Nudging in the Digital World: An Up-to-Date Systematic Literature Review

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Abstract

This systematic literature review examines the current state of research on digital nudges, a type of choice architecture used to influence human behavior in digital environments. Through the analysis of 64 articles, the study reveals a lack of research on the long-term effects of nudges and a predominance of studies conducted using surveys and laboratory experiments.

Future research should focus on evaluating nudges in real-life settings and incorporating both quantitative and qualitative methods. The review also highlights the need for standardization in nudge categorization and consideration of government regulations and technology's ethical implications.

Keywords: digital nudges, systematic literature review, behavioral economics

1. Introduction

The study of decision-making and human behavior has been of interest to psychologists for decades. One stream of this research focuses on how to get people to adopt new behaviors or ideas. Nudge theory is a theory that explores the different aspects of choice architecture that can influence human actions (Brown, 2019) According to the nudge concept, human beings, due to cognitive limitations, can only act within certain limits of rational behavior (Simon, 1955; Thaler and Sunstein, 2008). Thaler and Sunstein (2008) were the first to use the term "nudge" and defined it as the choice architecture that predictably changes people's behavior without prohibiting any choice or substantially altering their economic incentives.

Digital nudges, a type of nudge designed for digital environments, have become increasingly important as online decision-making becomes more prevalent. This systematic literature review examines the current state of research on digital nudges, including their types and effectiveness, and highlights key research gaps and future research directions. The systematic literature review conducted by Bergram, Djokovic, Bezençon, and Holzer (2022) identified nine types of digital nudges. (1) Social nudges, which are, nudges that use social influence to encourage specific behaviors. (2) Reinforcement nudges, that aim to encourage behavior repetition through positive reinforcement. (3) Disclosure nudges, that provide additional information to the decision-maker. (4) Friction nudges, that increase the effort required to perform a specific behavior. (5) Feedback nudges, that provide feedback on the decision-maker's behavior. (6) Default nudges, that utilize the status quo bias to influence decision-making. (7) Warning nudges, that alert the decision-maker to potential consequences of a behavior. (8) Scarcity nudges, that create a sense of urgency or scarcity to encourage behavior and (9) Deception nudges, that manipulate information to influence decision-making. Therefore, this review aims to answer the research question: How has research on digital nudges evolved over the years?

2. Research Methodology and Results

The present systematic literature analysis has been conducted in accordance with the established methodology proposed by Xiao and Watson (2019). This rigorous and well-defined methodology comprises a comprehensive approach for conducting systematic literature reviews, which involves the identification and screening of relevant studies, data extraction, and synthesis of findings. By adhering to the methodology of Xiao and Watson (2019), the present analysis ensures a robust and reliable approach to evidence synthesis, thereby enhancing the validity and generalizability of the study's results.

Xiao and Watson (2019) provide a comprehensive and detailed guideline for conducting a systematic literature review. The article emphasizes the importance of systematic reviews in synthesizing the existing knowledge base, identifying research gaps, and informing evidence-based practice. The authors propose a step-by-step approach, which includes defining the research question, developing a search strategy, screening and selecting studies, extracting data, and synthesizing findings. They also provide practical advice on critical appraisal, data analysis, and reporting of results.

There are several different approaches to systematic literature analysis (Nightingale, 2009; Okoli, 2010; Rother, 2007; Xiao and Watson, 2019), including descriptive, exploratory, explanatory, and meta-analytic. A descriptive review seeks to summarize and report the characteristics of studies included in the review, whereas an exploratory review aims to identify patterns or relationships among studies. Explanatory reviews attempt to explain the underlying

mechanisms or processes that account for the findings reported in the studies. Finally, meta-analytic reviews involve quantitative synthesis of the results across studies.
In the present context, a descriptive review was selected as the aim is to provide a comprehensive summary of the available evidence on a particular topic without attempting to establish causal relationships or test hypotheses. This approach will enable the identification of gaps in the current knowledge base and provide a foundation for further research.

3. Descriptive Systematic Literature Review – The Process

Step 1: Formulate the Problem

According to Xiao and Watson's (2019) recommended methodology for conducting a systematic literature review, the first essential step is to identify a well-defined research problem. In line with this guidance, the present study established two primary research questions to guide the scope and objectives of the review. Specifically, the study seeks to answer: (RQ1) How has research on digital nudges evolved over the years? and (RQ2) What are the key strategies for implementing digital nudges?

By adopting a focused and structured approach to the review process, the study aims to provide a rigorous and comprehensive synthesis of the existing literature on digital nudges, thereby contributing to a deeper understanding of this emerging area of research. Through a thorough analysis of the evidence, the study seeks to identify key trends, challenges, and opportunities for future research and practice in the field of digital nudging.

Step 2: Develop and Validate the Review Protocol
The second step in conducting a systematic literature review is to develop and validate the review protocol. The review protocol serves as a research design that outlines the methods used to conduct the review. It is critical to the quality and rigor of the review as it reduces researcher bias in data selection and analysis, and increases the reliability of the review (Xiao and Watson, 2019).
In accordance with recommendations of Nightingale (2009), Okoli (2010) Rother (2007), Xiao and Watson (2019), the review protocol for the present study included the following criteria:

1. The search was conducted in the Scopus and Science Direct databases.
2. The literature review only considered journal articles.
3. The following keywords were utilized: "digital nudge", "online nudge", "nudge ecommerce", "online stimuli", "ecommerce bias", and "heuristics ecommerce".
4. Only journal articles written in English were included.
5. There were no restrictions on publication date or geographic location.
6. Books, conference proceedings, and other non-journal documents were excluded from the analysis.
7. The inclusion of a study in one database did not necessitate its inclusion in the other.

Step 3: Search the Literature
Step 3 involves the organization and analysis of the search results obtained from the previous step (Xiao and Watson, 2019). At this stage of the research, it is important that collaboration between members of the research team is seamless. To make sure that requirements of the review protocol are met, the use of database technologies (e.g. cloud-based systems accessible to all participants) is recommended. At the end f this stage 158 papers were listed.

By applying this systematic and collaborative approach, the large volume of literature generated by the search process was accurately managed.

Step 4: Screen for Inclusion

In conducting a systematic review, screening for inclusion is a crucial step. This process involves screening each article to determine whether it should be included in the review, based on the established inclusion and exclusion criteria. This step is typically conducted in two stages, starting with a coarse sieve through the articles based on a review of abstracts, followed by a refined quality assessment based on a full-text review (Xiao and Watson, 2019).

In the fourth step, the literature was checked one by one. After reading each article, it was determined whether the literature was relevant to the study and a table was completed, as mentioned in the previous section. This step was essential to ensure that only relevant literature was included in the review and that the established inclusion and exclusion criteria were adhered to.

Step 5: Assess Quality

Step 5 involves assessing the quality of the studies that have passed the admission screening. The quality assessment helps refine the scope of studies for data extraction and synthesis. The criteria for quality assessment include internal validity and external validity or generalizability.

Based on the recommendation, two independent quality assessments were carried out in parallel, and in case of disagreement, the opinion of the research team was sought. Studies that did not meet the inclusion criteria were excluded from the final bibliography, and the list of excluded studies was retained for record-keeping, reproducibility and cross-checking.

Table 1: Results obtained for search terms in each database

Keyword	**Number of articles (Scopus)**	**Number of articles (ScienceDirect)**	**Number of relevant articles**	**Example**
"digital nudge"	19	44	41	van der Laan and Orcholska (2022); Guath, Stikvoort, and Juslin (2022); Bukoye, Ejohwomu, Roehrich, and Too (2022)
"online nudge"	3	3	3	Kawa, Ianiro-Dahm, Nijhuis, and Gijselaers (2021); Peer et al. (2020) Eschle, Wale, and McCarrick (2022)
"online stimuli"	22	46	18	Gatautis, Vitkauskaite, Gadeikiene, and Piligrimiene (2016); Crespo-Almendros and Del Barrio-García, (2015); Buchanan (2015)
"ecommerce bias"	0	0	0	
"heuristics ecommerce"	0	0	0	
"nudge ecommerce"	0	0	0	
Articles examined	44	93	**64**	

Source: Own edit

The final database of papers contained 64 articles that were considered by the researchers to be relevant for the purpose of the research (Table 1).

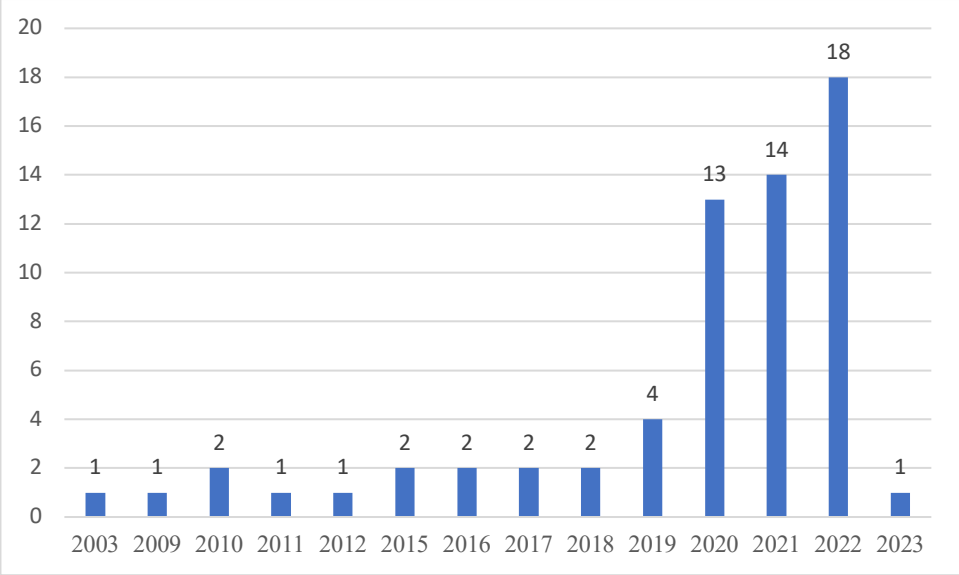
Step 6 and 7: Extracting, Analyzing and Synthesizing Data

Step 6 is the extraction of data from the literature based on the selected appropriate synthesis method. A pre-agreed code system was used to fill in the table. After the data are extracted, they are presented through an integrated design (combining quantitative and qualitative research to analyse and synthesise the data).

4. Discussion of the Results

In this systematic literature review of empirical research on digital nudges, we have analyzed a total of 64 articles to provide a comprehensive overview of the digital nudging landscape. Our findings reveal some important insights that shed light on the current state of digital nudges and the need for further research in this area.

Figure 1: Journal articles on digital nudges in the systematic literature review (N=64)



Source: Own edit

Figure 1 indicates a significant increase in the usage of digital nudges since 2020, which may be attributed to the rise in e-commerce resulting from the pandemic circumstances.
Digital nudging is observed in several fields of services. The most common field of analysis was healthy living and eating (12), e-commerce (10), information technology development (9) and social media (9). Other than these legal and privacy issues, education, sustainability were presented in multiple articles.
One of the major findings of our analysis is that the long-term effects of nudges are still largely unknown. While many studies have examined the short-term effects of nudges on behavior change (e.g (De Bauw, De La Revilla, Poppe, Matthys, and Vranken, 2022; Gatautis et al., 2016; Mills, 2022; Nori et al., 2022; Zimmermann and Renaud, 2021), there is a lack of

research that investigates the sustainability of these effects over time. This is an important gap in the literature that needs to be addressed in future research to determine the effectiveness of digital nudges in the long run. Only one article (Petrakaki, Hilberg, and Waring, 2021) explored the long-term effects of digital nudges, but the study does not focus on this.

Our analysis has revealed that the majority of research on digital nudges has primarily utilized surveys (e.g. Daunt and Harris, 2017; Fechner and Herder, 2021; Pilgrim and Bohnet-Joschko, 2022) and laboratory experiments (e.g. Dennis, Yuan, Feng, Webb, and Hsieh, 2020; Kitkowska, Shulman). These methods, while useful in examining the short-term effects of nudges, may not accurately reflect the long-term effectiveness of nudges in real-life settings. Therefore, it is critical for future research to focus on evaluating nudges in more naturalistic environments to provide more reliable data on their effectiveness over time. Some studies have employed field experiments as a research methodology; however, there is still a lack of thorough investigation into the effects of nudges in real-life conditions. Incorporating actual companies and organizations in research can provide a more accurate and representative picture of the impact of digital nudges.

It is also worth noting that most of the studies included in this review were quantitative in nature. While quantitative studies provide valuable insights into the effectiveness of nudges, they often lack the context and subjective information that can be gained from qualitative research. To gain a more comprehensive understanding of the effectiveness and ethical implications of digital nudges in real-life settings, future research should consider incorporating both quantitative and qualitative methods.

Furthermore, we have found that the nudge categories have not been consistently examined across the literature. While some studies have focused on a single nudge type, others have used a combination of different nudges. Moreover, the classification and categorization of nudges have not been standardized, which makes it difficult to compare the findings across different studies. Future research should address this issue by providing a more comprehensive examination of the different nudge categories and their effects.

To add further detail to our analysis, we have also found that the effectiveness of digital nudges varies depending on the context and the target behavior. For instance, some studies have found that social nudges are effective in promoting sustainable behavior , such as energy conservation or recycling (Jung, Cho, and Shin, 2021), while others have shown that reinforcement nudges are more effective in promoting healthy behaviors (van der Laan and Orcholska, 2022), such as exercise or healthy eating. This highlights the need for tailoring nudges to specific contexts and target behaviors to maximize their effectiveness.

After reviewing the literature, it has become apparent that government regulations concerning digital nudges have not been widely discussed. While ethical concerns surrounding nudges have been explored to some extent e.g. (Meske and Amojo, 2020), it is also important to consider the role of government in regulating the use of nudges to ensure that they are used in a fair and transparent manner. Further research is needed to better understand the potential risks and benefits of government regulations on digital nudges.

Finally, our analysis has revealed that the use of technology in digital nudges presents both opportunities and challenges. On the one hand, technology allows for the creation of personalized and adaptive nudges that can be delivered at the right time and place to maximize their effectiveness. On the other hand, the use of technology also raises concerns about privacy, data security, and algorithmic bias. Therefore, future research should explore ways to mitigate these challenges and leverage the opportunities offered by technology to enhance the effectiveness of digital nudges.

5. **Summary**

This systematic literature review offers valuable insights into the current state of digital nudge research, identifying gaps and opportunities for future research. The study highlighted the need for more research on the long-term effects of nudges and the importance of evaluating nudges in real-life settings using both quantitative and qualitative methods. Additionally, standardization in nudge categorization, government regulations, and technology ethics should be considered in future studies. The review's limitations included the use of only two databases and the possibility of missing relevant studies by not considering all relevant keywords. Despite these limitations, this systematic literature review provides an up-to-date overview of digital nudge research and serves as a starting point for future studies.
With the continued rise of e-commerce and social media, research into digital nudges will be much needed in the future.

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