

# Bridging Green Innovation and Online Green Purchasing: Insights from China's Market

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## ABSTRACT

This research paper delves into the dynamic interplay between green innovation and the burgeoning trend of online green consumer behavior in China. The focus is to unravel the complex relationship between these two spheres by conducting a thorough literature review, thereby setting a foundation for future empirical studies. The paper discusses key concepts of green innovation, particularly how businesses are adopting eco-friendly practices in their operations and product designs. It also examines the online green purchasing process from a consumer's perspective, integrating theories such as the diffusion of innovation, the theory of planned behavior, and the consumer decision-making process to understand the underpinnings of green purchasing decisions. The study identifies gaps in current research, particularly in the areas of how green innovation stimuli are perceived by consumers and the role of consumer knowledge in influencing online green purchase behavior. It proposes novel research avenues, including an empirical investigation into the causal relationships between green innovation initiatives by businesses and the resulting consumer behavior in the online marketplace. This paper aims to offer a comprehensive perspective on how business practices in green innovation can align with and influence consumer tendencies towards green purchases, especially in the digital realm. The findings and propositions put forth in this study are intended to benefit academics and practitioners alike, offering insights that could contribute to promoting sustainable consumer habits and guiding businesses in China and beyond in their green innovation strategies.

**Key Words:** Green Innovation, Consumer Behavior, Green Purchase, Online Shopping, China, Literature Review

## 1. INTRODUCTION

Understanding factors that motivate consumers' online green purchases is vital for promoting eco-friendly choices (Song et al., 2021; Sun et al., 2022). With growing awareness of environmental issues, green innovation has attracted great attention from governments, companies, and academics (Karimi Takalo et al., 2021).

Green innovation refers to "hardware or software innovation related to green products or processes, including technologies for energy conservation, pollution control, waste recycling, green product design, or corporate environmental management" (Chen et al., 2006, p.534). Consumers' online green purchase behavior refers to pro-environmental actions by consumers, like

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purchasing eco-friendly goods or adopting sustainable lifestyles on online platforms (Srivastava & Thaichon, 2023).

While past research has explored factors influencing green innovation adoption in companies and drivers of consumer green purchase decisions, existing literature has also highlighted the importance of aspects like green brand innovation management in shaping green buying (Cheah & Low, 2022; Gong et al., 2021). However, these factors have not been thoroughly examined in online shopping contexts. The unique online traits of convenience, access, and extensive product ranges warrant studying how these factors affect online green purchases (Z. Liu & Hu, 2022). There remains a research gap concerning how green innovation interacts with online green consumerism.

Therefore, this paper reviews current research on green innovation and online green purchase behavior, aiming to provide an integrated perspective on the relationship between the two and indicate future research directions.

## **2.VISUALIZATION OF RELATED LITERATURE**

To understand the topic of green innovation and consumer's green purchase behavior, we searched the literature from Web of Science (WoS) core collection which are Science Citation Index Expanded (SCI-EXPANDED) and Social Sciences Citation Index (SSCI) from 2003 to 2023, to check the recent 20 year's research topic and trend in green innovation and consumer behavior. The key search words are "green innovation\*" OR "eco-innovation\*" OR "green consumer behavior\*" OR "green consumer behaviour\*". As of December, 2023, 4624 publications that treated green innovation and green consumer behavior separately were found and 2000 publications were saved in "plain text" with "full record and cited references" of WoS. Therefore, a total of 2000 publications form a dataset for this study.

Figure 1 shows a graphical representation of how often the topic "green innovation" and "green consumer behavior" have been used in the literature for each year from 2014 to 2023. The most productive years are 2023 with 1,237 records (26.74% of total) and 2022 with 1,227 records (26.52% of total). There has been a sharp upward trend in publications since 2019. Specifically, there were only 307 records in 2019, representing 6.64% of the total, but this jumped to 382 records (8.26% of total) in 2020. The high concentration of research outputs in the most recent 2-3 years indicates rapidly rising academic attention and activity around these topics. It reflects exponentially growing research interest in green innovation and consumer behavior in the last 5 years, with over 50% of total records published in 2021-2023. This suggests these are emerging topics attracting greater scholarly focus recently, aligned with increased environmental awareness globally. The trend predicts that academic outputs will continue expanding in the coming years.

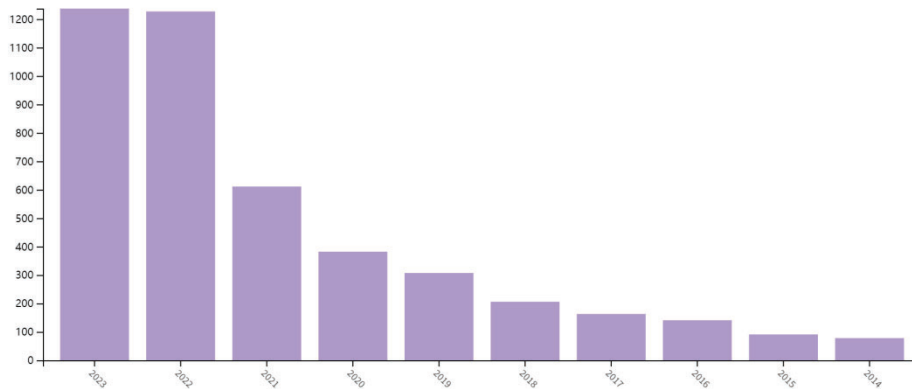


Figure 1  
 Publication years and Record counts of the topic “green innovation”  
 and “green consumer behavior”

Figure 2 shows the top 10 subject categories of the searched literature which show that Environmental Sciences and Green Sustainable Science Technology account for over 75% of the total documents, indicating these are the primary disciplines researching green innovation and consumer green purchase behavior currently. In addition, Environmental Studies, Management, and Business also take up considerable proportions, reflecting the high relevance of these two research topics to management practices and business operations. The literature distributes relatively concentrated in subjects closely related to environment and sustainable development, which aligns well with the research topic of the paper. The major disciplines are environmental science, sustainable science technology, environmental studies, management, and business. This provides very good references for further comprehending and analyzing the content of the literature.



Figure 2  
 The top 10 Web of Science Categories of the topic “green innovation”

and “green consumer behavior”

In this section, VOSviewer was employed in this study to conduct a quantitative bibliometric analysis of the literature collected from the WoS database. We analyzed the distribution of keywords to explore the contents of the literature. The keywords examined here are those utilized by authors in the titles, abstracts and keywords sections of their publications. The frequency with which one term appears together with other terms is called co-occurrence. Keyword use reveals patterns in previous publications and predicts future areas that may gain prominence, which can aid researchers in identifying yet unstudied topics. Keyword co-occurrence analysis of a research area can effectively represent research hotspots, offering additional support for scientific investigation.

The 2,000 documents contain 27,096 keywords, and the minimum occurrences of keywords were set to 10. Only 989 keywords meet the set threshold, and these were visualised, as shown in Figure 3. This network graph visually represents connections between keywords using nodes and lines. The importance of each keyword is shown through the size of its node - bigger nodes mean the terms were used more frequently in the literature. Terms that often appear together are connected by lines in the graph. The thickness and length of the connecting lines indicates how strongly related two keywords are. Thicker, shorter lines signify closer relationships and frequent co-occurrence between keyword pairs. Additionally, keywords are clustered by color if they are topically related to each other.

VOSviewer divided the keywords of green innovation and green consumer behavior publications into 4 clusters. Cluster 1 is red colour (China, corporate green innovation, efficiency, governance), which represents studies on how businesses and organizations in China implement and manage green innovations. Cluster 2 is green colour (practice, green product innovation, consumer, attitude, intention, knowledge, amos, pls-sem, etc.), which suggests a focus on understanding and predicting consumer green purchasing through psychological and empirical models like theory of planned behavior. Cluster 3 is blue colour (eco innovation, adoption, product, etc.), which indicates attention to how various types of green products and technologies diffuse through society. Cluster 4 is yellow colour (consumption, emission, renewable energy, consumer behavior, etc.) which highlights research investigating consumers' role in environmental impact.

The clusters demonstrate four major trends or focuses in this research field: 1) Organizational execution of green innovation, especially in China; 2) Factors driving consumers' green purchasing intent and behavior; 3) Diffusion of eco-friendly innovations and products; and 4) Consumers' environmental footprint through consumption choices. These foci on both producer and consumer sides of green shifts align with the topic linking business green innovations and consumer green behavior. The keyword network offers a useful framework for positioning future studies within relevant conversation strands.

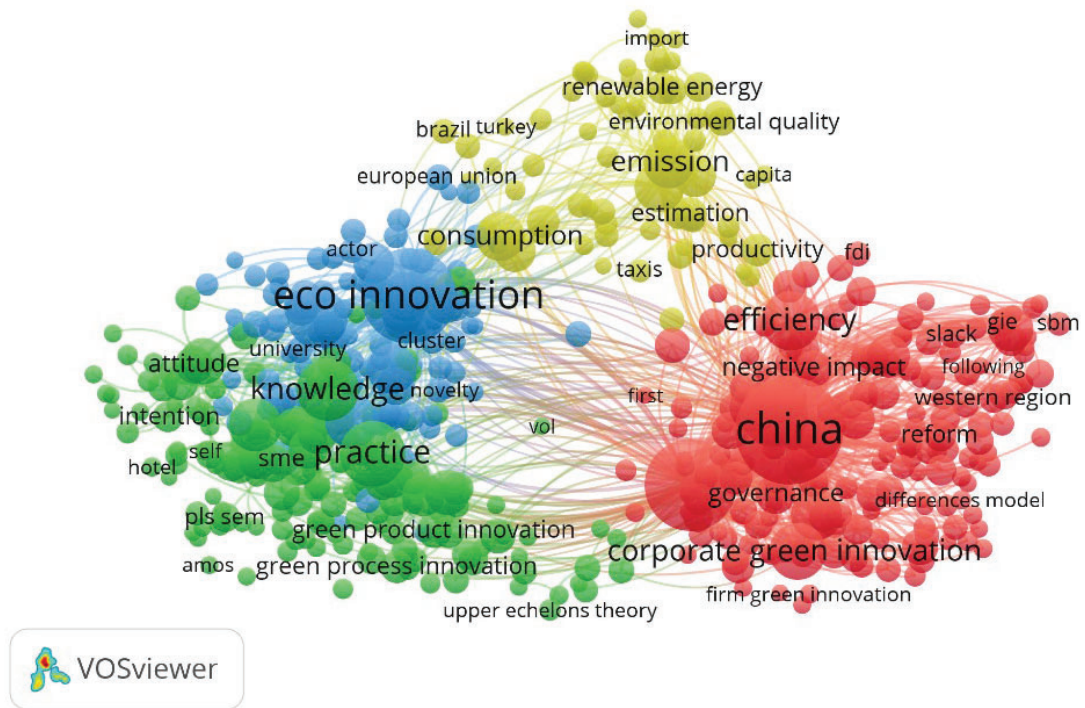


Figure 3  
Cluster visualization map for co-occurring keywords of the topic “green innovation” and “green consumer behavior”

### 3. LITERATURE REVIEW

#### 3.1 Review on Concept of Green Innovation

Green innovation is an increasingly important topic in business due to its vital role in sustainable development. Many researchers have examined the relationship between green innovation and sustainable consumption (M. A. S. Khan et al., 2022; A. P. Sharma, 2021; Vargas-Merino et al., 2023; Vazifehdoust et al., 2013). While definitions vary based on research objectives, reviewing different interpretations can clarify the concept of green innovation for researching online sustainable shopping.

In literature, green innovation has three similar concepts - eco-innovation, environmental innovation, and sustainable innovation. Eco-innovation stresses ecological sustainability and products' full lifecycles with new green offerings, technology and standards. Green innovation focuses on reducing resource use through environmentally friendly products and technology. Environmental innovation emphasizes external environments and new green tech, while sustainable innovation takes a more comprehensive long-term societal development view encompassing products, technology and management. These terms are often used interchangeably by researchers. This research adopts the more commonly used green innovation (Schiederig et al., 2012).

Green innovation aims to lower energy and resource consumption, reduce waste, improve recycling, and enhance reusable and biodegradable materials (Adams et al., 2016). It has several dimensions: Technological innovation involves adopting energy-efficient, sustainable tech in business (Rennings, 2000); Product/service innovation means providing eco-friendly, socially-



valuable offerings (Khan et al., 2021); Process innovation implements sustainable procedures for utilizing resources, handling waste, managing supply chains (Schiederig et al., 2012); Management innovation refers to new managerial initiatives, measures and policies improving environmental capabilities, competitiveness and performance (Asadi et al., 2020).

Based on literature, factors influencing green innovation include internal aspects like top management support (Li et al., 2018), HR and R&D investment (De Medeiros et al., 2014), organizational culture (Liao & Tsai, 2019); and external factors including government policies and regulations (Biscione et al., 2022), market demands (Chang & Chen, 2013), stakeholder pressures from NGOs, industry groups (Zheng et al., 2022).

Considering previous definitions and this study's goal, this research defines green innovation as: the innovative process of a green business to implement product, technological, marketing, production, and business model innovation that meets consumer demand and reduces environmental impact over products' full lifecycles by developing innovative offerings, applying technology, and promoting ecological awareness to contribute to sustainability.

### **3.2 Review on Different Research Perspective of Green Innovation**

In studying green innovation, researchers must comprehend innovation's nature from different lenses. Three vital perspectives (Innovation Management, Degree of Innovation, Diffusion of Innovation) can help explore green innovation's definition, attributes and influence. This section will discuss the three angles and their theoretical foundations.

#### **3.2.1 Innovation Management Perspective**

Many scholars define green innovation's facets through an innovation management lens (N. Sharma et al., 2022). Their research concentrates on eco-innovation dimensions like eco-product, process, marketing, and technological innovation (Carrillo-Hermosilla et al., 2009; L. Chen et al., 2021; Y.-S. Chen et al., 2006; D'Attoma & Ieva, 2020; De Medeiros et al., 2014; Dilotsotlhe, 2021; Fussler & James, 1996). Innovation management theory covers economics, management and organization. Key contributors comprise Joseph Schumpeter, Peter Drucker, and Clayton Christensen (X. Zhang et al., 2022).

Joseph Schumpeter pioneered the "disruptive innovation" idea, stressing how new offerings, technologies and markets significantly further economic growth (Schumpeter & Swedberg, 2021). He categorized innovation into types like product, technological, market and process. According to Awan et al., (2021), product innovation means developing new goods and services to better meet consumer needs. Technology innovation denotes applying new technologies in production to elevate productivity. Market innovation refers to new marketing channels and promotions for expanding market share. In green innovation, Schumpeter's theory can help classify its dimensions. Firms can develop novel environmental goods, invent energy-saving production technologies, or utilize new marketing methods to draw green consumers (Schumpeter & Swedberg, 2021).

Other scholars like Peter Drucker and Clayton Christensen also made key innovation management contributions (Nakamori, 2020). Drucker emphasized entrepreneurship's importance for innovation, while Christensen's *The Innovator's Dilemma* is a classic text. Innovation management evolved from Schumpeter's economically efficient, competitively focused approach,

to Drucker's entrepreneurial, organizational outlook, to Christensen's technologically-driven disruptive perspective (Christensen & Euchner, 2011). Now in the digital age, innovation management applies not just in traditional industry but also digital business. Using it to protect the environment can address pressing ecological problems and drive more sustainable economic growth.

### **3.2.2 Degree of Innovation Perspective**

Some scholars define green innovation through a degree of innovation lens, dividing it into incremental and radical types (Azzone & Noci, 1998; Horng et al., 2017; Martínez-Martínez et al., 2023). Radical green innovation stresses profoundly altering operations to revolutionize product design, services or processes by harnessing novel technologies to slash environmental impacts. This often yields entirely new goods and business models conferring competitive edge. However, radical innovation also brings higher risks and costs for companies (Dewar & Dutton, 1986). Incremental green innovation concentrates on gently enhancing existing offerings, services, processes or strategies. Green tech is leveraged to develop new eco-friendly products and optimize production to reduce pollution and maintain market share. Gentle marketing approaches also aim to provide consumers more sustainable product knowledge to motivate green purchases (X. Zhang et al., 2022).

Small incremental green innovations can spur more radical ones as green firms gently shift consumers onto adopting more transformative eco-innovations over time. For instance, consumers may first install solar water heaters (incremental innovation), then progress to solar panels with energy storage, and even selling excess power to utilities (radical innovation) after noting the benefits (Hazarika & Zhang, 2019).

### **3.2.3 Diffusion of Innovation Perspective**

A third green innovation perspective stems from Rogers' Diffusion of Innovation (DOI) theory concerning how innovations spread through a society over time. DOI has four key elements - the innovation itself, time, communication channels, and the social system. In adopters' eyes, innovation means new ideas, practices and objects - either completely novel things or improvements over previous versions. Innovations require certain qualities to diffuse successfully among potential adopters (Rogers et al., 2014).

Per the DOI model, five characteristics impact innovation adoption rates. Firstly, relative advantage - the perception that an innovation is better than what preceded it and delivers gains - affects adoption levels. Secondly, compatibility - aligning with potential adopters' existing values and past experiences - also matters. If an innovation matches prevailing social values and norms, diffusion happens more smoothly. Thirdly, complexity refers to the difficulty level of adopting a new product or method - more complexity slows adoption speeds. Fourthly, observability denotes how visible an innovation's outcomes are to others. Greater visibility spurs faster diffusion. Finally, trialability represents the ease of testing out an innovation (Rogers et al., 2014). If users can experiment first, they become more eager to adopt (Kapoor & Dwivedi, 2020b).

Some research has combined DOI with the Theory of Planned Behavior (TPB) to investigate consumer acceptance of sustainable goods, showing DOI's efficacy in elucidating links between innovation and consumer attitudes, awareness and actions regarding green purchasing

(Hosseinikhah Choshaly, 2019; Islam & Meade, 2013; Kapoor & Dwivedi, 2020).

Discussing the Innovation Management, Degree of Innovation and Diffusion of Innovation perspectives facilitates better grasping green innovation's intricacies. These lenses provide researchers, marketers and policymakers valuable theoretical foundations for studying and enabling green innovation to further sustainable consumption.

### **3.3 Review on Concept of Consumer's Online Green Purchase Behavior**

Consumer green purchase behavior involves the eco-friendly actions taken by consumers, like buying sustainable products, embracing green lifestyles, or backing environmental initiatives (Srivastava & Thaichon, 2023). It encompasses attitudinal aspects reflecting consumers' environmental awareness, concerns and values, as well as actual purchase decisions and post-purchase processes (Follows & Jobber, 2000).

Before making a green purchase, consumers form green purchase intentions based on their environmental knowledge, perceived efficacy of green goods, and social influences from family, friends and green marketing (Dilotsotlhe, 2021). The actual green buying decision depends on trade-offs between a product's sustainability versus other attributes like price or quality (Jinliang et al., 2023). After purchase, satisfaction and loyalty are shaped by assessments of a product's greenness and value (Sharma et al., 2022).

Many researchers have defined online shopping behavior. Mosteller, Donthu & Eroglu (2014) stated that consumers increasingly use Internet-connected tools for online buying. Similarly, Nguyen, de Leeuw & Dullaert (2018) described online consumer behavior as encompassing consumer decision-making stages like problem identification, information search, evaluation, product choice and post-purchase outcomes. Mican & Sitar-Taut (2020) found online purchase decision-making for goods/services is intricate and affected by multiple factors. Comparing offline and online choice revealed variables that motivate customers to buy online or not. Communication strategies also differ in influencing offline versus online consumer decisions. These definitions highlight online shopping's varied phases, essential for grasping green online consumerism.

Based on green consumption research, online green purchase behavior means consumers consciously applying sustainability principles when shopping online. This encompasses various consumer behavior and decision-making facets across the online shopping journey, including green need recognition, information search, evaluating alternatives, sustainable purchase decisions and post-purchase assessments. At its core, online green purchase behavior involves consumer considerations around environmental soundness, social accountability and economic practicality, aiming to reduce wastage and support eco-friendly brands/products to positively contribute to sustainability and conservation goals (Mican & Sitar-Taut, 2020; Quoquab & Mohammad, 2020a).

### **3.4 Review on Related Theories of Green Purchase Behavior**

The theories related to green purchase behavior here include the theory of planned behavior and consumer decision making model. Past research shows consumer green conduct is complex and no single theory fully explains it (K. Sharma et al., 2022). Hence, this research combines multiple theories to better understand online green purchasing.

#### **3.4.1 Theory of Planned Behavior**



The theory of planned behavior (TPB), proposed by Icek Ajzen in 1985 as an extension of the theory of reasoned action, assumes deliberate control over human behavior. It posits that attitudes, subjective norms and perceived behavioral control together shape intentions and actions (Ajzen, 1991). Per TPB, the more positive the attitude and norms about a behavior, and the greater the perceived control, the stronger the intention to perform it.

TPB has been widely and successfully applied across fields to predict and explain human behaviors, especially green purchase intentions and actual buying (Yadav & Pathak, 2017). For instance, (N. Kumar et al., 2022) used TPB to examine young Indian consumers' organic food purchases, finding positive effects of attitude, norms and knowledge on purchase intention. (M. T. Liu et al., 2020) combined TPB and value-belief-norm theory to study Chinese consumers' green product purchase intentions, evidencing positive impacts of attitude and perceived behavioral control.

However, TPB also has some limitations. It overly relies on rational reasoning while discounting affective, non-rational drivers in decision-making (Snihotta et al., 2014). Moreover, TPB focuses more on behavioral intention rather than actual actions, despite the intention-behavior gap (Carrington et al., 2014). Future studies could address this by incorporating emotional factors or other models like prospect theory to better predict real green buying.

### **3.4.2 Consumer Decision Making Model**

First proposed by Engel et al. in 1968, the consumer decision-making model describes a five-stage consumer decision process of: need recognition, information search, evaluating alternatives, purchase decision and post-purchase behavior (Engel et al., 1986). Originally meant for ordinary consumer goods, this model has been widely adopted to study buys across products/services, including green goods (Sreen et al., 2018). For example, (D. Jaiswal & Kant, 2018) used it to examine Indian consumers' organic food purchase decisions and determinants at each stage.

Despite extensive applications, this model has been critiqued for over-simplifying complex decision-making and lacking clear boundaries between stages (Sreen et al., 2018). It also overlooks existing consumer habits and brand loyalty's effects on purchase choices (Solomon & Behavior, 1994). Future studies could expand the model by adding more influencing variables for a more detail depiction of green purchase decision-making.

### **3.5 Relationship Between Green Innovation and Consumer Online Green Purchase Behavior**

Enterprise green innovation activities boost transparency and credibility around sustainability claims, alleviating consumer skepticism and improving green purchase intentions (Leonidou et al., 2011). Eco-friendly technological and product innovations also raise environmental awareness and attitudes by communicating sustainability concepts and providing green options, furthering green buying (Jinliang et al., 2023). However, empirical evidence directly linking green innovation with consumer green conduct is still scarce, with most studies focused narrowly on green purchase intention deterrents while ignoring business-consumer interactions (Zameer & Yasmeen, 2022).

Online consumers see green product innovations with superior environmental performance versus conventional choices as having extra value. This added value in the form of higher quality, enhanced functionality or cost savings translates into greater willingness to pay price premiums for green online offerings (Chauhan et al., 2021). Process innovations that increase sustainability

across production/supply networks boost company image among green consumers (Awan et al., 2021). Firms can then capitalize on green label to charge higher prices for e-commerce goods. The relative edge of green innovations motivates online adoption and purchase despite greater costs (Leonidou et al., 2017). Consumers willingly pay more for tangible benefits like reduced environmental impacts when shopping online.

Consumer traits and psychological variables may moderate green innovation's effects. For instance, younger generations are more open to sustainability, while educated, urban and higher-income consumers have a greater green buying tendency (Shen et al., 2018).

By fulfilling consumer demand for eco-friendly choices, green innovations including product, process and marketing positively influence willingness to pay premiums for sustainable goods in online retail.

#### **4. FUTURE RESEARCH**

Firstly, integrated theoretical frameworks could be developed to combine organizational-level green innovation activities with individual consumer decision-making (Kautish & Sharma, 2020). Potential theories like institutional theory, stakeholder theory or social exchange theory could elucidate company interactions with consumers in achieving sustainability aims.

Secondly, links between diverse green innovation practices and different consumer decision stages warrant exploration, such as how technological advancements stimulate needs for eco-friendly product aspects, or firms co-creating green offerings with lead users (Chang & Chen, 2013). Quantitative empirical assessments are also required to test the hypothesized relationships.

Thirdly, contextual and contingent factors like national cultures, industry traits or product types may affect how green innovation transforms into consumer green conduct (Zeng et al., 2010). Future research should focus more on boundary conditions between green innovation and green purchasing.

In summary, potential avenues comprise establishing integrated theories spanning organizational green innovation and individual green consumption, probing connections between specific green innovation activities and consumer decision phases, together with elucidating contingent external variables that moderate the green innovation to green purchase relationship. Advancing research in these directions would provide more holistic and nuanced understanding of how business-level sustainability strategies shape consumer choices and behaviors.

#### **5. CONCLUSION**

In conclusion, this paper reviews enterprise green innovation practices and consumer green purchase conduct, offering a reference for future research on their interrelationships. Although direct evidence linking them remains inadequate presently, potential mechanisms have been proposed. More empirical and cross-disciplinary investigations spanning innovation management and consumer scholarship are required to deepen comprehension of this realm. Achieving environmental sustainability necessitates collaborative efforts between academics and business practitioners.

Specifically, the paper defines green innovation and online green buying behavior based on previous academic conceptualizations, enriching understanding of their multifaceted attributes. Dimensions of green innovation range from product/service offerings to production procedures

and managerial initiatives, while online green consumerism encompasses need recognition, information search, evaluations, purchases and post-buy assessments. Additionally, important theoretical perspectives are highlighted that facilitate analyzing green innovation and green consumption, including innovation management, degree of innovation, diffusion of innovation, planned behavior, and consumer decision-making viewpoints.

Moreover, potential associations between green innovation execution and online green purchasing are proposed, suggesting green product/process advancements can enable firms to charge price premiums among environmentally conscious online consumers. Individual differences like generational cohort or education levels may also moderate effects. However, empirical testing is still lacking concerning how diverse organizational green strategies interact with consumer decision journey phases. Developing integrated multi-level frameworks combining green innovation stimuli with consumer responses, and probing context-specific boundary conditions around their relationship, stand out as fruitful future research directions.

In essence, this review paper lays down important conceptual and theoretical foundations concerning alignments between business green innovation management and online green consumer behavior. It contributes timely insights into an emergent research domain with rising practical significance, while highlighting promising avenues for further investigation through quantitative and qualitative lenses across disciplines. Realizing environmental sustainability in the digital era necessitates synergistic efforts from both corporate and consumer stakeholders, calling for more cross-collaborations between industry and academia.

This review has limitations in its English-centric literature selection, restricted visual analytic tools, narrow theoretical integration centered on innovation theories, confined modeling to planned behavior paradigm, and outcome emphasis on willingness to pay over real environmental gains; future research should expand language and discipline breadth, leverage alternative bibliometric techniques, incorporate adjacent concepts like sustainability economics, test diverse behavior models, and construct multi-level impact metrics, to offset these constraints and develop a more rigorous, holistic academic dialogue around green innovation and online green consumption.

## ACKNOWLEDGEMENTS

I would like to express my sincere thanks to Asst. Prof. Dr. Chaithanaskorn Phawitpiriyakliti, Assoc. Prof. Dr. Sid Terason, and Suan Sunandha Rajabhat University for invaluable help throughout this research.

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