

SMART NUDGE MARKETING: AI-DRIVEN BEHAVIOURAL INTERVENTIONS FOR SUSTAINABLE TOURISM

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ABSTRACT

This study explores the integration of nudge theory and marketing practices through a digitalization lens, proposing a framework for smart behavioral interventions to foster sustainable changes in the tourism industry. Recognizing the critical role of tourists' responsible behavior in mitigating environmental and social impacts, the research examines how digitally driven behavioral insights, such as gamification and behavioral design, can influence decision-making. The study emphasizes the potential of disruptive technologies, particularly artificial intelligence (AI), in delivering personalized, real-time interventions that encourage sustainable tourism practices.

A fast review analyzed 187 research documents spanning 1987 to 2024, using VOS viewer to identify and refine 148 relevant keywords from 176 recurring terms. These were categorized to reflect the evolution of responsible behavior: traditional marketing (past), nudge theories (present), and digitalization (future). Case studies and best practices were reviewed to explore AI-driven nudges in tourism.

Findings indicate that AI-powered nudges enhance traditional behavioral interventions by offering dynamic, personalized experiences that promote sustainable actions among tourists, such as waste reduction, resource conservation, and cultural respect. AI's predictive capabilities, combined with gamification and behavioral design, facilitate a shift toward responsible tourism practices.

This research introduces "Smart Nudge Marketing" as a novel framework for addressing sustainability challenges in tourism, advancing beyond traditional marketing approaches. By integrating AI with behavioral insights, the study provides actionable strategies for fostering responsible tourist behavior and addressing complex environmental and social issues in the tourism sector.

KEYWORDS: *AI, Nudge, Nudge Marketing, Responsible Behaviour, Smart Nudge, Tourism.*

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1. INTRODUCTION

Over the past few decades, constant change has become a hallmark of modern life, especially in the worlds of management and business. However, with the rise of major trends, like rapid technological innovation, urbanization, and evolving ethical values, this concept has gone beyond simple change to something much bigger: a full-on transformation. In this landscape, smart nudge marketing has emerged as a powerful way to shape consumer behavior. By combining behavioral science with data-driven insights, it gently guides decisions while respecting individual freedom.

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At its core, smart nudge marketing focuses on the complex nature of consumer decision-making, which has only grown more dynamic in today's fast-paced and competitive markets. Building on Thaler and Sunstein's (2008) nudge theory, it uses subtle cues to influence choices without limiting freedom. For example, businesses in rapidly shifting industries like fashion and retail are increasingly using nudges to stay ahead of changing customer preferences. This is especially true in emerging markets like India, where organized retail and online platforms are thriving (Guerassimoff & Thomas, 2015).

But there's a catch: while broad, generalized nudges work well for short-term decisions, they often fail to create lasting behavior change. Long-term impact requires nudges to be more personalized and tailored to specific contexts, encouraging habits that stick over time.

This is where technology comes in. Advancements in artificial intelligence (AI), digital twins, and machine learning are opening up exciting possibilities for creating real-time, personalized nudges. Digital twins, for instance—virtual models that adapt to real-time data—can help businesses respond to individual consumer preferences on the fly. AI-powered systems can refine these nudges even further, using consumer data to turn cognitive biases into opportunities for promoting responsible behaviors, like making sustainable shopping choices, without overwhelming people.

Cognitive insights also play a key role in smart nudge marketing. Kahneman's (2003) dual-process model, which divides decision-making into automatic (System 1) and deliberate (System 2) processes, helps marketers understand how to guide choices effectively. For example, nudges based on simple heuristics can encourage eco-friendly purchases, appealing to consumers' automatic decision-making in ways that align with their values. The problem is that many traditional nudges are too generic to achieve this level of personalization.

AI-driven smart nudge marketing offers a solution. By adapting nudges in real time to fit individual contexts, businesses can make sustainable decision-making easier and more accessible for consumers. Tools like augmented reality (AR), the Internet of Things (IoT), and machine learning add another layer of adaptability. Together, these technologies allow marketers to design more interactive, engaging nudges that respond directly to consumer needs. This approach ties in with service-dominant logic (SDL) theory, which highlights the importance of co-creating value through meaningful consumer experiences (Vargo et al., 2015).

In short, smart nudge marketing—powered by AI and digital twins—has the potential to transform how businesses influence consumer behavior in a responsible and sustainable way. Despite its potential, much of the existing research in this field leans heavily on quantitative methods, leaving room for deeper exploration of personalized, adaptive strategies within business and policy settings. This study aims to fill that gap through a bibliometric analysis of behavior design, focusing on smart nudge marketing and its application to sustainable tourism. It explores the following question: What is the past, present, and future of nudge marketing in the context of sustainable tourism?

By tackling this question, the study seeks to provide a deeper understanding of behavior design and nudge marketing, paving the way for data-driven, sustainable, and adaptive consumer engagement strategies.

2. LITERATURE REVIEW

2.1 Nudge

Nudging is about making small tweaks to the environment where decisions happen, subtly steering behavior without limiting options or adding significant costs (Hausman & Welch, 2010). It works by tapping into our cognitive biases and mental shortcuts, making it particularly helpful in situations where choices are complex, feedback is limited, or consequences are delayed (Thaler & Sunstein, 2008). Nudges have been used successfully in a variety of areas, such as encouraging healthier lifestyles, boosting retirement savings, promoting eco-friendly habits, and improving tax

compliance (Congiu & Moscati, 2022). For example, redesigning cafeteria layouts can nudge people toward healthier food choices, and setting defaults can significantly increase organ donor registrations (Johnson & Goldstein, 2003).

That said, nudges don't always work the same way in every situation. Some, like default settings, can produce striking results in one context but fall flat in another. For instance, Bronchetti et al. (2011) found that using default options to encourage savings among low-income tax filers didn't have much impact, suggesting that the surrounding circumstances and people's existing intentions play a big role in outcomes. This variability makes it clear how important it is to tailor nudges to the specific context.

There are also some important challenges to consider when it comes to nudging. Ethical concerns, as highlighted by Kuyer and Gordijn (2023), include risks to personal autonomy, welfare, democratic values, and potential long-term effects. There's also a debate over whether nudges should supplement or replace more traditional policy tools. These issues emphasize the need for thoughtful, context-aware design and careful evaluation when applying nudges in practice.

2.2 Nudge marketing

Nudge marketing has become a powerful way to influence consumer behavior by tweaking the environment in which choices are made. It's rooted in nudge theory and works by subtly guiding people toward decisions that benefit them, without taking away their freedom of choice. According to Congiu and Moscati (2022), what makes nudge marketing unique is its alignment with the ethical principles of libertarian paternalism. For something to count as a true "nudge," it shouldn't just benefit the company implementing it. Instead, it might aim to improve the well-being of the person being nudged, contribute to societal good, or strike a balance between the interests of the business and the consumer.

This ethical foundation is what sets nudge marketing apart from traditional marketing. Conventional approaches often focus on maximizing profits, serving primarily the marketer's interests. While both approaches might rely on cognitive biases and still allow consumer choice, nudge marketing works to achieve business goals while also promoting positive outcomes for individuals or society at large.

Not all sales-boosting tactics qualify as nudges, even if they use psychological principles. True nudges are more like gentle encouragement rather than hard-selling strategies. They are particularly helpful in situations where simply appealing to logic or reason isn't enough (Gallopel Morvan & Crie, 2022). For instance, in retail, nudges might take the form of descriptive calorie or nutrition labels, or color-coded information (Vandenbroele, 2019). Online, digital nudges can include tweaks to website interfaces, pop-up notifications, or even user reviews (Schneider et al., 2018). The key difference is that nudge marketing focuses on steering people toward choices that are good for them and society, rather than just trying to drive purchases.

Nudges are often used at pivotal points in the customer journey, such as when people are deciding what to buy or right before they make a purchase. They can also help correct mistakes, introduce users to new features, or guide individuals who are stuck and unsure how to move forward (Korhonen, 2020). Making decisions can be tough, especially when there's a lot of complexity involved (Schwartz, 2004). The "paradox of choice" suggests that having too many options can leave people overwhelmed, making it harder for them to decide. Nudge marketing tackles this problem by improving the way choices are presented, offering just the right balance of options and subtly leading people toward better decisions.

2.3 Smart nudge marketing

Smart nudge marketing is all about using digital nudging strategies tailored to fit each user's unique situation. As Karlsen and Andersen (2019) point out, we face growing challenges in areas like

health, environmental sustainability, and energy use, making it crucial to encourage healthier lifestyles and more sustainable choices across society. Nudging, which comes from economic and political theory, involves gently influencing people's decisions through positive reinforcement, subtle suggestions, and other non-intrusive methods.

With the rise of digital technology, nudging has evolved into "digital nudging," offering powerful ways to influence behavior in online environments. This approach works by embedding nudges into user interfaces—think about prompts, reminders, or suggestions that help guide decisions. In smart nudging, these digital prompts are personalized, matching the user's specific needs and context. By combining helpful recommendations with motivational cues, smart nudging aims to steer users toward better choices without feeling manipulative.

However, ethical transparency is a critical part of this. Smart nudges must adapt based on users' actions and contexts while respecting their autonomy. Designers of user interfaces increasingly act as "choice architects," whether they realize it or not, shaping consumer decisions through design elements (Weinmann et al., 2016). In online spaces like web forms or interactive tools, these digital nudges consider social dynamics and human biases to create solutions that truly resonate with users. Research shows that understanding how different users respond to various nudges can lead to better designs (Matz & Netzer, 2017; Weinmann et al., 2016).

To make these nudges even smarter, some researchers suggest using information systems like real-time tracking and personalization (Schneider et al., 2018; Weinmann et al., 2016). Digital tools, including smart devices and apps, play a big role here. They can deliver timely reminders, alerts, and other gentle prompts that encourage good behavior, from healthier habits to more sustainable choices (Okeke et al., 2018). Plus, digital nudges often spread easily through social networks by tapping into behaviors that people find socially acceptable (Yeung, 2016).

Taking it a step further, intelligent software agents (ISAs) add another layer of sophistication to smart nudging. These agents can learn about users through their behavior, using emotional and social cues to fine-tune recommendations (Burr et al., 2018). By aligning suggestions with user preferences at the right moment, ISAs can boost engagement and drive actions, such as higher click-through or purchase rates (Matz & Netzer, 2017). While ISAs can encourage positive outcomes like healthier choices, they also carry risks—such as enabling overconsumption of digital content. Given that this field is still emerging, more research is needed to explore how AI-powered nudging can shape behavior and create shared value (Mele et al., 2021).

In summary, smart nudging is all about personalizing digital nudges to fit individual users and their circumstances. By combining user data with thoughtful design, these nudges aim to inform and motivate people while respecting their freedom to choose. As user behaviors and needs change, smart nudging must evolve to keep guiding people toward meaningful and positive actions (Karlsen & Andersen, 2019).

2.4 Responsible behaviors and sustainability

In a world increasingly affected by natural disasters, economic crises, and health challenges, it's more important than ever to understand how individual and organizational behavior impacts resilience and sustainability. Research into organizational behavior in extreme conditions—like areas dealing with economic sanctions or internal conflicts—highlights the importance of proactive personality traits in encouraging socially responsible actions (Afshar Jahanshahi et al., 2021).

Bear et al. (2003) describe responsible behavior as self-motivated and guided by internal values, rather than simply following rules under external supervision. When it comes to environmental sustainability, responsible behavior can be either reactive or proactive. For example, someone might recycle because they're responding to external incentives, like rewards or reminders (reactive). On the other hand, proactive recyclers are driven by a deep environmental awareness and a personal sense of duty (Ohtomo & Hirose, 2007; Teo, 2016). These individuals often feel morally obligated

to protect the environment, which strengthens their commitment to recycling and contributes meaningfully to sustainability efforts.

People with proactive mindsets are typically forward-thinking and motivated by a desire to make a positive impact on their environment and society. This outlook plays a key role in promoting behaviors that benefit others and the planet—behaviors that might not be explicitly outlined in their job descriptions but are fueled by genuine care for future generations (Afsar et al., 2016; Afshar Jahanshahi et al., 2021). Proactive environmental stewardship is essential for addressing urgent global issues like pollution, ecological destruction, and climate change.

Take tourism, for example. Irresponsible behaviors—like littering in water bodies, damaging green spaces, or discarding disposable items—can severely harm the environment and diminish the natural beauty of tourist destinations. Studies have shown how these actions negatively affect ecosystems, especially in coastal areas. As a result, researchers and destination management teams are working to better understand tourists' behavior and develop strategies to encourage environmentally responsible behavior (ERB). These efforts not only help protect the environment but also support local economies and cultures, ensuring long-term sustainability.

Ultimately, responsible behavior (RB) is driven by an internal sense of duty rather than external pressure. It plays a vital role in areas like tourism, health, education, and organizational management by promoting sustainability and social responsibility. Responsible actions can take many forms—whether it's using natural resources wisely, supporting local economies, preserving cultural heritage, managing waste effectively, conserving energy, recycling, upcycling, or protecting plant and animal species. Together, these efforts create a positive ripple effect that benefits both current and future generations.

3. METHODOLOGY

This study takes a descriptive-analytical approach, using bibliometric analysis to explore and visualize trends in smart nudge marketing research. The aim is to track how the field has evolved, spotlight influential works and authors, and uncover collaboration networks among researchers, institutions, and countries. By applying statistical techniques to bibliographic data, bibliometric analysis provides a broad overview of the research landscape, offering insights that traditional literature reviews might miss (Rostaing, 1996).

We pulled bibliographic data from the Scopus database, a trusted source for indexing high-impact journals and offering powerful analytical tools. This allowed us to dive deep into the key players and emerging trends in the field. To find relevant studies, we used a search query designed to capture works combining "Nudge" and "Marketing" with terms like "artificial," "AI," "smart," and "digital." The specific search string was:

TITLE-ABS-KEY (("Nudge" AND "Market") AND ("artificial" OR "AI" OR "smart" OR "digital"))*

Conducted in September 2024, the query returned 187 research documents spanning 1987 to 2024, representing the body of Scopus-indexed work contributing to the global conversation on smart nudge marketing.

The extracted data included details like titles, abstracts, keywords, authors, sources, countries, institutions, and publication years, all of which we downloaded in CSV format for analysis. To process this data, we used VOS viewer (version 1.6.16), a software tool renowned for its ability to create visualizations of networks, clusters, and density patterns.

Using VOS viewer, we created bibliometric maps that reveal the progression of research in this area and illustrate collaboration networks. These maps provide a clear picture of the field's development, highlighting influential studies, popular themes, and key collaborations among leading contributors in smart nudge marketing.

4. FINDINGS

Figure 1 illustrates the progression of nudge research publications from 1987 to 2024, highlighting the chronological growth in the total number of publications, which shows an upward trend each year. The timeline can be divided into two primary phases. The first phase, spanning from 2008 to 2017, marks the initiation period, characterized by a relatively low number of publications, with yearly totals remaining below 10. In contrast, the second phase, covering 2017 to 2024, experienced significant growth, evidenced by an increase in articles published each year, surging from 13 publications in 2017 to 35 in 2023.

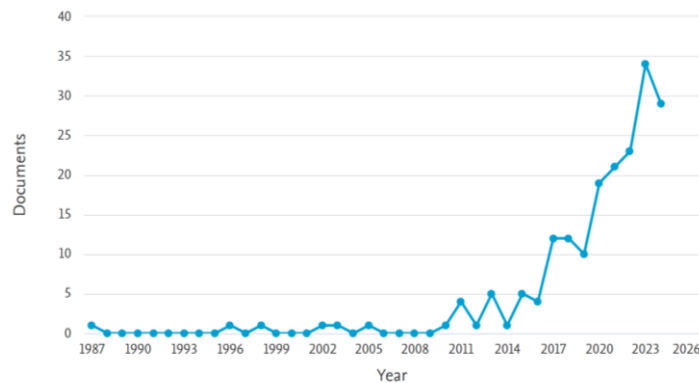


Figure 1. Evolution of nudge research

Source: authors with VOS Viewer using Scopus database

Keywords play a vital role in scientific research, helping to convey the core ideas that authors want to share. In this study, researchers analyzed over 1,700 keywords, out of which 714 appeared at least twice. The analysis revealed two key clusters: “nudge” and “marketing.” Using VOS viewer software, they created a bibliometric map where the most frequently used keywords were shown with larger circles and fonts, making their importance within the research landscape clear at a glance.

The study delves into how keywords related to sustainable decision-making have evolved over time, breaking this progression into three clusters: past, present, and future.

The Green Past cluster represents the foundation of sustainable decision-making, focusing on traditional marketing strategies and tools. This group includes 42 keywords such as “marketing,” “sales,” “promotion,” “services,” “food and beverages,” “trade,” “supply chain,” “sustainable consumption,” and “sustainable development.” These terms highlight the early role of marketing in encouraging sustainable practices, setting the stage for future developments in the field.

The Red Present cluster reflects the current focus on nudge theory and its application to sustainable decision-making. With 70 keywords, this group includes terms like “social marketing,” “nudge,” “design,” “regulation,” “heuristics,” “adaptation,” “optimization,” “management,” “energy consumption,” and “sustainability.” This cluster emphasizes the use of social and behavioral design to address cognitive biases, promote adaptive strategies, and improve resource optimization, showcasing a blend of regulatory and innovative approaches.

Looking ahead, the Blue Future cluster is all about digital transformation. Comprising 36 keywords, it highlights the growing importance of digital and online marketing in driving sustainable practices. Key terms include “electronic business,” “online social marketing,” “digital marketing,” and “digital nudge.” This cluster points to a future where digital tools and AI-driven strategies play a central role in encouraging sustainable behavior through smart, tech-enabled interventions.

By exploring these three clusters, the study paints a clear picture of how sustainable decision-making has progressed—from traditional marketing techniques to present shaped by behavioral insights, and finally toward a future defined by digital innovation.

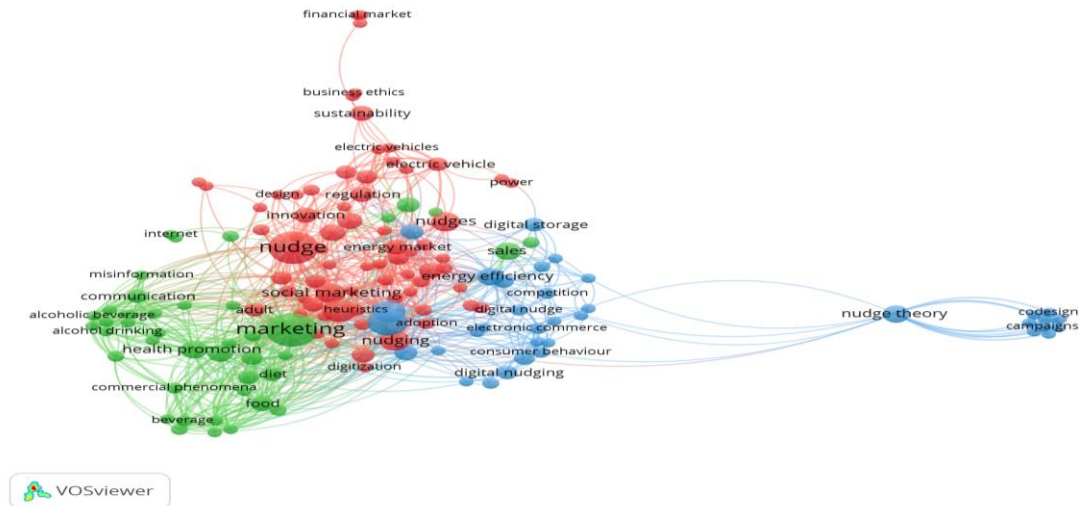


Figure 2. Co-occurrence visualization

Source: authors with VOS Viewer using Scopus database

Figure 3 shows how keywords have evolved over time, covering the period from 2000 to 2024. Looking specifically at the period from 2008 to 2024, it becomes clear that the concept of the "digital nudge" has gained significant traction, particularly since 2008. This trend points to the growing role of technology, mobile apps, and smartphones in encouraging sustainable behavior. Digital nudging has found applications in various areas, such as energy management, promoting healthy lifestyles, responding to epidemics, supporting renewable energy use, and encouraging responsible behaviors like alcohol moderation.

These insights underscore the importance of integrating sustainability and responsible behavior into our everyday lives, particularly within the tourism sector. To make this happen, key stakeholders—spanning academia, industry, and policy—should focus on three main strategies: providing immediate feedback, integrating technology into decision-making, and promoting habits that lead to lasting, sustainable change. Nudge marketing, driven by AI and digital tools, offers practical approaches, such as using real-time data to create adaptive and context-specific interventions. By aligning these strategies with ethical principles and sustainability goals, stakeholders can develop frameworks that not only help people make informed decisions but also empower them to take collective action for a more sustainable and resilient future.

The study also explores how stakeholders can be empowered to better understand and manage consumer behavior. Keyways to do this include providing stakeholders with AI-driven tools that can:

Improve Decision-Making: AI systems can analyze consumer data to predict behaviors, offering actionable insights for creating interventions that improve decision-making processes.

Enable Personalization: Real-time feedback allows nudges to be adjusted to fit individual preferences and goals, leading to more engagement and better outcomes.

Support Ethical and Sustainable Practices: By integrating ethical principles and sustainability goals into AI models, marketers can ensure that nudges serve both consumers and society, reducing the risk of manipulation.

Tackle Market Complexities: AI tools can help overcome cognitive biases, reduce fatigue decisions, and promote long-term behavior changes that align with broader societal goals, like environmental sustainability and improved health.

That said, the study also points out the need for a clearer framework – a sort of "blueprint" – for putting these strategies into practice. For example, in tourism marketing, AI could help create eco-friendly travel itineraries tailored to individual preferences, encouraging sustainable behaviors like reducing travel-related waste or opting for low-impact travel options.

The bibliometric analysis identifies some of the most influential studies, key institutions, and collaborative networks in the field, providing a useful guide for future research. While the findings give a good overview of the field's development, there's a lack of in-depth discussion around the core arguments and empirical research. More detailed insights into how digital and AI technologies address these challenges and strategies for empowering stakeholders across academia, industry, and policy are needed for a fuller understanding.

In conclusion, this study underscores the transformative potential of AI-driven nudging for promoting sustainable and ethical marketing practices. As we continue to innovate and collaborate across disciplines, future research should focus on developing clear frameworks and empirical studies to fill the gaps identified here. With the right approach, stakeholders can harness these technologies to address the complex societal, environmental, and economic issues we face, all while respecting consumer autonomy.

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