-purchase context (see Figure 3).

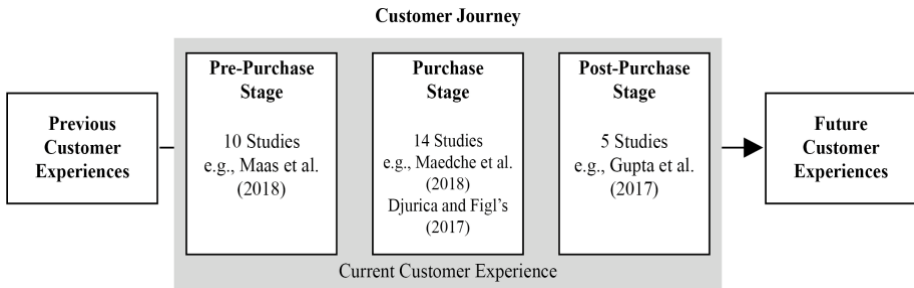


Figure 3. Nudging Studies in Pre-Purchase Stage

Source: Adapted from (Lemon & Verhoef, 2016; Schär & Stanoevska-Slabeva, 2019)

When investigating digital nudging, various researchers have provided classifications for the phenomenon. Sunstein's (2019) overview contained 10 nudges considered to be significant, including default, simplification, reminders, implementation intentions, social norms, ease and convenience, disclosure, warnings, pre-commitment strategies, and informing about consequences. These 10 nudge categories have been used in the morphological box of Hummel and Maedche (2019).

Other researchers have built on the underlying biases and heuristics to explain digital nudging. Mirsch et al. (2017) published a list of 19 psychological effects used in digital nudges, such as framing, status quo bias, or social norms, based on their examination of 65 studies. In their later work, Mirsch et al. (2018) summarized the five most common nudging principles (as described in Table 4), spanning multiple digital nudges and allowing a classification of various psychological effects and instantiations of digital nudges.

Existing classifications of digital nudging are subdivided into psychological principles (biases and heuristics), nudges (the instantiation of one or more psychological principles as a nudge), and nudging principles (the classification of various nudges into main principles or synoptic groups). The five principles are demonstrated in several instantiations and methodical approaches, as Table 4 shows. As this classification includes nudges and their underlying psychological principles, this study uses it to further investigate the efficacy of the different digital nudging principles.

Table 4. Five Digital Nudging Principles

Digital Nudging Principle	Selected Research	Research Method
Status Quo Bias: Individuals prefer to maintain the current situation because they perceive there are greater potential disadvantages than potential benefits of leaving the current state.	Maas et al. (Maas et al., 2018): Defaults in insurance channel choice have proven effective across all stages of the customer journey.	Online experiment
Social Norms: Individuals tend to orient themselves toward the behavior of others. Rules and standards are understood by members of a group that guide or constrain social behavior.	Wong-Parodi et al. (2019): Social norms feedback leads to significant less energy consumption compared to the monitoring group. Also see (Gursoy, 2019; Hall & Towers, 2017; Moran et al., 2014; Pauwels et al., 2018; Wolny & Charoensuksai, 2014).	Field experiment
Loss Aversion: The losses and disadvantages resulting from a decision are weighted more heavily than gains and benefits. Individuals tend to avoid risks, even when the potential for gains is greater.	Wijland et al.'s (2016) study shows that loss aversion nudges are desired features by young mobile banking users.	Online survey and explorative interviews
Anchoring and Adjustment: Uninformed individuals tend to estimate choices in relation to individual cues or starting points. Different starting points can lead to different assessments, thereby influencing the result of the decision.	Larsen (2016) used anchoring via low-frequency targeting through Facebook ads when prospects inform themselves about car brands. Also see (Hall & Towers, 2017; John & Blume, 2017; Ostländer & Koch, 2017; Roscoe et al., 2016; Sigerson & Cheng, 2018).	Case study using Facebook retargeting
Hyperbolic Discounting: Individuals behave inconsistently, as they value the present more than the future. Options with an outcome in the present are preferred over those with future implications, regardless of whether future outcomes are of greater value.	Retailers offer financing and deferred payment for products on their e-commerce websites, decoupling the purchase from the payment, lowering the purchase barrier, and shortening the decision-making process. (Hepburn et al., 2010; Mirsch et al., 2018)	Laboratory and field experiments

Personality as Moderator

Hummel and Maedche (2019) stated that besides the nudge category and context (in terms of industry), reviewed studies have foreshadowed several moderation effects on the nudges. Stutzer et al.'s (2011) study on blood donation behavior speculates the personality trait conscientiousness to have an influence on donation behavior when using default nudges but could not report significant interactions. Jung and Mellers (2016) measured attitudes toward nudges and found various individual dispositions and perceptions to have an influence on opposing or supporting different types of nudges. Furthermore, studies have linked people's personality to their consuming behavior in a marketing context (Mulyanegara et al., 2009). These insights indicate potential moderations of the digital nudging principles by the recipient's personality.

To investigate potential moderators, this study measures personality traits by applying the model of big five personality traits. The concept of the big five personality traits have become a well-established instrument to measure and illustrate an individual's personality in a simplified way (Gosling et al., 2003). The big five personality traits measure the expression of five traits, which are as follows:

Extraversion: Assessing quantity and intensity of interpersonal interaction, activity level, need for stimulation and capacity for joy.

Openness to experience: Assessing proactive seeking and appreciation of experience for its own sake; toleration for and exploration of the unfamiliar.

Agreeableness: Assessing the quality of one's interpersonal orientation along a continuum from compassion to antagonism in thoughts, feelings, and actions.

Neuroticism: Assessing adjustment versus emotional instability; identifies individuals prone to psychological distress, unrealistic ideas, excessive cravings or urges and maladaptive coping responses.

Conscientiousness: Assessing the individual's degree of organization, persistence, and motivation in goal-directed behavior. This contrasts dependable, fastidious people with those who are lackadaisical and sloppy. (Costa & McCrae, 1988; Mulyanegara et al., 2009)

Jung & Mellers (2016) have conducted two studies that focused on the personalities influence on 23 different nudges in various domains spanning personal

vs. social and cost vs. benefit-based decision making. They assigned the nudges to system 1 (automatic cognitive processing) and system 2 (deliberate processing) decision processes based on Kahnemann (2011). Their results show if empathetic, reactant, individualists, desire for control and conservatives type personalities support the nudges or not. Other researchers, such as Pelau et al. (2018), find personality types to influence impulsive buying behavior. Their findings for example show extroverted, feeling-based decision-makers and perception-oriented persons to have more frequently an impulsive buying behavior at shopping sessions. One relevant study (Korhonen, 2020) reported significant influences of personality traits on the effectiveness of social norms and a combined loss aversion and hyperbolic discounting nudge in a purchase setting.

Research Questions and Hypotheses

Maas et al. (2018) have shown that digital nudges to have an effect in a pre-purchase stage when people decide on the information channel through which they want to interact with a company. Other studies (Djurica & Figl, 2017; Eigenbrod & Janson, 2018; Esposito et al., 2017; Hall & Towers, 2017) have further investigated digital nudges in other stages of the customer journey. Furthermore, Hummel & Maedche (2019) show that digital nudges have a significant impact on choice behavior in the pre-purchase stage. While Maas et al. (2018) examined four digital nudges and other studies investigated single nudges in varying contexts, this study aims to investigate the efficacy of all five digital nudging principles within a consistent pre-purchase context. Consequently, research question one (RQ1) asks, which digital nudging principles show a larger difference to a user's decision behavior when considering information in a pre-purchase context within a conversion funnel?

Following above theorizing, it can be hypothesized that the use of the five digital nudging principles (Mirsch et al., 2018) will lead to a positive outcome in behaviors at the pre-purchase stage. Thus, the nudge needs to be instantiated in a context where pre-purchase behaviors take place. According to Lemon and Verhoef (2016), relevant behaviors in this stage are need recognition, search, and consideration. Following the theorization on digital nudging in the pre-purchase context, the following hypothesis can be derived:

Hypothesis One: The use of each of the five digital nudging principles shows a

positive difference in the pre-purchase stage on guiding the users' behavior towards deciding for the intended option compared to a choice environment without nudges.

Based on literature review about the five digital nudging principles (Hummel & Maedche, 2019; Larsen, 2016; Maas et al., 2018; Wijland et al., 2016; Wong-Parodi et al., 2019), it can be stated that all principles will lead to a difference in behavior in favor of the nudged option compared to a control treatment without a nudge (see Table 4). Furthermore, based on the quantitative analysis by Hummel and Maedche (2019) the following order of effectiveness can be suggested:

1. Status quo bias (e.g., defaults).
2. Anchoring and adjustment (e.g., simplification).
3. Social norms.
4. Loss aversion.

No meta-study has been found in the literature review that classified the effectiveness of hyperbolic discounting.

Literature research about personality's moderating effect on nudging principles revealed that specific studies in the domain of customer journeys and digital nudging are scarce. Analyzed studies stemming from related fields of study imply for further theoretical insight and lead to research question two (RQ2): Do personality traits influence the efficacy of digital nudging principles in the pre-purchase context?

The following hypotheses are developed by focusing on each of the five digital nudging principles and derive existing theoretical insights on personality traits.

Social Norms

Korhonen (2020) as well as Oyibo and Vassileva (2019) were able to proof a weakening moderation of a high individual openness value on a social proof nudge in their experimental studies. Thus, it can be hypothesized that a high value in openness weakens the effect of social norms nudges on decision behavior compared to an individual with low openness values.

Hypothesis Two A: A high value in openness to experience weakens the impact of a social norms nudge on decision behavior.

Oyibo and Vassileva (2019) further proved individuals with high values in

neuroticism to be more susceptible to the three social influence strategies social learning, social proof and social comparison.

Hypothesis Two B: A high value in neuroticism strengthens the impact of a social norms nudge on decision behavior.

Pelau et al. (2018) show that extraverted, feeling-based and perception-oriented individuals have a higher likelihood to impulsively buy new products. Even though, these general findings apply on the purchase stage behavior, we state that comparable studies like Maas et al. (2018) show that nudges to have had a continuous significant positive effect throughout all customer journey stages. Thus, it can be hypothesized that a high value in extraversion and agreeableness increase the impact of nudging principles that include impulsive behavior. Such include social norms.

Hypothesis Two C: A high value in extraversion strengthens the impact of a social norms nudge on decision behavior.

Hypothesis Two D: A high value in agreeableness strengthens the impact of a social norms nudge on decision behavior.

Loss Aversion

Bibby and Ferguson (2011) investigated the ability to process emotional information to predict loss aversion and found a higher extraversion value to negatively influence a loss aversion nudge. Consistent to these results, Raynor and Levine (2009) studied health behavior amongst college students and found that extraversion, openness and neuroticism lead to an increased risk taking behavior. Thus, it can be hypnotized that:

Hypothesis Three A: A high value in extraversion weakens the impact of a loss aversion nudge on decision behavior.

Hypothesis Three B: A high value in openness weakens the impact of a loss aversion nudge on decision behavior.

Hypothesis Three C: A high value in neuroticism weakens the impact of a loss aversion nudge on decision behavior.

Hyperbolic Discounting

In an experimental setting, Silva et al. (2017) tested hyperbolic discounting through a questionnaire where respondents were asked to choose between two sure payoffs at two distinct points. Their results show conscientiousness, openness to experience and extraversion to be traits that contribute to rational decisions in intertemporal choice which makes participants with these personality traits less susceptible to hyperbolic discounting. Although these findings result from an experimental setting focusing on purchase transactions, we hypothesize that:

Hypothesis Four A: A high value in conscientiousness weakens the impact of a hyperbolic discounting nudge on decision behavior.

Hypothesis Four B: A high value in openness to experience weakens the impact of a hyperbolic discounting nudge on decision behavior.

Hypothesis Four C: A high value in extraversion weakens the impact of a hyperbolic discounting nudge on decision behavior.

Status Quo

Status quo nudges using defaults are amongst the most studied nudging effects (Mirsch et al., 2017). Mellers and Jung (2016) have studied defaults as “system 1 nudges”. Out of six individual dispositions, only empathetic people tend to support default nudges.

We therefore hypothesize that:

Hypothesis Five: A high value in extraversion strengthens the impact of a status quo nudge on decision behavior.

Anchoring & Adjustment

Although anchoring effects have been thoroughly studied in decision-making research, results show inconsistent support for personality traits influence on the effect of anchoring effects (Furnham & Boo, 2011). Furnham et al. (2012) studied anchoring within an experimental setting including four anchoring tasks and also measured personality traits of the participants. Their findings show that none of the personality traits showed significant results (Furnham et al., 2012). Another study using

anchoring tasks, found high values in agreeableness and openness to experience were found to be related with reduced susceptibility to the anchor (Caputo, 2014).

A contrary indication is Eroglu and Croxton’s (2010) paper in which they studied statistical forecasting and found participants with high conscientiousness and agreeableness and low extraversion are more susceptible to the anchoring effect. While a theoretical statement towards agreeableness is not appropriate, the following hypothesis can be derived:

Hypothesis Six A: A high value in conscientiousness strengthens the impact of an anchoring & adjustment nudge on decision behavior.

Hypothesis Six B: A high value in openness to experience weakens the impact of an anchoring & adjustment nudge on decision behavior.

Hypothesis Six C: A low value in extraversion weakens the impact of an anchoring & adjustment nudge on decision behavior.

Addressing the research question one with H_1 and research question two with H_{2-6} , the constructed theoretical framework can be visualized as Figure 4 shows:

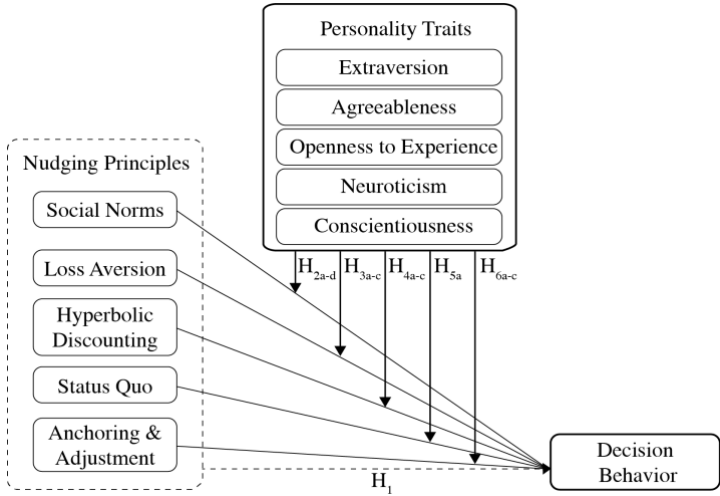


Figure 4. Hypothesis

Online Experiment

To investigate how effective digital nudges can be set in a certain context, various experimental designs are feasible. Hummel and Maedche (2019) stated that, out of 291 examined data collections, 46 data collections were gathered in an online experiment. This study followed an online experimental design, as this allows for high control of the setting and for a follow-up questionnaire obtaining additional data such as demographics and psychometric items.

The online experiment was set up as a search task. The participants were asked to search for and consider educational programs they are interested in. Deciding on how to further educate oneself involves many different decision parameters such as investment, influence on career/life, duration, and type of certificate. Educational offers provide an adequate context for the experiment, as there is a high need to gather information.

To operationalize, there were six treatments (5 stimuli, 1 control group), with a sample size of at least 100 participants per treatment. The design of an online decision environment and control questions allowed for the acquisition of participants through the use of Amazon's Mechanical Turk (MTurk), which delivers reliable and good-quality data on psychological tasks (Shank, 2016). A manipulation check confirmed the persistence of the stimuli in the setup and an attention check was implemented to ensure that participants thoroughly read the instructions.

Design and Treatments

The comparative online experiment (Oehlert, 2010) was set up as a single factorial, between-subjects online experiment with five factor levels. It investigated the effectiveness of five different treatments containing digital nudges as major manipulations against a control treatment that did not contain a digital nudge. The participants were randomly assigned to one of six treatment groups.

The experiment took place in a search context for educational programs. To set the context and as a warmup exercise, the participants were asked to write down subjects they would be interested to learn more about. To simulate a realistic online search process, the participants were instructed to search for an educational program on their favorite subject on an interactive search site. After submitting the search

query, the participants were randomly assigned to one of six treatments. The loaded search results site then showed their individual search query and two generalized search results that were identical in all treatments (see Figure 5). Below the search results, they were presented with a choice task, where they had to choose which one of the two results they would like to further consider. The shown choice environment contained the digital nudge (or not in the case of the control group), as listed in Table 5. The design of the choice environments followed Schneider, Weinmann, and vom Brocke’s (2018) four-step process for designing digital nudges: (1) have prospective students visit the universities’ website by clicking on the search results of an online search; (2) gain an understanding of prospective students’ decision process (to inform oneself about programs as part of further educating oneself) before taking a decision; (3) have the nudges designed according to the users’ needs and goals; (4) test in a pre-test. When testing the specific nudging texts, Sunstein’s guide to nudges (2019) suggestions were applied. In order to minimize confounding effects, such as color coding, the nudges only contain text cues.

Please study the following search result page and answer the question below:

Search Results

"INDIVIDUAL SEARCH QUERY"

Q

2 Results (0.32 sec)

Brigels Center for Further Education

[www.brigelscenter.com](#)

Various programs and classes for your future plans. Our continuing education programs are designed to help individuals grow – whether it's exploring an interest, developing skills or shifting careers. The programs lead to associate degrees and certificates.

Education Institute of Andeer

[www.andeereducation.com](#)

We offer first class further educational trainings in our facilities as well as through online tutoring. These include career training, personal enrichment or general education programs resulting in certificates or leading to associate degrees.

About which search result would you further inform yourself?

☐ Brigels Center

☐ Institute of Andeer

CONTINUE

Figure 5. Choice Environment

The search results page including the choice environment as main manipulation at the bottom is illustrated as Figure 5 shows. The control group as illustrated in Figure 5 gets shown a search result screen with two education providers with similar marketing text to promote their services. The texts are independent from the participants' search queries. Table 5 below shows the nudged choice options compared to the control group.

Table 5. Stimulus Design in Treatments

Treatment Description	Operationalization
Control Group: No nudge had been placed. The options were shown in a randomized order.	About which search result would you further inform yourself about? ☐ Institute of Andeer ☐ Brigels Center
Status Quo Bias: The operationalisation of the status quo nudges implements a default choice, where an effort has to be undertaken to choose the opposing choice (Smith et al., 2013). The default option is pre-filled and a text explains this option to be the default.	About which search result would you further inform yourself about? Default choice is Institute of Andeer ☐ Brigels Center ☒ Institute of Andeer
Social Norms: A random number between 50 – 100% has been chosen according to similar studies like (Maas et al., 2018). The nudge's wording originates from Sunstein's guide (Sunstein, 2019).	About which search result would you further inform yourself about? 87% of users choose the Institute of Andeer. ☐ Institute of Andeer ☐ Brigels Center
Loss Aversion: Kahneman described loss aversion as a weighted decision towards a less risky alternative when assuming that choices are changes relative to a neutral reference point (instead of states of wealth or welfare (Kahneman et al., 1991)). As the subject is searching for a study place, the constituted scarceness of one alternative influences the	About which search result would you further inform yourself about? Last admissions to the Institute of Andeer! ☐ Brigels Center ☐ Institute of Andeer

decision towards the alternative that shows a smaller risk of losing an opportunity.

Hyperbolic Discounting:

Based on the finding that individuals behave temporally inconsistently as they value the present more than the future (Mirsch et al., 2018), this nudge lays focus on the value of instant admission notice. Mirsch et al. (2018) write that individuals prefer options with an outcome in the present over those with future implications, regardless of whether future outcomes are of greater value.

About which search result would you further inform yourself about?

Instant admission & enrollment notice at the Institute of Andeer

☐ Institute of Andeer

☐ Brigels Center

Anchoring & Adjustment:

As uninformed individuals tend to assess or estimate choices in relation to individual clues or starting points (Mirsch et al., 2018), this operationalization sets distance as a starting point, regardless of its correlation with quality of the educational program.

About which search result would you further inform yourself about?

Institute of Andeer is 50 miles closer to your location.

☐ Brigels Center

☐ Institute of Andeer

The shown choice options (Institute of Andeer vs. Brigels Center) are presented in a randomized order. After the main manipulation, additional questions involve a 10-item questionnaire to measure personality traits (Gosling et al., 2003). Further questions included a manipulation check (Oppenheimer et al., 2009), a need for cognition inventory (Beißert et al., 2014), cognitive reflection test (Frederick, 2005) and socio-demographic questions.

Measurements and Controls

After participants accepted the disclosure agreement at the start of the experiment, they randomly got divided into six groups. The group assignment was recorded as the independent variable ($0 = control$, $1 = status\ quo$, $2 = social\ norms$, $3 = loss\ aversion$, $4 = anchoring\ \&\ adjusting$, $5 = hyperbolic\ discounting$) as it correlated with the treatments faced by the participants. The participants were presented with a choice environment, where they needed to choose which of the two

options to further elaborate on. The selected choice represents the dependent variable ($0 = \text{"Institute of Andeer"}\text{"}, 1 = \text{"Brigels Center"}\text{"}) that measures click behavior. The dichotomous variable recorded 1 for a click on the nudged search result and 0 for clicking on the result that is not nudged. After participating in the experimental part, the participants answer Gosling's (2003) 10-item personality measure. In each of the ten items, the participants decide on a 7-point Likert scale ($1 = \text{Disagree strongly}$, ..., $7 = \text{Agree strongly}$), whether a specific statement on their personality applies to them or not. Following Gosling's (2003) measure, the answers are later calculated to report the big-five personality traits of the individual participant. As this study investigates decision-making behavior and relies heavily on participants to follow the instructions, an instructional manipulation check (IMC) was implemented. Based on Oppenheimer et al. (2009), it instructs participants to click on "No Answer" instead of a number on the 7-point Likert scale ($1-7 = \text{failed}$, $8 = \text{passed}$). Failing to pass the IMC led to exclusion from the data set. Other studies that examine interactions on digital nudges have used demographic data as well as the behavioral concepts need for cognition (NFC) (Cacioppo et al., 1984) and cognitive reflection (Frederick, 2005). Need for cognition (NFC) and cognitive reflection have been linked to influence decision behavior (Ingendahl et al., 2020; Maas et al., 2018; Petty & Cacioppo, 1986; Toplak et al., 2011). Therefore, NFC values were evaluated using a short-inventory item (Beißert et al., 2014) and cognitive reflection abilities using a standardized three question inventory (Frederick, 2005) as also used in Maas et al. (2018). Last, Educational background ($1 = \text{primary school}$, $1 = \text{secondary school}$, $3 = \text{junior college}$, $4 = \text{university undergraduate}$, $5 = \text{university graduate}$), gender and age were raised to control for potential interactions.$

Results

The experiment was conducted on October 16th, 2020. A total of 1’448 participants were recruited via Amazon’s MTurk Service. 290 participants (20.03%) failed the IMC and were removed from the dataset, the valid sample included 1158 participants. Demographic statistics, reported in Table 6, showed that the sample of participants were majority male and highly educated at a mean age of 34,49 years (*SD* = 18.19).

Table 6. Demographic Data of Participants

Demographics of experimental study	
Gender	
N	1158
% female	38.4
% male	60,4
% unspecified & empty	1.2
Education	
N	1158
% university (graduate)	35.1
% university (undergraduate)	45.9
% junior college, Polytechnic, institute of technical education	8.8
% secondary school	8,0
% primary school & empty	2.2
Age	
N	1158
Mean	34.59
SD	18.187

The participants were randomly assigned to treatment groups. The analysis of the participants’ socio-demographic attributes showed no significant difference of means between the experimental treatment groups and the control group’s age, gender, and education.

The treatment groups counted the following number of participants: Control group (*n* = 195), status quo (*n* = 195), social norms (*n* = 200), loss aversion (*n* = 193), anchoring and adjustment (*n* = 197), and hyperbolic discounting (*n* = 178).

The independent variable indicated the assigned treatment, and the dependent variable recorded the dichotomous choice of either (1) the nudged option versus (0)

the not nudged option. As the control group does not show a nudge, all nudges were operationalized with the same option (Institute of Andeer) to compare nudge performance against a control group. The order of the presented choice (e.g., first option or second option) was randomized.

Due to the nominal scale of the dependent variable, the results were analyzed using cross-tabulations and a Pearson chi-square test to test for the overall difference in choice behavior between the treatments. A logistic regression Table 8 was calculated to first analyze the overall model and the click behavior within the five nudging principle treatments. In a second step, the hypothesized moderation effects by the participants personalities were tested. Finally, in the third step of the regression, the control variables age, gender and education were inserted into the equation.

Main Effect Analysis

The analysis of the impact by digital nudging principles on decision behavior showed a significant overall difference between treatment allocation and choice behavior ($Chi^2(5) = 35,688$ $p = .000$, $n = 1158$). The correlation is considered to be weak ($CC = .176$, $p = .000$, $Cramer's V = .176$, $p = .000$). Cross-tabulation analysis of the participants' choices demonstrates significant impact of the digital nudges toward a user's choice, as illustrated in Figure 6. While 46.2% of the users in the control group decided on the option of "Institute of Andeer," the favorable response spanned between 51,3% and 69%, with the different nudges applied.

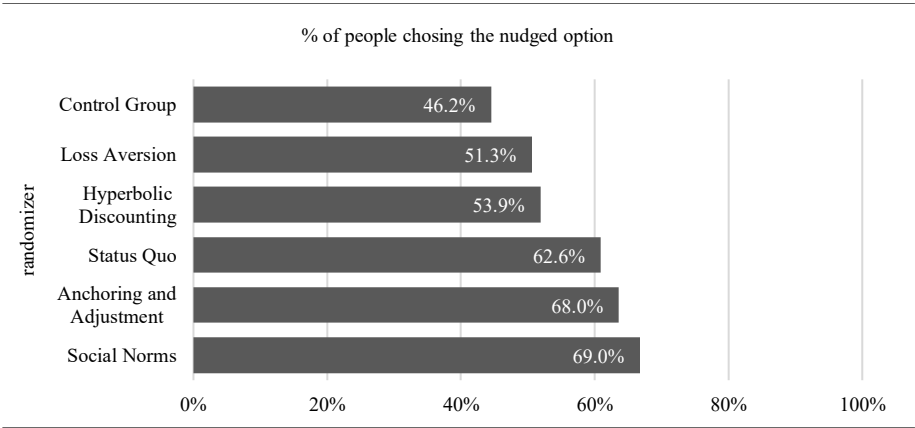


Figure 6. Percentage of Participants Choosing the Nudged Option

The analysis of each digital nudging effect compared to the control group show significant differences for status quo, social norms and anchoring & adjustment as documented in Table 7. Cramers V attests all three nudges weak correlations of the click behavior compared to the control group.

Table 7. Chi²-Tests

Comparison of click behavior between treatments to control group

Treatment compared to control	Chi ²	CC	Cramers V	N	p
Status Quo	10.583	.163	.165	390	.001**
Social Norms	21.117	.225	.231	395	.001**
Loss Aversion	1.026	.051	.051	388	.362
Anchoring & Adjustment	19.133	.216	.221	392	.000**
Hyperbolic Discounting	2.252	.077	.078	373	.133

** p < .005

The logistic regression shown in Table 8 provides further insight into the effect of the five nudges on the click behavior. The logistic regression ($Chi^2(22) = 67,246$, $p = .000$, $n = 1158$) states an increased likelihood for a click on the nudged alternative by 25,077 times for social norms and by 7,392 times for loss aversion nudges. It does not report significant changes for status quo, anchoring & adjustment and hyperbolic discounting nudges. R² (Nagelkerke) is at .076 which is a weak effect according to Cohen (1992).

Controls and Moderation Effect Analysis

The main stimulus within the online experiment recorded a binary choice (*nudged alternative* = 1, *not nudged alternative* = 0). In order to measure the influence of the likelihood a participant chooses the nudged option, a logistic regression analyzed hypothesized moderation effects and potential influence of the control variables (age, gender, education, personality traits, need for cognition, cognitive reflection). This approach relates to other experimental studies investigating digital nudges' interaction effects (Ingendahl et al., 2020; Silva et al., 2017; Tietz et al., 2016). The participants' choice serves as the dependent variable and interactions and controls are inserted as independent variables. The foreshadowed effects of the personality traits on choice behavior have been added to the model in step two. The

results show the personality trait extraversion to have a significant negative impact on the loss aversion nudge. All other potential moderations have not shown a significant effect as hypothesized. Step three then inserted need for cognition, cognitive reflection, education, gender and age to the regression. The control variables have not had an effect on the model.

Table 8. Logistic Regression on Click Behavior

Results of logistic regression analyses in digital nudging experiment					
Independent Variables	B	S.E.	Wald	Sig.	Exp(B)
Step 1 (Nudging Principles)					
Status Quo	.670	.443	2.284	.131	1.954
Social Norms	2.974	.868	11.731	.001*	19.562
Loss Aversion	1.809	.711	6.483	.011*	6.106
Anchoring & Adjustment	.544	.860	.400	.527	1.723
Hyperbolic Discounting	-0.243	.774	.098	.754	.784
Step 2 (Interactions)					
Social Norms * Openness	-0.159	.157	1.032	.310	.853
Social Norms * Conscientiousness	* -0.201	.135	2.228	.136	.818
Social Norms * Extraversion	-0.095	.105	.811	.368	.910
Social Norms * Agreeableness	.045	.132	.116	.733	1.046
Loss Aversion * Extraversion	-0.230	.108	4.482	.034*	.795
Loss Aversion * Openness	-0.181	.143	1.602	.206	.835
Loss Aversion * Conscientiousness	* .040	.134	.088	.767	1.041
Hyperbolic Discounting * Extraversion	* .023	.131	.031	.860	1.023
Hyperbolic Discounting * Openness	* -0.166	.108	2.368	.124	.847
Hyperbolic Discounting * Conscientiousness	* .218	.141	2.367	.124	1.243
Status Quo * Extraversion	.001	.100	.000	.989	1.001
Anchoring & Adjustment * Openness	* .243	.132	3.384	.066	1.275
Anchoring & Adjustment * Conscientiousness	* -0.036	.127	.081	.775	.964
Anchoring & Adjustment * Extraversion	* -0.183	.113	2.614	.106	.833
Step 3 (Control variables)					
Need for Cognition	.000	.002	.002	.963	1.000
Cognitive Reflection	-0.030	.061	.238	.625	.970
Education	.005	.122	.002	.969	1.005
Gender	.005	.003	2.473	.116	1.005
Age	.000	.002	.002	.963	1.000
Constant	.011	.432	.001	.979	1.011

a. all results stem from step 3 analysis, b. df= 1 for all results, * p<0.05, ** p<0.005

Discussion

The online experiment tested digital nudging principles in the pre-purchase customer journey stage. In sum, the results of the experiment state that digital nudges have a significant effect on the choice behavior of participants toward a nudged search result when searching for educational program offers.

Research question one aimed to investigate which digital nudging principle shows a larger difference to a user's decision behavior when considering information in a pre-purchase context within a conversion funnel. The results show limited support for H_1 that stated all digital nudging principles showed to have a positive effect toward the nudged option.

In line with the findings of Hummel and Maedche's (2019) meta study, the differences in click behavior were notable. In contrast to existing research though, the social norms nudging principle had the most distinctive difference in decision behavior (+22.8 percentage points compared to the control group) followed by anchoring and adjustment (+21.8) and status quo (16.4). The different order of the behavior change can be explained by the novel context of the experiment compared to previous experiments as classified by Hummel and Maedche (2019). The order of the status quo and social norm nudge correlate with previous (Maas et al., 2018) findings that also found social norms nudges to be more effective in the pre-purchase stage, compared to the purchase stage. The difference between status quo and social norms likely stem from the chosen stage of the customer journey, where a customer is still in the stage of being informed (Lemon & Verhoef, 2016). Considering the two different studies available in the pre-purchase stage (this study and Maas et al.'s (2018) study covering the insurance context), the key takeaway is that the social norm nudge outperforms the status quo nudge in early stages of the customer journey. Furthermore, an anchoring and adjustment nudge in the early information gathering stage of a customer journey has an extensive effect on immediate choice. Further studies could investigate the persistence of the effect of an early anchoring & adjustment nudge during later stages of the customer journey. H_1 though, could not fully be confirmed, as hyperbolic discounting and loss aversion nudges have not reported significant changes in behavior. Loss aversion and hyperbolic discounting are two closely connected nudging principles (Mirsch et al., 2018) that have been often implemented in purchase transactions. Their effect has been smaller. This could

be due to their consequential wording, as a customer doing research might not yet be addressable to more pressing nudges as later in the customer journey.

Research question two raised the question if personality traits influence the efficacy of digital nudging principles in the pre-purchase context. Testing the moderation effects has only shown support for one (H_{3a}) of the 14 hypothesized interactions. The influence on the click behavior by the digital nudging principle loss aversion is significantly, negatively moderated when an individual has high extraversion values. A loss aversion nudge is less likely to change the click behavior by 20.2% with each additional point on the 7-point extraversion scale. Further studies could investigate the persistence of this interaction throughout the customer journey in order to find gain a better understanding for potential boomerang effects on the loss aversion nudge.

The study has not showed support for all other hypothesized moderations. Considering social norms (H_{2a-d}), different ways of inducing the norm may lead to other outcomes on potential moderators. Cialdini et al. (2006) have shown significantly different behavior when using descriptive normative versus injunctive normative information on a social problem. Although the interactions regarding social norms have not shown significant impact, this might only be true for the pre-purchase context of the study. Especially as other researchers (Korhonen, 2020; Oyibo & Vassileva, 2019) reported significant interactions of the personality on social norms nudges. Applying throughout testing of nudging effects seems mandatory before implementing these in live digital environments. The results on the hypothesized interactions of personality and hyperbolic discounting nudges (H_{4a-c}) clearly show no moderation in the investigated context. As discussed, hyperbolic discounts are usually operationalized within purchase decision environments with more immediate consequences on decisions (Mirsch et al., 2018) and though might also be less weighted within a pre-purchase context. Status quo nudges are commonly applied in user interfaces. A clear indication of a personality's influence would have led to practical implications. The hypothesized interaction of extraversion and status quo nudging principle (H_{5a}) was not supported in this study. The influence of personality on status quo has been shown by Mellers & Jung (2016) though.

The use of anchoring effects has been thoroughly studied (Furnham & Boo, 2011; Kahneman et al., 1991), but various studies have shown inconsistent effects.

While this study, focusing on the pre-purchase stage, has not shown hypothesized interactions (H_{6a-c}), investigations in later customer journey stages might show moderations. While hyperbolic discounting shows no significant effects on choice behavior its relevance the pre-purchase stage could be questioned in general.

Implications

Above findings allow for theoretical implications. Although, the discussed results present implications about personality traits having an effect on digital nudging principles, the influence of an individual's personality on the efficacy of digital nudges should be further studied. The results imply an influence of extraversion on the digital nudge loss aversion. This proves personality to have an influence on the loss aversion nudge and underlines Hummel and Maedche's (2019) statement that personality might moderate nudging efficacy. As the experimental setup had to be very narrow, investigating personality as a nudge moderator in other contexts should lead to further theoretical insights. Furthermore, as Hummel and Maedche (2019) implied, there is not just context and nudge type influencing the effect of a nudge but also other moderators. As the operationalization of the nudges might have had an influence on the results, more specific examinations of single nudges should allow to examine further facets of potential moderators. The strength or specific expression of the nudge implication could have an influence on the outcome (e.g., (Cialdini et al., 2006) comparing the effect of descriptive or normative messages in social norms). An investigation into the strength (or aggressiveness) of the nudge operationalization might shed further insights on the influence of personality regarding nudging effects.

Practical implications of this study add to the knowledge on how to apply nudges in digital choice environments. Having a detailed understanding of how personality and other moderators affect nudges would be beneficial for policy makers, marketers, and other industry professionals who guide customers through online choice architectures. Consequently, marketing professionals who are considering the use of digital nudges in a pre-purchase stage of their customer journeys should carefully plan, test, and consider digital nudges for their effectiveness and refrain from blindly following the temptation to use all nudging opportunities offered by digital innovation. This study shows that marketers should primarily use social norms, anchoring & adjustment, and status quo nudging principles to evaluate the early stages

of the customer journey. For loss aversion nudging principles, the personality traits of the intended recipient should be taken into account to avoid potential negative interactions. As this study focused on an information gathering task, practical applications are also of value to policy makers. Stutzer, Goette and Zehnders (2011) for example have investigated the influence of personality on blood donation behavior and were not able to prove an influence of personality on donation behavior. The results of this study imply a negative moderation on extroverted individuals when using loss aversion nudges. While further studies might look into specific moderations within different contexts of policy making (such as social security administration, insurance, health, energy, education, environment, etc.) the individual personality has to be taken into account to avoid creating unintended biases in public decision architectures.

Limitations

This study has several limitations to be considered. First, the online experiment has made use of a common click-worker portal to acquire the study participants, which comes with drawbacks. Especially cultural differences between the mainly North American MTurk worker and other populations will have to be accounted for in future studies. Hagmann et al. (2015) have, for example, shown a higher acceptance of nudges by Swedes compared to participants in the United States. Some limitations also arise from the chosen research design. A fifth of the participants did not thoroughly read the instructions (20.03%) and had to be excluded. Besides the IMC test, further tests might have improved the quality of the survey. To reduce such effects, a real-life or laboratory experiment could further investigate the efficiency of digital nudges in natural environments and lead to more insights. While a set of common control variables such as age, gender and education as well as behavioral constructs (as used in related studies) have been implemented, further behavioral concepts like cognitive dissonance (Brehm & Cohen, 1962) or individual predispositions like political preference (Fellner et al., 2013) that have shown to influence decisions have not been taken into account.

Conclusion

This study followed two research questions investigating pre-purchase decision-making. It focused on elaborating on digital nudge efficacy and the influence of personality on these nudges. The conducted online experiment operationalized an information research task for further educational offerings and found social norms, anchoring & adjustment, and status quo nudging principles have a substantial impact on choice behavior when used in the pre-purchase stage. These findings are in line with previous research that showed divergent but mainly significant and positive effects on these nudging principles. Several hypothesized interactions of personality traits and digital nudges have been tested in the experiment. While all other hypothesized interactions were not supported, this study showed that extraversion negatively moderates the effect of loss aversion nudges. Choice architects elaborating on using digital nudges should therefore take their customers personality into account when planning to implement loss aversion nudges. While this study showed some impact of personality on digital nudges in a pre-purchase customer journey context, its main theoretical contribution is the proof, that there are more interactions to digital nudges than industry and nudge type. These findings imply for more scientific research about moderation effects on digital nudging principles in order to eventually more thoroughly understand how to purposefully design digital nudges for choice environments.

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Research Paper 3: Social Pressure on Heavy Thinkers? - The Influence of Need for Cognition on Pre-Purchase Social Norm Nudges

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Social Pressure on Heavy Thinkers?

The Influence of Need for Cognition on Pre-Purchase Social Norm Nudges

Completed Research

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Abstract

The design of user interfaces has seen an increasing use of digital nudging principles in recent years. Research has shown many nudging principles, like defaults or social norms, to be effective in persuasive systems. So far though, little research has focused on the user's personality and its influence on the efficacy of such nudges. This paper investigates the influence of an individual's need for cognition on the effectiveness of a digital social norms nudge. The experimental design operationalized an information research task for further education offerings. The results indicate that users with a higher need for cognition are 29.1% less likely to select the nudged option. This result aligns with theoretical findings but contrasts another study within the purchase stage of a customer journey that did not find significant moderation effects. It demonstrates the need for a careful consideration of users' personality traits when using digital nudges in persuasive systems.

Keywords

Digital Nudging, Social Norms, Need for Cognition, Customer Journey

Introduction

The targeted implementation of heuristics and biases to guide individuals in their decision-making processes throughout user interfaces has become widespread in online platforms. Researchers have studied this phenomenon termed *digital nudging*. The research stream around this term has gained attention through the best-selling book *Nudge* by Thaler and Sunstein (2008) and has led to various scientific substreams. Digital nudging is understood as the purposeful implementation of heuristics and biases in choice environments, with the aim of guiding a user to make better decisions (Mirsch et al., 2017).

Such nudges make use of defaults, social cues, or anchoring biases, among others, to influence a user's decision toward a desired outcome (Schneider, Weinmann, & vom Brocke, 2017). Studies have shown a general effectiveness of these nudging principles but have also found largely varying effect sizes (Hummel & Maedche, 2019) as well as situations in which nudges tend to backfire (Burger et al., 1999; Schultz et al., 2018). Hummel and Maedche (2019) predict that not only do nudge types and contexts have an influence on their effect sizes (i.e., in which industries a nudge is applied) but also other moderators like an individual's personality trait as demonstrated by Jung and Mellers (2016).

Therefore, it is of theoretical and practical relevance to deeply examine digital nudging principles beyond design guidelines and investigate potential moderators. Studies imply that a user's attributes like personality (Jung & Mellers, 2016), cultural heritage (Hagman et al., 2015), and political preference (Fellner et al., 2013) interact with a nudge's effectiveness. As such interactions are scarcely studied, digital nudges often show unexpected outcomes and largely varying effect sizes (Hummel & Maedche, 2019).

Practitioners could benefit from more insights on how their customers' personalities influence the effectiveness of applied digital nudges. With the ongoing advancement of data collection and behavior analysis applications in the design and usage of user interfaces, illuminating the effect of the personality on digital nudges can allow partitioners to design better user interfaces and decision environments.

Current research streams are looking into moderation effects of various digital nudges in different contexts and highlight the importance of gaining a better

understanding of interactional effects (Hummel & Maedche, 2019; Ingendahl et al., 2020; Maas et al., 2018; Schär & Stanoevska-Slabeva, 2019). The aim of this research is to better understand how one of the most studied nudges, the social norms nudge (Hummel & Maedche, 2019), is influenced by an individual's personality.

One previous study that investigated the personality trait “need for cognition” (NFC) within a purchase decision context and found no significant interactions on social norms nudges (Ingendahl et al, 2020). Building on these findings, this study adds an additional insight on the potential moderation by NFC through shifting the focus to investigating decision making in the pre-purchase customer journey context. The research question therefore states: *How does the personality trait “need for cognition” influence the efficacy of social norms nudges in the pre-purchase customer journey stage?*

Following this research question, the presented paper provides premier insight into interactions of digital social norm nudges in a pre-purchase customer journey stage.

Digital Nudging

Thaler and Sunstein (2003) described *nudging* as “[...] an approach that preserves freedom of choice but that authorizes both private and public institutions to steer people in directions that will promote their welfare” (p. 179). Nudges contain “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). Thaler and Sunstein’s research has been applied to the digital realm and has found broad application in user interface design throughout various industries. The transfer of nudging into human computer interface applications has been called *digital nudging* and is described as the use of user-interface design elements to guide people’s behavior in digital choice environments (Weinmann et al., 2016). Including behavioral patterns and heuristics into persuasive system design has been common, for example, in social support principles (Oinas-Kukkonen & Harjuma, 2009).

Other definitions focus on the predictive analytics of digital nudges (Gregor & Lee-Archer, 2016) or refer to the original definition of *nudging* by Thaler and Sunstein (2008) without discussing specific characteristics of its digital application (Esposito

et al., 2017; Li et al., 2018; Lieberoth et al., 2018; Maas et al., 2018). Not least, Mirsch et al. (2017), as well as Schär & Stanoevska (2019), understand digital nudging as being facilitated by information and communication technology. It is an attempt to influence decision making, judgment, or behavior in a predictable way by counteracting cognitive boundaries, biases, routines, and habits that hinder individuals from acting in their own self-interest in the digital sphere. It does not forbid or add any rational-choice option, change incentives significantly, or provide rational argumentation.

Current research shows different classifications of the various types of digital nudges. While Sunstein (2019) lists 10 nudge categories (e.g., default, simplification, social norms, pre-commitment strategies), other researchers focus on examining the underlying psychological effects (Mirsch et al., 2017) that had been used instead of nudge classifications. These effects had also been combined into the 5 overarching digital nudging principles: status quo bias, social norms, loss aversion, anchoring and adjustment, as well as hyperbolic discounting (Mirsch et al., 2018).

Social Norm Nudges

Cialdini & Trost (1998) define social norms 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” (p. 152). These social norms may consist of societal or our own expectations for our behavior as well as standards that develop from our observations of other people’s behavior (Cialdini & Trost, 1998). This study investigates how observed behavior in a digital context influences a users’ decision making. A specific focus lies within behavioral change when individuals are shown information about how many people decide in a specific choice situation as proposed by Sunstein (2019) and implemented in various studies (Maas et al., 2018; Cialdini, 2013).

The effect of social norms has been intensely studied. Burnkrant and Cousineau (1975) provided support for the informational social influence in a purchase stage context and made a statement for the importance of social product evaluations long before e-commerce star ratings were en vogue. In their literature review, Cialdini and Goldstein (2004) studied how compliance and conformity interact with external forces to reduce social influence processes. In various experiments and field studies,

researchers investigated the effects of social norm nudges. Cialdini et al.'s (2006) field experiment showed the persuasive impact of social norms on people's behavior (in that case, stealing petrified wood in a forest). Another field experiment focusing on private energy consumption led to significant less consumption in a monitoring group that experienced social norm nudges (Wong-Parodi et al., 2019). Experimental setups also included studying preferred communication channel choice with an insurance in the pre-purchase context (Maas et al., 2018) or using star ratings in an e-commerce purchase context (Djurica & Figl, 2017). The importance of social norms to the design of persuasive systems has also been discussed (Castmo & Persson, 2018; Oinas-Kukkonen & Harjumaa, 2009).

Customer Journey Perspective

Various researchers have attested to digital nudges leading to different behaviors across changing decision environments and contexts. Hummel and Maedche (2019) showed significant differences based on the nudge type (such as social norms or defaults) and context (industry in which nudges are applied such as finances, policy making, or health) and further stated moderating effects (such as political preferences and personality traits). Maas et al. (2018) first applied the customer journey perspective to the topic of nudging. Customers' actions are different at the beginning of the journey. Potential customers recognize their needs, search for solutions, and consider a purchase in the pre-purchase stage. They then focus transactional tasks like choice, ordering, and payment within the purchase stage. Finally, they focus on usage, consumption, and support requests in the post-purchase stage (Lemon & Verhoef, 2016). Maas et al.'s (2018) study showed significant differences in nudge efficacy across the customer journey. They argued that different customer goals in the three stages (pre-purchase, purchase, and post-purchase) and the varying consequences of a decision lead to the changing efficacy of the same nudging principle throughout the customer journey. Consequently, understanding how digital nudges work in a pre-purchase stage, where customers consider a purchase and gather information, can lead to a more goal-oriented implementation of nudging principles and allow practitioners to use the right nudge at the right moment of the customer journey.

While several studies have focused on purchase-driven decision environments (Schär & Stanoevska-Slabeva, 2019), investigations into decision behavior at early

stages of a customer journey are scarce. Schär and Stanoevska-Slabeva (2019) classified 29 studies into the three customer journey stages and offered insights into the effectiveness of the various nudges in the pre-purchase context. Their findings listed 10 studies in the pre-purchase stage that examined various nudges such as framing (Chen, Kyaw, & Ross, 2008; Hall & Towers, 2017), social norms (Moran, Muzellec, & Nolan, 2014; Wolny & Charoensuksai, 2014), color coding (Maas et al., 2018), among others.

Moderators for Social Norm Nudges

While social norm nudges have been proven in various contexts to have a large effect on decision behavior, Hummel and Maedche (2019) compared effect sizes of 12 studies that investigated 49 social reference effects. While the median effect sizes of social references show a positive median effect (20%), the compared studies' effects sizes ranged from -20.5% (Kallbekken & Sælen, 2013) to +165% (Demarque et al., 2015). The authors discussed various potential interactions such as nudging context (in terms of industry like environment, energy, health) and foreshadowed several further moderation effects. Stutzer et al.'s (2011) study on blood donation behavior speculates the personality trait conscientiousness to have an influence on donation behavior when using default nudges but fails to report significant results. Jung and Mellers (2016) measured attitudes toward nudges and found various individual dispositions and perceptions to oppose or support different types of nudges. Furthermore, studies have linked people's personality to their consuming behavior in a marketing context (Mulyanegara, Tsarenko, & Anderson, 2009). These insights indicate a potential moderation of the various digital nudging principles through the recipient's personality.

Several cognitive theories have studied which personality traits influence human decisions. The elaboration likelihood model of persuasion offers a dual-process theory that tries to explain individual decision making (Morris, Woo, & Singh, 2005; Petty & Cacioppo, 1986; Tam & Ho, 2005). This theory states that an individual that is motivated and has the ability to process central variables of a decision will process given information in more depth. In contrast, the person's thinking and decision-making process will follow a peripheral route when NFC is not given. Research indicates that social norm nudges have a larger impact on an individual's attitudes and

decision behavior on the peripheral decision route compared to the central decision route. NFC is an individual's intrinsic motivation to think about information before making a decision (Cacioppo et al., 1984). Therefore, NFC serves as an important and stable individual personality trait that moderates behavior in a wide range of domains (Petty et al., 2009). It has become a key moderator in dual-process persuasion theories. One study that investigated the influence of personality on social norm nudges is Ingendahl's et al.'s (2020) approach. Following a theoretical rationale, they observed social norms and defaults to be robust against the NFC personality traits in their purchase stage experiments.

Another insight was Maas et al.'s (2018) experimental study showing that in all social cue nudges, there was significantly higher influence of the nudge in the group with lower cognitive reflection skills. This implies a negative interaction of high NFC values on a social norm's nudge efficacy. Following this theoretical reasoning, NFC should have an impact on social norms in the pre-purchase context. Following this theoretical discussion, we hypothesize that a high NFC leads individuals to take the central decision route, which makes them less susceptible to social norm nudges:

H₁: High "need for cognition" values negatively moderate the digital social norms nudge in a pre-purchase decision environment.

The hypothesis will be tested through an experimental research design, like several studies that investigated digital nudging and its correlating effects (Fonseca & Grimshaw, 2017; Maas et al., 2018; Székely et al., 2016; Tietz et al., 2016).

Experimental Design

The online experiment aims to analyze moderating effects of a digital social norms nudge in a pre-purchase decision context that is defined by users recognizing their needs, searching for solutions, and considering a purchase (Lemon & Verhoef, 2016). As the effects of social norms emerge from observing how others behave (Cialdini & Trost, 1998), the experimental design aims at simulating how others decide when searching for solutions and considering a purchase. To operationalize this, a search task where users inform themselves about a recognized need seems appropriate for an online experiment, especially since users are used to searching the internet via their digital devices when considering a purchase. To set up a realistic experimental scenario, the search task focuses on an individual's further education, as

this topic is of individual relevance and involves much information to make a decision.

To acquire participants for experiments, current behavioral research often utilizes online clickworker platforms. The validity of scientific data collected via MTurk has been investigated, and researchers have found that participants produce reliable results that are consistent with decision-making biases (Goodman et al., 2013). Therefore, this experimental study recruits its participants on this platform. To address documented drawbacks of utilizing clickworker portals, an instructional manipulation check (Oppenheimer et al., 2009) assures the participants' attention on the task, and a manipulation check toward the end of the experiment validates the manipulations' persistence. A pre-test has taken place to validate questions, the procedure, and the compensation offered to the participants.

Procedure and Materials

The experimental setup was implemented as follows. After giving consent to the data usage policy, participants are instructed to think about further educating themselves. As a warm-up question and to support individual relevance of the task—as discussed by Morris et al. (2005) and Petty and Cacioppo (1986)—participants are told to think of and write down one to three educational courses/subjects that are of interest to them. Following this short brainstorming session, the participants are told that they have decided to further inform themselves about available education programs for their most favorite subject and to type in their query in the search box to search for such an offering.

The participants are then randomly assigned to the control group or the treatment group and presented a search results page that contains the main manipulation. The results page represents a choice architecture, where participants are shown two search results and decide which one to further consider. Figure 7 shows the choice architecture consisting of the individual search query (that is copied from the participants' previous input), two generalized search results, and a question asking about which of the two results one desires further education. The treatment group is shown a social norms hint below the question, whereas the control group is not.

Please study the following search result page and answer the question below:

Search Results

Python Programming Course

2 Results (0.32 sec)

Brigels Center for Further Education
www.brigelscenter.com

Various programs and classes for your future plans. Our continuing education programs are designed to help individuals grow — whether it's exploring an interest, developing skills or shifting careers. The programs lead to associate degrees and certificates.

Education Institute of Andeer
www.andeereducation.com

We offer first class further educational trainings in our facilities as well as through online tutoring. These include career training, personal enrichment or general education programs resulting in certificates or leading to associate degrees.

About which search result would you further inform yourself?

87% of users choose the Institute of Andeer.

☐ Institute of Andeer

☐ Brigels Center

Figure 7. Search Results Page with Individual Search Query and Social Norms Nudge

The order in which the answer options are presented is randomized. To compare control group (without the nudging hint) with the treatment group, the nudge consistently guides the user toward the “Institute of Andeer” option. Sunstein (2019) described the social norms nudge to be most effective when it is local and emphasizes what most people do. Based on Sunstein’s (2019) guide to nudging, the user is told that 87% of other users (picked as a random number above the threshold that triggers pro-social behavior) are tending toward one of the options. The operationalization of the nudge is purely textual to prevent confounds like color coding or pop-ups that had significant influences in other studies (Maas et al., 2018).

After making a decision for one of the options (dependent variable), the participants are presented with an instructional manipulation check question based on Oppenheimer et al.’s (2009) suggestions, where they are asked to choose the “*no answer*” option of a 7-point-likert scale for a question with the title “search frequency.” Taking into account Goodman et al.’s insights (2013) on working with online surveys in behavioral experiments, failure to pass the instructional manipulation check leads the participant to be excluded from the evaluated data set. After the decision has been made, the participants are asked to fill out a questionnaire. It first evaluates the participants’ NFC. The questions include the validated short-item

inventory (Beißert et al., 2014) of Petty and Cacioppo’s (1986) original questionnaire, containing the questions 25, 39, 40, and 41. The answers are recorded using a 7-point-likert scale (1 = *doesn’t apply at all* to 7 = *applies completely*).

To compare user behavior with other studies, the participants are then presented with a standardized cognitive reflection test (Frederick, 2005). A manipulation check raises the persistence of the social norms nudge to see if participants remain conscious of the given information. Finally, participants are asked for relevant demographic information (gender, age, and educational background) and thanked for their participation.

Results

The experiment was conducted in late 2020 and 484 participants were recruited. 89 participants (18.4%) failed the instructional manipulation check and were excluded from further analysis. Demographic statistics reported a male majority (male = 63%, female = 36.2%, unspecified/empty = 0.8%) and predominantly high educational background (graduate = 33.7%, undergraduate = 46.1%, junior college and rest = 20.2%), with a mean age of 33.86 years (*Median* = 32 years, *SD* = 20.284).

The impact of the social norms nudge on decision behavior showed a significant correlation of treatment allocation and choice behavior ($Chi^2(1) = 21.117, p = .000, n = 395$). The effect is considered to be small to medium ($\Phi = .231, p = .000$). Cross-tabulation analysis of the participants’ choices demonstrated significant impact of the social norms nudge toward a user’s choice, as illustrated in Figure 8. While 46.2% of the users in the control group decided on the option of “Institute of Andeer,” the favorable response with the applied social norms nudge reached 69%.

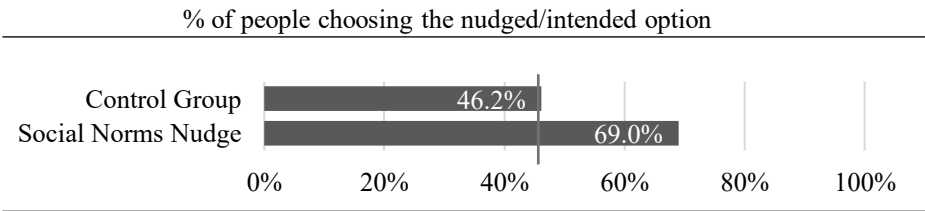


Figure 8. Percentage of Participants Choosing the Nudged/intended Option

The questionnaire consisted of the NFC items and the cognitive reflection test

of Frederick (2005). The cognitive reflection test showed no significant correlation of cognitive reflection abilities and click behavior ($Chi^2(4) = .778, p = .941, n = 395$).

Influence on Social Norms

To analyze the moderating effect of individuals' NFC on the nudging effect, the NFC value of each participant was calculated and put into perspective using a regression. The participant's answers to the 7-point NFC items have been recoded by inverting answers to the questions 41, "Simply knowing the answer rather than understanding the reasons for the answer to a problem is fine with me" and 25, "I primarily think because I have to" and were then computed into a mean NFC value with question 39, "I prefer my life to be filled with puzzles that I solve" and 40, "I would prefer complex to simple problems" on a scale of 1 to 7. The NFC value resulted in a mean of 4.334 ($SD = 1.21$).

Due to the dichotomous dependent variable (0 = *not nudged option*, 1 = *nudged option*), a logistic regression was calculated to analyze the overall effect of social norms on click behavior. Then, the hypothesized moderation of NFC on the social norms nudging effect was tested by inserting the interaction into the logistic model. Finally, the control variables *age*, *gender*, and education were inserted into the equation. The regression, as illustrated in Table 9, shows that the summarized model ($Chi^2(5) = 30.470, p = .000, n = 395$) as well as the coefficient of the social norms nudge and its moderation through the NFC value of the participants are significant. Consequently, an individual's likelihood to make the nudged decision decreases by 29.1% by every additional point in the NFC scale.

Table 9. Logistic Regression on Click Behavior

Independent Variables	B	SE	Wald	df	Sig.	Exp(B)
Social Norms Nudge	2.510	.665	14.241	1	.000**	12.310
Social Norms Nudge × Need for Cognition	-0.344	.437	6.271	1	.012*	0.709
Education	0.085	.214	0.158	1	.691	1.089
Gender	-0.063	.102	0.385	1	.535	0.939
Age	0.007	.005	1.815	1	.178	1.007
Constant	-0.288	.592	0.237	1	.626	0.750

* $p < .05$. ** $p < .005$.

To exclude the confound that NFC also moderates the control group's choice behavior, both treatment and control group had been examined on a potential correlation through a Pearson chi-square analysis. Consistent with the above findings, the calculation shows that the NFC and click behavior significantly correlate in the treatment group ($\chi^2(30) = 48.539, p = .018, n = 200$) and does not correlate in the control group ($\chi^2(30) = 30.246, p = .453, n = 195$).

Discussion

This online experiment investigated how a social norms nudge is influenced in a pre-purchase customer journey stage, where users research information before considering a purchase. Based on previous research and theorizing, it was expected that the social norms nudge would have a positive impact on the desired clicking behavior. Concluding the literature research, it was further hypothesized that a user with a high individual NFC would be less prone to social norms nudges.

As meta-studies have postulated (Hummel & Maedche, 2019), the social norms nudge had a significant impact on potential customers' decision behavior. Previous studies have described that digital nudges are moderated by external factors like a user's personality (Jung & Mellers, 2016) or political preference (Fellner et al., 2013). The undertaken experiment shows that a digital social norms nudge implemented in a pre-purchase customer journey context is indeed influenced by the potential customer's NFC. While the experimental context was able to demonstrate the social norms effect, the effect size might likely vary in other contexts, as Hummel and Maedche (2019) have shown in their comparison of empirical nudging studies. The main effect of the social norms nudge had been proven by various researchers (Cialdini et al., 2006; Cialdini & Trost, 1998; Maas et al., 2018; Thaler & Sunstein, 2008) and served to investigate the potential moderation through the NFC personality trait. The study indicates a significant influence of a user's NFC on the efficacy of social norms nudges in the pre-purchase context. In line with H_1 , this study shows that for every 1-point increase in the NFC scale, the social norms nudging effect is reduced by 29.1%.

Theoretical Implications

Although theoretical derivation has led to the verified hypothesis, this study

sheds new light on moderating effects in comparison to other research. Worth mentioning is the contrast to Ingendahl et al.'s (2020) findings that did not show a significant effect of NFC on social norms in a purchase context. The presented study adds additional insight to previous research. In both studies, the digital nudge had been designed according to Sunstein's (2019) guide and has shown a positive effect on decision behavior. Thus, the difference of the moderation effect between the two studies likely stems from the differing context of the studies. Contextual differences were the domain of the decision (buying coffee beans vs. information research on further education offerings), the stage of the customer journey (purchase vs. pre-purchase), as well as potential cultural differences as one study had been implemented in a U.S. context and the other in a German cultural frame. In line with Ingendahl et al.'s (2020) research though, social norm nudges remain effective, even for those with a high individual NFC score. A main conclusion of these insights is that the strength of a moderation varies in different contexts. It cannot be assumed that NFC has the same impact on a digital social norms nudge in different settings. Rather, the result of this study, in contrast to Ingendahl et al., demonstrates that varying contexts and dimensions may lead to contradicting influences of potential moderators. NFC serves as a key differentiator in the elaboration likelihood model of persuasion (Petty & Cacioppo, 1986). The finding that NFC moderates social norm nudges leads to the question of whether other nudges are also influenced by NFC and different nudging principles (e.g., defaults, loss aversion).

The results imply an investigation of digital nudges from a dual-process perspective. A classification of nudges into central or peripheral decision route, as postulated by the elaboration likelihood model theory could be a potential research branch. Researchers have already discussed classifying nudges in system one and system two in terms of dual-process theory (Kahneman, Knetsch, & Thaler, 1991; Tversky & Kahnemann, 1981).

Practical Implications

Regarding the results of this study in comparison with existing research, it seems obvious that it is a far way to postulate a set of rules for practical operationalization of digital nudges that allow a precise prediction for their effects on decision behavior. Hence, it comes as a small surprise that researchers had been aiming at developing guides on how to design and implement digital nudges in a trial-and-error manner

recommending A/B and split testing approaches (Schneider et al., 2018) and controlled trials (Sunstein, 2019). Currently, it is unknown when to utilize which digital nudge at which (industry) context and point in time (of a customer journey). This study implies that practitioners should not only carefully choose and shape digital nudges but also consider their customers personalities like their NFC.

Limitations and Further Research

This study provides support that an individual's NFC moderates digital social norm nudges. An integration of these findings into a customer journey perspective could shed light on how personality traits or other potential moderators influence single nudges throughout the customer journey. Further research could aim at creating a theoretical framework for nudging throughout the customer journey and make the application of nudging more predictable for practitioners.

While the experimental approach has been conducted following scientific protocol, the experimental setting represents a limitation. On one hand, the experimental context of information research for educational offerings cannot be adapted to any other user case like buying a car or making policies. Furthermore, the participants had been recruited in the North American region and, as Hagman et al. (2015) demonstrated, cultural differences have significant impact on the efficacy of digital nudges. Other potentially correlating factors such as the personality trait "need for uniqueness" (as used by Ingendahl, 2020) or general intelligence (shown as potentially correlating by Petty & Cacioppo, 1982) were not considered. Last, although Goodman et al. (2013) provided evidence that data collection through clickworker portals satisfy scientific requirements (and their recommendations had been followed in this study), these types of participants are extrinsically monetary motivated. A field study that includes intrinsically motivated customers would enrich the study's findings.

Conclusion

This paper has shown that NFC significantly moderates a digital social norms nudge in a specific context. Within a pre-purchase information context, it supports the foreshadowed interaction of personality and digital nudges. There is significant interaction between an individual's NFC and the decision behavior when confronted

with a digital social norms nudge. These findings add to the current scientific discussion on interactions of digital nudges and deepen the current discussion, as the findings were able to primarily back up theoretical claims that digital nudges are significantly impacted by an individual's personality traits. These findings may lead to further investigations across other digital nudging principles, industries, and customer journey contexts. Finally, the study shows that interactions may vary throughout the customer journey and the context where digital nudges are being applied. As this study further elaborates on the complexity of digital nudges, practitioners are advised to apply trial-and-error guides when designing digital nudges to minimize unwanted effects by their nudges and maximize their impacts.

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Research Paper 4: Is there a Social Impact Paradox in Cross-Channel Communication? A Management Perspective

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Is there a Social Impact Paradox in Cross-Channel Communication? A Management Perspective

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Abstract

Customers use multiple channels to inform themselves about products and services before making a buying decision. As companies provide information on their owned platforms, their customers experience a multi-channel journey on their way to the company website. While companies try to nudge potential customers into consuming provided information, potential effects of previous customers experiences (such as social media browsing) on the effect of digital nudges (i.e. social norms) and the perception of such guidance are not thoroughly investigated yet. First studies imply that customers react differently to nudges depending on their previous channel experience. This paper contributes by focusing on digital nudging during the pre-purchase phase of the customer journey. The potential effect of social norm nudges on information search intentions and the influence of previous social media usage are investigated. Two online experiments examined previous social media usage as a potential moderator of the social norms nudge efficacy as well as the influence of previous social media usage on the perception of social norms nudges. Results show that previous social media usage influences perception as well as the efficacy of a social norms nudge on a company website in certain circumstances. Although social norms do not always significantly affect user behavior, users that consumed social media before seeing a social norms nudge, have an altered perception of these nudges. Choice architects implementing digital nudges are challenged to carefully consider such effects when applying nudges on their user interfaces.

Keywords:

Social Networks; Decision Making; Experiment

Introduction

Nowadays, companies are providing multiple channels for interaction with users. Major managerial tasks in this context are the creation of necessary cross-channel technical infrastructures and architectures on the one hand, and building integrated and synergetic cross-channel information, communication, product, and service spaces – with other words spaces of shared meaning (Benyon & Resmini, 2017), and personalized customer relationships on the other hand.

From a user and customer perspective, the availability of various information channels to choose from resulted in new interaction opportunities with companies. Users take advantage of this new freedom of choice and develop customer behavior patterns such as channel-switching, cross-channel free-riding, and research shopping (Hummel, Schacht, & Maedche, 2017) that are not favorable for companies. For example, customers might choose more expensive channels (from companies' point of view) instead of more efficient ones or they might collect information and move on to competitors' channels. Consequently, one research area emerging in the context of cross-channel communication is related to the need of companies to actively steer users along the cross-channel customer journeys and customer experiences towards defined business outcomes such as lock-in in a specific channel, guidance towards the choice of a specific channel, increase of sales or customer engagement (Hummel et al., 2017). In such complex, cross-channel environments, companies try to digitally persuade users by applying various digital persuasive communication instruments such as digital nudging (Esposito, Hernández, van Bavel, & Vila, 2017; Thaler & Sunstein, 2008). By adapting findings from behavioral economics and libertarian paternalism introduced by Thaler and Sunstein (2008), companies apply nudging to digital customer touchpoints in a commercial context. They try to nudge users (i.e., customers) to consume the information they provide, to stay on or choose another company's channel (Maas, Bieler, Borchert, & Barwitz, 2018) as the next step in their journey, or to buy the company's offerings.

Digital nudges often show significant influence on customer behavior (Hummel & Maedche, 2019), but effect sizes vary strongly, depending on the context in which

they are applied. Recently research is emerging related to nudging in the context of cross-channel environments consisting of companies owned channels (Hummel et al., 2017; Maas et al., 2018). For example, nudging is applied to influence channel choice, channel lock-in or targeted channel crossing. However, customers are using not only company owned channels, but also independent channels such as social media or search engines. The interrelationship as well as impact of independent channels on nudging in companies' owned channels has not been considered in research in a sufficient manner yet. For example, with respect to social media studies show that peers or peer groups influence one's behavior and needs via social media platforms usage. According to Riesmeyer et al. (2021), on Instagram, users feel the pressure to conform to the requirements and aesthetic ideals of the peer group. The study of Kwahk and Ge (2012) indicates that social media interaction has a positive effect on normative and informative social influence. De Vries and Kühne (2015), and Pempek et al. (2009) show that a major activity on social media is social browsing, which often results in social comparison. Thus, social media usage influences the behavior and choices of users, as it urges them to behave and decide in ways that conform to the expectations of their peers. Furthermore, other studies show (Hildebrand & Schlager, 2019) that this influence of social media affects behavior outside the respective social media platforms as well. With other words users that have visited social media might visit company channels with a specific subconscious mindset that could interfere with companies' nudging efforts. This interplay of influences from different channels particularly in a hybrid environment of owned and independent channels in context of nudging has not yet been considered in existing research yet. This study aims to contribute to this research gap by exploring the effectiveness of nudging on the example of the social norm nudge in the context of the pre-purchase phase of the customer journey in a hybrid (owned and independent) cross-channel environment. This leads to the following two research questions:

RQ1: Does the social norm nudge impact customers' willingness to consume information about an offered service or product in the pre-purchase phase?

RQ2: Is the efficacy of the social norms nudge influenced by the previous use of company independent channels, i.e. social media channels, in an early, pre-purchase stage of a customer journey?

To explore both aspects of social norm nudge usage, two experiments were

designed and conducted in which participants have a high need for information—namely, the planning of their summer vacation during the covid pandemic. A 2 x 2 between-subjects design was carried out in both experiments to test the effect of the social norms nudge and the potential moderating effect of the customer’s previous social media usage on the willingness to consume the offered information. The intervention with the social norm nudge was embedded on a website offering travel information and the previous social media usage was exemplified in Experiment I by use of TikTok and extended in Experiment II by choice from several popular social media platforms.

The expectation that previous social media use, would increase the efficacy of the social norm nudge on a company’s website were not met in both experiments. While the first experiment showed no significant differences within the 2x2 study design, the second experiment resulted in a significant disordinal interaction. More in-depth analysis showed that the participants that previously used social media do show a different information intention in the covid-related context. Despite the insignificant main statistical findings, the research presented in this paper provides important contributions to science and practice. Hummel and Maedche (2019) noted that many studies showing no significant effects are not published, but they argue that such studies would also contribute to our knowledge about which nudge is suitable for which context. Managerial insights resulted related to both the efficacy of social norm nudges and cross-channel impact on its efficacy in the pre-purchase phase. An important lesson for cross-channel managers is the insight of whether or not it is valuable to implement a social norm nudge when their website visitors come from a social media site.

The next section of this paper lays out the theoretical background of the research and presents the hypotheses. Then, the research design and methods are explained. This is followed by a description of the data collection and the analysis of the achieved results. Finally, the paper concludes with a discussion of the results, limitations, and future avenues of research.

Theoretical Background

The research goal of the research presented in this paper is to explore the effectiveness of the social norm nudge in the context of the pre-purchase phase of the customer journey and the broader context of previous usage of social media in a hybrid (owned and independent) cross-channel environment. Thus, relevant theoretical background is related to the pre-purchase phase, nudging and social norms as well as the impact of previous usage of social media.

The Pre-Purchase Phase as Context for Digital Nudging

Digital nudging has its origin in behavioral economics and libertarian paternalism as introduced by Thaler and Sunstein (2008). In general, nudging refers to the design of decision choices: “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). The choice architecture is designed and manipulated by introducing interventions that provoke specific psychological effects such as social pressure through the introduction of social norms, loss aversion by introducing scarcity in the choice design, or the competition instinct through gamification.

Digital nudging differs from conventional nudging in two ways: On one hand, digital nudges are embedded and executed in digital settings such as newsletters or websites, and on the other hand, digital nudges are embedded in screen decision environments within user interfaces (Weinmann, Schneider, & vom Brocke, 2016). The term digital nudging is also used to refer to the transfer of insights from behavioral economics and libertarian paternalism into commercial, business settings. Digital nudges embedded in digital user interfaces are applied to guide and influence users toward defined decisions such as “buying” in the context of customer journeys.

The effects of digital nudges vary strongly, depending on the nudge type and context (Hummel & Maedche, 2019). As Maas et al. (2018) have shown, digital nudges also vary in efficacy throughout the customer journey. Hence, understanding which customer behavior is in focus and which nudge leads to the desired outcome is important. Most of the existing research concentrates on the context of the purchase phase of the customer journey aiming to persuade users to push the “Buy” button in the very moment when it appears on the screen in front of them. Compared to that,

little research has been dedicated to the context of the pre-purchase phase (Schaer & Stanoevska-Slabeva, 2019) where users are still searching for the right product and the goal of nudging is to persuade users to consume information about products offered.

Regarding the pre-purchase stage, Lemon and Verhoef (2016) described need recognition, consideration, and information search as relevant customer behaviors. Especially the aspect of information search seems to be of interest for further investigation, since information plays a decisive role with regard to purchase decisions (Tsotsou & Wirtz, 2015). This leads to the question of whether the purposeful and ethical (Sunstein, 2014) use of nudges can influence customers' information consumption in ways that are advantageous for the customer and the companies and their business goals.

While some purchase decisions such as shopping for groceries or other everyday products normally do not require a serious search for information, other purchases, like booking a vacation or buying a car, very well do. Due to high levels of uncertainty, customers' need for information is high as well. According to Atkin (1973), in such situations, a person depends on information with "instrumental utility" that helps to "keep abreast of governmental actions, to guide his consumer decision-making, or to reinforce his political preferences" (Atkin, 1973: 205). The selection of information is subjective, according to Atkin (1973), and depends on a person's perception if the 'reward value' is higher than the expenditures of obtaining and processing or avoiding the information. In the present paper, it is thus of interest if nudges have the power to increase the perceived reward value of information observable via an increased willingness to choose specific information offered to customers during the search process. If nudges turn out to be effective, they could be used to assist customers to find adequate information right away and prevent information overload or disinformation. Furthermore, businesses would have a tool helping them to increase the probability that customers consume all necessary information to make a perfect purchase decision, potentially reducing customer service costs or customer complaints.

In accordance with other studies (Cialdini et al., 2006; Wong-Parodi, Krishnamurti, Gluck, & Agarwal, 2019) that have investigated the information consumption behavior of users, the social norm nudge was chosen for nudging users

to consume the offered useful information. According to Venema et al. (2020) social norm nudges prove particularly effective when users still do not have a clear prior preference which is often the case in the pre-purchase phase of the customer journey. Concluding from the theorization above and based on Hummel & Maedche's (2019) meta study that attests that social norms nudges generally lead to a positive effect direction, the first hypothesis is derived as follows:

H1: The implementation of social norm nudges in the pre-purchase customer journey stage has a positive effect on intended information consumption behavior.

Previous Social Media Usage as Hybrid Cross-Channel Context of Digital Nudging

Nowadays, companies are communicating with customers using multiple channels. The coping with and management of the complexity resulting from this has initiated research related to development of architectures for cross-, multi and omnichannel support (Resmini & Lacerda, 2016), cross-channel communication design (Mulder, 2016) as well as design and mapping of customer journeys and user experiences in cross-channel environments (Benyon & Resmini, 2017; Lindenfalk & Resmini, 2019; Resmini & Lacerda, 2016). This extant research focuses on the complex environment consisting of companies' owned channels (Benyon & Resmini, 2017) and provides insights for managerial decisions related to necessary cross-channel technical infrastructures and architectures on the one hand as well as for building integrated and synergetic cross-channel information, communication, product, and service spaces, i.e. shared meaning spaces (Benyon & Resmini, 2017) as well as personalized customer relationships on the other hand.

Another research area emerging in the context of cross-channel communication is related to the need of companies to actively steer users along the cross-channel customer journeys and customer experiences towards defined business outcomes such as lock-in in a specific channel, choice of a specific channel, increase of sales or customer engagement (Hummel et al., 2017). In such complex, cross-channel environments, companies try to digitally persuade users by applying various digital nudges (Esposito et al., 2017; Thaler & Sunstein, 2008). They try to nudge users (i.e., customers) to consume the information they provide, to stay on or choose another

company's channel (Maas et al., 2018) (as the next step in their journey), or to buy the company's offerings.

Existing research in digital nudging in cross-channel environments focuses on exploring the impact of single nudges in the context of a given channel (see overview in (Hummel & Maedche, 2019, and Schaer & Stanoevska-Slabeva) or on cross-channel environments consisting of companies' own channels. However, customers are using not only company owned channels, but also independent channels such as social media or search engines. The interrelationship as well as impact of independent channels on nudging in companies' owned channels has not been considered in research in sufficient manner yet.

To investigate the influence of company independent social media usage on social norm nudges, it is important to understand the influence of social media usage on a user's behavior. In their study, Riesmeyer, Pohl, and Ruf (2021) examined the influence of peers or peer groups via the social media platform Instagram on behavior and one's own needs. According to the study, peers feel a pressure to conform to the requirements and aesthetic ideals of the peer group. Further influences of social peer pressure on Instagram show up in the form of "fear of missing out" and the urge to communicate with the peer group (Riesmeyer et al., 2021).

Research by Kwahk and Ge (2012) indicated that social media interaction has a positive effect on normative social influence (pressure to conform to others' expectations) and informative social influence (assuming that the information received from someone corresponds to reality), and the latter also has an influence on visit and purchase intention in an e-commerce context.

One of the major activities on social media platforms is social browsing (de Vries, Jager, Tijssen, & Zandstra, 2018; Pempek et al., 2009). People's motives for this behavior are manifold, yet surveilling "what others do" is one of the leading drivers, often resulting in acts of social comparison (Bernath et al., 2020; Pempek et al., 2009; Sheldon & Bryant, 2016). It can be assumed that the act of monitoring other people's actions not only has an impact on one's own behavior within the realms of the social networking site but also beyond. Monitoring and comparing to others may function as a prime, causing other people's behavior or opinions to be of higher relevance in subsequent tasks.

Furthermore, research shows that the mere consumption of social media platforms also influences behavior outside the respective medium. For example, Hildebrand and Schlager (2019) investigated in their study how the use of social media influences subsequent product choices made by consumers in an e-commerce context. In doing so, the authors were able to prove with a large field study and some experiments that the use of Facebook can lead to a more conventional product choice compared to other social media channels such as Instagram, Twitter, or LinkedIn before a car configuration task. Accordingly, consumers take their cues from others on social media and are guided in their decision making. Another influencing factor, according to the authors, is the fear of receiving a bad review from peers if they were to choose a more unconventional product choice (Hildebrand & Schlager, 2019).

A core theory that may explain the influence of social media usage on an individual's behavior is the social impact theory of Bibb Latane (1981), who defined the term social impact as follows:

By social impact, I mean any of the great variety of changes in physiological states and subjective feelings, motives and emotions, cognitions and beliefs, values and behavior, that occur in an individual, human or animal, as a result of the real, implied, or imagined presence or actions of other individuals. (1981: 343)

Similar psychological effects resulting from social media usage are expected to occur with social norm nudges. By providing social information (i.e. what other users are doing), social norm nudges nudge users to socially beneficial behavior and behavior that is similar to behavior of others, as opposed to behavior that benefits only the individual. Picking up on Latané's social impact theory, the expected impact of social norm nudges (see for example Venema et al. (2020)) and building on latest research on social media's influence on behavior (Cialdini et al., 2006; Hildebrand & Schlager, 2019; Kwahk & Ge, 2012; Litt & Stock, 2011), it can be postulated as follows:

H2: Previous social media usage positively moderates the effect of social norm nudges on intended information consumption behavior in hybrid cross-channel environments.

Research Model

Figure 9 summarizes the theoretical concept and shows the application of social norm nudges and the previous consumption of social media as independent variables. Previous social media usage is also conceptualized as a moderating variable and intended information consumption behavior is conceptualized as a dependent variable. The research design, as depicted in Figure 9, focuses on investigating the influence of social norm nudges on participants' information-consumption intention (H1). We further analyze the impact of previous social media usage on information consumption and the interaction of previous media usage and social norm nudges (H2).

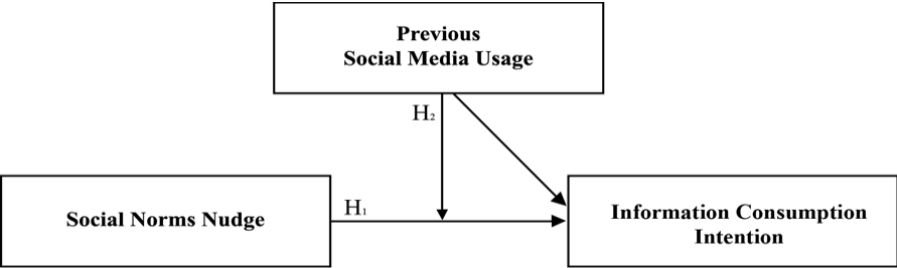


Figure 9. Theoretical Concept.

Research Design & Method

According to Hummel & Maedche's (2019) meta study, investigation of digital nudges and their effects have often been carried out through experimental study designs. Especially online experiments have proven to expand theoretical insight and lead to managerial implications in the goal-oriented use of digital nudges. Hence, to study the hypothesized effects, two online experiments were carried out.

Both conducted experiments focused on the pre-purchase customer journey context. More specifically, an information gathering task examining intended information consuming behavior using a digital nudge as a manipulation was operationalized. In wake of the global health crisis and pandemic that the covid-19 virus had brought upon us, enabling individuals to make informed decisions involving their health has become increasingly important. As it is the goal to have people make

informed and responsible decisions when taking potential risks by the covid-19 pandemic into account, the experiment simulated the pre-purchase context of a holiday booking platform. Travel restrictions varied greatly between different holiday destinations in different countries in the summer of 2021. This implies a high need for information about regulations, risk and rules when travelling on summer vacation. Information about regulations were shown on a holiday booking platform. Consuming such an information on booking platforms meet the Lemon & Verhoef's (2016) description of a typical pre-purchase customer journey context.

During this crisis, younger people tend to inform themselves less and through media that are altogether less credible and also rely heavily on social media (Zimmerman, 2021). Experiment I, that investigates the impact of previous social media usage on the effect of the social norms nudge, therefore focused on the social media platform TikTok. TikTok shows an increasing impact on health information behavior amongst youths (Ostrovsky & Chen, 2020) and consequently represents a suitable social media channel to investigate the effect of the social norms nudge and its interaction with previous social media usage.

Verifying the findings of Experiment I above the level of a single social media channel, Experiment II was performed that included additional channels. Within the second experiment additional insights into the effect of previous social media usage on social norms nudges were sought by analyzing how the social norms nudge has been perceived by the participants. Existing literature points out that persuasive communication such as for example nudging has the potential to be effective when perceived among others for example as trustworthy, reliable, credible, stimulating, relevant, worthwhile, or useful (see Pielot, Church & de Oliveira (2014) and Westermann (2017)). In accordance with existing literature the following perception measures were introduced: trustworthy, reliable, informative, stimulating, credible, necessary, disruptive, and instructive (Evers, Marchiori, Junghans, Cremers, & De Ridder, 2018; Pielot et al., 2014; Westermann, 2017). Finally, the second experiment included slight improvements to the experimental design.

Experiment I

The experiment was conducted online. The participants were recruited through a German research survey sharing platform. Participants were randomly assigned to the four treatment groups (2 x 2 combinations of “previous social media usage (1,0)” and “social norms nudge (1,0)”). The two groups in the previous social media usage were sent to spend 5 minutes browsing their TikTok “For you” page right before answering the questionnaire. The other group was sent to the questionnaire straight away. The questionnaire asked the participants about where they would want to spend their summer vacation (four holiday destinations were shown for choice) and showed a mockup travel agency website with the chosen holiday destination as well as offerings. On that page, all participants were shown general advice to gather information on travelling during a pandemic before proceeding with the booking procedure. Beneath this advice, participants belonging to the no-nudge groups found six randomly ordered headlines to additional readings concerning travelling during the Coronavirus pandemic, introduced by the phrase “the following articles might be of interest to you.” Participants in the nudge groups were confronted with the same six headlines, yet the introduction read, “78% of people who searched for summer vacation found these articles helpful!” (translated from German).

Measures

Measuring the dependent variable, willingness to consume offered information, we lean on an operationalization used by Obermaier, Haim, and Reinemann (2014). The participants were asked which articles they would read and a checkbox at each headline would record the participants decision (0 = not read, 1 = read). The summarized score of the number of articles participants were likely to read (ranging from 0 = no article to 6 = all articles) was recorded as the dependent variable. Additionally, based on research studying the influence of need for cognition (NFC) on social norms nudges (Schär, 2021), we controlled for NFC. It is expected that participants with high NFC are less likely to be influenced by a social norms nudge. NFC was evaluated using an established four items scale (Beißert, Köhler, Rempel, & Beierlein, 2014). According to studies on information behavior, the age of potential customers appears to have a significant impact on the choice of information channels (Akalamkam & Mitra, 2018). Hence, we suspect age to have an influence on one’s willingness to consume the offered information. Furthermore, we controlled for

gender and education. Finally, to check for the effectiveness of the manipulation, the survey question asked participants if they saw the hint that 78% of people found the articles to be helpful.

Data

The experiment was published in German and ran from June 2nd until July 6th, 2021. The experiment started with 256 participants. Of these, 15 participants did not complete the survey, 24 were excluded for not being active TikTok users, and 8 participants were excluded for failing the attention check. This resulted in 209 participants successfully completing the experiment.

Demographic statistics show the participants were 15 to 58 years old, with a mean age of 29.66 years ($SD = 9.209$, $Med = 26$). Their educational background lies primarily between a high school and university degree (secondary education = 41%, undergraduate = 34.9%, graduate = 18.2%, other = 5.9%). Slightly more of the participants were female (female = 57.9%, male = 40.7%, other and missing = 1.4%). The “need for cognition” values show a mean score of 4.57 ($SD = .947$). Overall, 63% of participants in the nudging group were able to remember the nudge after the main manipulation.

Analysis of the main effect

The 209 participants had been randomly assigned to the four treatment groups. Table 10 shows the number of participants per treatment (n), the calculated mean (M) number of articles the participants in the group would read (dependent variable), and the corresponding standard deviation (SD).

Table 10. Participants per Treatment of the Dependent Variable

	Nudge			No Nudge			Total		
	n	M	SD	n	M	SD	n	M	SD
TikTok	53	3.24	1.47	45	3.40	1.53	98	3.32	1.49
No TikTok	55	3.15	1.46	56	3.21	1.59	111	3.18	1.59
Total	108	3.19	1.46	101	3.30	1.56	209	3.24	1.50

Table 11 shows the one-way analysis of covariance (ANCOVA). It allows for comparisons of the two manipulations' effectiveness on the number of articles while controlling for age, gender, education, and the need for cognition.

Table 11. Multi-Factorial ANCOVA

Source	Sum Squares	of df	Mean Squares	F	Sig.
<i>Main Effect</i>					
Social Norms Nudge Treatment	.06	1	.06	.03	.87
Previous TikTok Usage Treatment	.25	1	.25	.112	.74
<i>Moderation Effect</i>					
Interaction of Previous TikTok Usage & Social Norm Nudge Treatment	.04	1	.04	.019	.89
<i>Covariates</i>					
Age	23.22	1	23.23	10.49	.001**
Need for Cognition	.21	1	.21	.09	.76
Gender	.48	1	.48	.22	.64
Education	3.10	1	3.10	1.40	.24
Intercept	37.66	1	37.66	17.01	.00
Corrected Model	28.03 ^a	7	4.00	1.81	.09
Error	436.22	197	2.21		
Total	2654.00	205			
Corrected Total	464.24	204			

n = 209

a. $R^2 = .060$ (Adjusted $R^2 = .027$)

* $p < 0.01$

Levene's test and normality checks were carried out and the assumptions were met. The ANCOVA reports a significant model on a 10% significance level ($p = .088$). The social norms nudge treatment [$F(1, 197) = .028, p = .868$] and previous TikTok usage [$F(1, 197) = .112, p = .738$] do not significantly influence the participants' behavior. Furthermore, the hypothesized interaction of TikTok usage and digital nudge treatment do not report a significant effect [$F(1, 197) = .019, p = .889$]. Although the need for cognition, gender, and education did not report significant influence, the age of the participants led to a significant difference in the number of articles read between the four treatments [$F(1, 197) = 10.489, p = .001$]. To further analyze the covariate of age, a simple regression was calculated. According to the analysis, age explains a significant amount of variance in the number of articles participants are willing to read [$F(1, 207) = 7.583, p = .006, R^2 = .035, R^2 \text{ adj.} = .031$]. The unstandardized regression coefficient ($B = .031, 95\% \text{ CI } [.009, .053]$) finally indicates that an increase in age leads to an increase in the willingness to read articles by .031.

Intermediate Discussion

The analysis shows that, despite the proven effectiveness of the social norms nudge in various studies (Hummel & Maedche, 2019), the nudge had no significant overall effect on user behavior in the conducted experiment. Furthermore, the hypothesized influence of previous social media usage on decision behavior in general and as a moderator of the social norms nudge specifically could not be verified. These results, although not expected, could stem from various reasons and limitations presented through the chosen study design. First, TikTok might not postulate the same effects as other social media channels on later user behavior. The derived hypothesis is based on Hildebrand and Schlager's (2019) findings conducting field studies on Facebook. Furthermore, the Covid pandemic represents a more urgent context than configuring a car. The pandemic has also had various negative impacts onto the participants' lives and health information on the covid-19 pandemic have been controversially discussed publicly as well. Especially as TikTok is often used with an escapism motive (Omar & Dequan, 2020), it is important to look into other social media channels. Two major limitations to the experimental design might also have impacted the outcome of the studies. One of which being the low number of participants (63%) recognizing the social norms nudge. The other being the fact that

the control group that had not been sent to use TikTok before completing the experiment, were sent to the experiment straight away, leading to a lack of control on what they were doing just before doing the experiment.

Finally, age has had a significant effect on the willingness to consume information. We would argue that there are various potential explanations for that. One reason could again be the context of the study. As older individuals supposedly face a higher personal health risk of the infection, this could lead to a higher willingness to inform oneself. In addition, TikTok users are rather young and, if they still go on vacation with their families, they are not in charge of organizing and paying for the trip. Thus, the expenditures of obtaining and processing the information are probably perceived to be higher than the “reward value” among the youngest (Atkin, 1973).

Experiment II

With the goal to validate the results of the first experiment, the experimental design has been adapted to cover other social media channels. A focus is laid on further investigating the social norm nudges effect on participants. Besides validating its non-significant effect on participants information behavior on covid information before booking a summer vacation, it is of interest how the nudge is being perceived by the different groups.

Additionally, to gain more control, a 5-minute research task has been added to the control group (research sustainable travel options on the internet) to reduce cross-effects with potential social media usage before the experiment. Reacting to the low recognition rate of the nudge, we redesigned the nudge to be more visible.

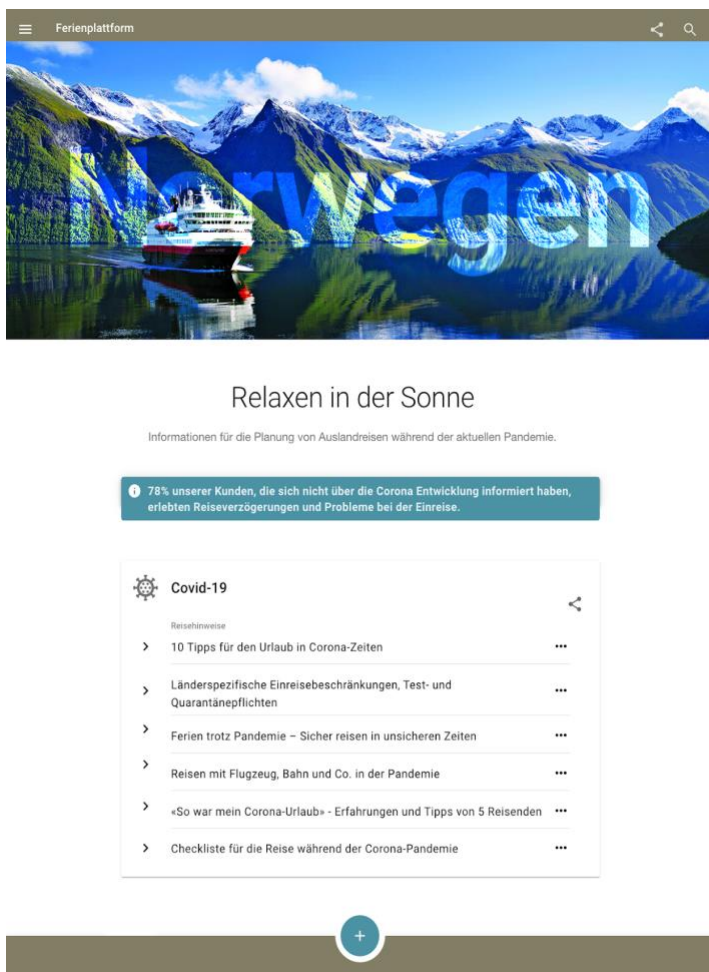


Figure 10. Travel Agency Mockup with Social Norms Nudge Displayed

Data

The second experiment was also published in German and ran from July 12th until October 2nd, 2021. The experiment was conducted with 227 participants. 16 participants were excluded for failing the attention check. This resulted in 211 participants successfully completing the experiment. Demographic statistics show the participants were 19 to 60 years old, with a mean age of 25.17 years ($SD = 4.848$). Their educational background lies primarily between a high school and university degree (secondary education = 47.9%, undergraduate = 41.4%, graduate = 7.9%, other

= 2.8%). Most of the participants were female (female = 62.3%, male = 36.3%, other and missing = 1.4%). The “need for cognition” values show a mean score of 4.35 (SD = .939, Cronbach’s Alpha = .52). Overall, 90.8% of participants in the nudging group were able to remember the nudge after the main manipulation. The participants in the previous social media usage group were free to choose the social media channel that they wanted to use and have selected Facebook (n = 14), Twitter (n = 5), Snapchat (n = 5), TikTok (n = 2), Instagram (n = 85).

Analysis of the main effect

The 211 participants had been randomly assigned to the four treatment groups. Table 12 shows the number of participants per treatment (n), the calculated mean (M) number of articles the participants in the group would read (dependent variable), and the corresponding standard deviation (SD).

Table 12. Participants per Treatment of the Dependent Variable

	Nudge			No Nudge			Total		
	n	M	SD	n	M	SD	n	M	SD
Previous Social Media Usage	52	3.10	1.19	59	2.68	1.12	111	2.87	1.17
No previous Social Media Usage	45	2.96	1.28	55	3.20	1.43	100	3.09	1.36
Total	97	3.03	1.23	114	2.93	1.30	211	2.98	1.26

The descriptive numbers imply that the implementation of the nudge leads to a contrary effect in both groups. While the social media group tends to choose more articles, they were willing to read due to the nudge, the group not having used social media before seems to read less articles after being exposed to a social norm nudge. To further analyze main and interaction effects, an analysis of covariance has been conducted. Table 13 shows the one-way analysis of covariance (ANCOVA). It allows for comparisons of the two manipulations’ effectiveness on the number of articles while controlling for age, gender, education, and the need for cognition.

Table 13. Multi-Factorial ANCOVA

Source	Sum Squares	of df	Mean Squares	F	Sig.
Main Effect					
Social Norms Nudge Treatment	.51	1	.51	.32	.57
Previous Social Media Usage Treatment	1.77	1	1.77	1.11	.29
Moderation Effect					
Interaction of Previous Social Media Usage & Social Norm Nudge Treatment	6.06	1	6.06	3.78	.05*
Covariates					
Age	.94	1	.94	.59	.44
Need for Cognition	1.23	1	1.23	.76	.38
Gender	4.26	1	4.26	2.65	.11
Education	.22	1	.22	.14	.71
Intercept	29.14	1	29.14	18.16	.00
Corrected Model	14.44 ^a	7	2.06	1.29	.26
Error	314.55	196	1.61		
Total	2159.000	204			
Corrected Total	328.10	203			

n = 211.

a. $R^2 = .044$ (Adjusted $R^2 = .010$)

* = $p < .1$

Levene's test ($p = .210$) and normality checks were carried out and the assumptions were met. The ANCOVA reports a non-significant model ($p = .259$). The nudge treatment [$F(1, 196) = .319, p = .573$] and previous social media usage [$F(1, 196) = 1.105, p = .294$] do not significantly influence the participants' behavior. On a 10% significance level, the hypothesized interaction of social media usage and nudge treatment report a significant interaction [$F(1, 196) = 3.775, p = .053$]. The covariants age, need for cognition, gender, and education did not report significant influence.

The non-significant main effects can be explained with the significant disordinal interaction between the nudging treatment and previous social media usage. As shown in Figure 11, the effect of the social norms nudge influences the user's behavior in opposite directions.

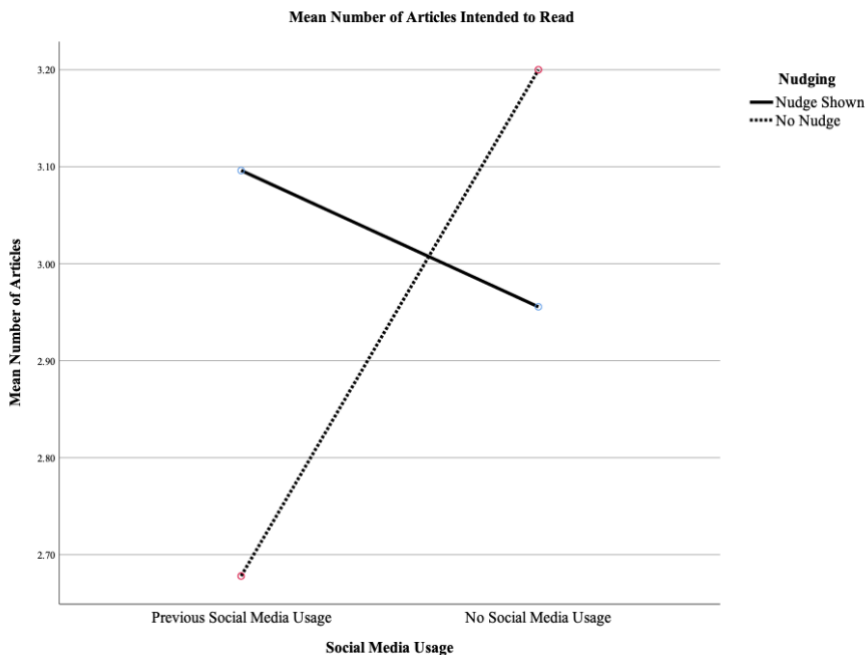


Figure 11. Disordinal Interaction

To further analyze the disordinal interaction, four t-tests were conducted regarding each group separately. Results indicate that the group previously using social media showed a significant difference in decision behavior on the amount of articles participants were willing to read when they saw a nudge ($t(109) = 1.904$, $p = .060$) on a .1 significance level. The group not using social media before the treatment reports no significant effect ($t(98) = -.891$, $p = .375$) on behavior.

Comparing the groups that saw the social norm nudge showed no significant change in behavior whether they were on social media or not ($t(95) = .560$, $p = .577$). Remarkably, analyzing the two groups that were not shown a social norm nudge, decided significantly different depending on whether they previously used social media or not ($t(112) = -2.175$, $p = .032$).

Consequently, it can be stated that on one hand, users that previously used social media intend to read significantly less articles on covid-related travel information than users not having browsed social media channels before. Furthermore, implementing a social norms nudge significantly raises the number of articles the social media group

intends to read. The nudge tends to decrease the negative effect of previous social media usage on information consumption intention.

Analysis of Nudge Perception

The presence of the social norm nudge has a positive effect on participants previously browsing social media channels. Although not significantly, it tends to have the contrary effect on the behavior of participants not browsing social media. Therefore, it seems a valid contribution to analyze how the nudge is being perceived by the two different groups. To find out if the nudge has been perceived differently. Table 14 shows the conducted t-tests on the recorded perception items (*0 = Does not apply at all, 7 = Applies completely*).

Table 14. Perception of Nudge by Groups previously using Social Media or not.

Perception Item	Previous Social Media Usage			No Social Media Usage			t	df	p
	N	M	SD	N	M	SD			
Trustworthy	53	4.02	1.61	45	4.60	1.36	-1.91	96	0.06
Reliable	53	3.87	1.55	45	4.56	1.36	-2.32	96	0.02*
Informative	53	4.45	1.6	45	4.89	1.62	-1.34	96	0.18
Stimulating	53	3.4	1.65	45	4.07	1.80	-1.93	96	0.06
Credible	53	3.96	1.58	45	4.78	1.41	-2.67	96	0.01*
Necessary	53	4.25	1.79	45	4.64	1.65	-1.14	96	0.26
Disruptive	53	3.11	1.83	45	3.02	1.55	0.26	96	0.79
Instructive	53	4.23	1.64	45	4.62	1.40	-1.27	96	0.21

Levene's test for equality of variances was not significant for all perception items

* = $p < .05$

The analysis shows that participants previously using social media judge the nudge to be less reliable and less credible than the group not browsing social media beforehand. It is remarkable that all mean values for the perception items show that the social media group perceived the nudge less positive than the group not browsing social media beforehand.

Finally, it is questionable which aspects of the nudge (in terms of perception)

had an influence on user behavior overall? Analyzing the perception items influence on participants behavior shows that perceived informativeness and necessity had a significant positive influence on the number of articles participants wanted to read. Perceived disruptiveness had a significant negative influence on participants behavior as Table 15 shows.

Table 15. General Influence of Nudge Perception on Behavior.

Perception Item	Low Values (1-3)			High Values (4-7)			t	df	p
	N	M	SD	N	M	SD			
Trustworthy	28	2.82	1.25	53	3.34	1.22	-1.80	79	0.08
Reliable	30	2.90	1.27	44	3.29	1.15	-1.39	72	0.17
Informative	24	2.50	1.22	60	3.22	1.22	-2.43	82	0.02*
Stimulating	45	2.78	1.28	33	3.21	1.02	-1.61	76	0.11
Credible	28	2.93	1.33	54	3.24	1.20	-1.08	80	0.28
Necessary	29	2.66	1.08	52	3.37	1.27	-2.54	79	0.01*
Disruptive	59	3.25	1.15	21	2.52	1.29	2.42	78	0.02*
Instructive	22	2.86	1.04	57	3.19	1.29	-0.95	77	0.34

Levene's test for equality of variances was not significant for all perception items

Intermediate Discussion

The improvements in the second experiment led to the nudge being more visible (90.8%). While including other social media networks the main hypothesized effects could also not be demonstrated with the second experiment. The experiment shows a disordinal interaction between the nudging effect and the effect of previous social media usage. The further investigation of the main effects shows that the nudge had been effective amongst the users who previously used social media. While that finding supports hypothesized effects (H_2) of the social norms nudge it is remarkable, that the nudge had no significant effect on the participants that have not used social media platforms before the nudging treatment. People that used a social media channel before being nudged, find the nudge less reliable and credible than the group not being on social media and still, the nudge has a positive effect on this group while not on the other. That seems paradox.

In general, how a nudge is being perceived, has an influence on its efficacy on the participants behavior. While informativeness ($p = .017$) and necessity ($p = .013$) have a positive influence, the perceived disruptiveness ($p = .018$) of a nudge has a negative influence on its effectiveness towards influencing decision behavior.

Discussion

In the main analysis, the two experiments consistently showed no support for the two hypothesized effects of previous social media usage and social norms nudges on information consumption behavior in the chosen context. While the first experiment showed no significant differences within the 2x2 study design, the second experiment resulted in a significant disordinal interaction. More in depth analysis showed that the participants that previously used social media show a different information intention in the covid-related context.

Social norms

A potential explanation to the missing effect of the social norms nudge could be drawn from Hansen and Jespersen's (2013) thoughts. Based on Kahneman's dual process theory, they categorize different nudging types (such as defaults or warnings) into system 1 and system 2 nudges. Social norms nudges motivate users to follow the behavior of others and are therefore defined as system 1 nudges, meaning that these nudges result in a larger effect when recipients take impulsive decisions. As participants are aware of the ongoing pandemic, the problem of circulating fake news, as well as potential consequences when traveling uninformed. It is likely that this awareness could have minimized the effect of the nudge. Further support to this argument is drawn from Venema et al.s (2020) findings, that undecided customers are more susceptible to social norms. In the presented context, participants could have already made up their mind and thus are less open to be influenced by social norms nudges. Furthermore, users are presumably very motivated to organize safe and relaxing summer holidays after months of lock-downs and quarantine, they may have a high intrinsic motivation to inform themselves about how the pandemic will likely affect their travel plans, independent from any other social opinion that is shown to them. Further support for this argument has been shown by Schär (2021) who demonstrated a negative moderation of the need for cognition on social norm nudges in a pre-purchase context. People who tend to think things through are less likely to

change their behavior based on what others do.

Social Impact Paradox?

While absent in the first experiment, the second experiment showed a disordinal interaction between social media usage and the social norms nudge. It arguably leads back to the improvement to the experimental design that led to the manipulation being recognized by 90.8% vs. 63% of the participants allowed to record this effect in one experiment compared to the other. Within the group that previously used social media, participants seeing the social norms nudge had a significantly higher intention of reading covid related travel information ($M = 3.096$) than users not seeing the social norms nudge ($M = 2.678$). Here the nudge seems to take effect as hypothesized. The participants that have not been on social media beforehand, show a contrary reaction to the nudge. It seems that social media consumption in general reduces the intention to consume important health related travel information. In order to reduce this negative effect, the using a social norms nudge for users coming from social media platforms, could lead to information gathering intentions that lie closer to users that did not use social media beforehand.

Cross-Channel Interaction

The two experiments show that depending on which channel a website user has used before a visit their information gathering behavior varies significantly. The use of a social norms nudge has shown a positive effect on the amount of information participants intended to use when they come from a social media channel. The effect however could only be verified in one of the two experiments. One remarkable result to consider is the opposite effect the nudge had on users that did not come from a social media channel. This leads to the conclusion that a nudge can at the same time have a positive effect on the behavior on users coming from one channel and a negative effect on users coming from another.

Limitations & Further Studies

While the hypothesized effects could partially be verified, the very narrow context of the experiments during the global health crisis, further studies should pick up investigating how customers can be accompanied best through cross-channel customer journeys that include social media and company owned channels. The fact that the origin of a user has an influence on their behavior on a website as well as the perception of its content should be further investigated to make more informed decisions when designing a brand's online presence. The two experiments both contain several limitations. The lack of control on experimental studies could have had an impact on some of the results. Furthermore, specific social media channels are being used with different motivation (Alhabash & Ma, 2017) and users cultural background influence the efficacy of digital nudges (Jung & Mellers, 2016). The focus on TikTok in the first experiment likely had an influence on the outcome compared to other platforms. While we investigated the effect of perception of the nudge, further studies could more thoroughly theoretically catch up on the potential mediating effect of perception in digital nudging.

Conclusion

Two experiments have been conducted investigating user behavior in cross-channel pre-purchase customer experiences. The focus was laid upon analyzing the influence of previous social media usage on the efficacy of social norms nudges. Both experiments used an information gathering context before booking a summer vacation during the covid pandemic. While the first experiment focused on the social media channel TikTok, the second included further channels and further investigated the perception of the nudge between the two groups as well as the influence of perception on behavior.

Whereas the theoretical contribution lies on the insight that previous social media usage does have an influence on the efficacy of social norms nudges on company owned channels, it cannot be concluded on a set of rules yet. The findings show a negative influence of previous social media usage on the perception of the digital nudge while still having a positive effect on participants behavior. It was also found that perceived informativeness, necessity and disruptiveness of displayed social norms nudge have a significant influence on the participants behavior. These effects

should be further analyzed in varying contexts to postulate a set of rules that allow to forecast a specific behavior when using one or the other nudge in certain contexts.

The conducted experiments lead to various managerial implications. On the one hand marketeers should be aware, that nudges lead to varying effects depending on where the users come from. The current results imply that users that browsed a social media channel before getting on the brand-controlled website tend to show a positive change in behavior towards gathering more information. All the while not perceiving the nudge too well. On the other hand, evidence suggests that users not coming from a social media channel show the opposite behavior than intended with the implemented social norms nudge. Hence, cross-channel managers and choice architects must take great care when they design and implement social norms nudges in the important pre-purchase phase of the customer journey. At the same time more research is necessary related to effects of nudge combinations (see also Howley & Ocean (2021)) as well as nudging in cross-channel context.

As the effects are manyfold, we recommend building on a knowledge platform within company and test digital nudges thoroughly for varying impact depending on where the customer comes from. We therefore pledge for a multi-channel-context-oriented implementation of digital nudges to achieve best possible results. Lastly, while the effects of nudges are more and more studied, we endorse scarcely making use of digital nudges.

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Curriculum Vitae

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Education

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2008 – 2012	University of St.Gallen, Switzerland Diploma in Business Education
2007 – 2010	University of St.Gallen, Switzerland B.A. HSG in Business Administration

Work Experience

2015 – Present	University of Applied Science of the Grisons, Switzerland Director of Studies Digital Business Management
2012 – 2015	Namics AG, Switzerland Senior Consultant
2009 – 2012	Scil. Swiss competence center for innovations in learning (University of St.Gallen), Switzerland Junior Research Assistant
2010 – 2011	Highschool Heerbrugg, Switzerland Teacher for Business and Economics