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EDITORIAL COMMENT

Eco-innovation: opportunities, challenges, and advances in current research

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Section: *Editorial Comment*

Abstract

The objective of this editorial in the International Journal of Innovation (IJI) is to share reflections on eco-innovation, highlighting the advances and perspectives in current research, emphasizing the opportunities and challenges of organizations identified by researchers in their studies. Eco-innovation is important for sustainable development as it promotes business practices that combine economic performance and environmental responsibility. This editorial discusses current research on the factors driving eco-innovation adoption, its economic and environmental implications, and how its intersection with internationalization can enhance benefits. Furthermore, we explore the opportunities and challenges, such as the need for favorable public policies and interdisciplinary collaboration. We invite researchers to submit their studies to the IJI to advance the field of eco-innovation.

Keywords: editorial commentary, eco-innovation, eco-innovation research, opportunities and challenges in eco-innovation

Ecoinovação: oportunidades, desafios e avanços nas pesquisas atuais

Resumo

O objetivo deste editorial no *International Journal of Innovation (IJI)* é apresentar algumas reflexões sobre a ecoinovação, destacando os avanços e perspectivas nas pesquisas atuais, ressaltando as oportunidades e desafios das organizações identificados pelos pesquisadores em seus estudos. A ecoinovação é importante para o desenvolvimento sustentável, pois promove práticas empresariais que aliam desempenho econômico e responsabilidade ambiental. Este editorial discute as pesquisas atuais sobre os fatores que impulsionam a adoção da ecoinovação, suas implicações econômicas e ambientais, e como a interseção com a internacionalização pode potencializar os benefícios. Além disso, exploramos as oportunidades e os desafios, como a necessidade de políticas públicas favoráveis e a colaboração interdisciplinar. Convidamos pesquisadores a submeterem seus estudos ao IJI para avançar no campo da ecoinovação.

Palavras-chave: comentário editorial, ecoinovação, pesquisa em ecoinovação, oportunidades e desafios em ecoinovação

Ecoinnovación: oportunidades, desafíos y avances en la investigación actual

Resumen

El objetivo de este editorial en el International Journal of Innovation (IJI) es compartir reflexiones sobre la ecoinnovación, destacando los avances y perspectivas en las investigaciones actuales, resaltando las oportunidades y desafíos de las organizaciones identificados por los investigadores en sus estudios. La ecoinnovación es importante para el desarrollo sostenible, ya que promueve prácticas empresariales que combinan el rendimiento económico y la responsabilidad ambiental. Este editorial discute la investigación actual sobre los factores que impulsan la adopción de la ecoinnovación, sus implicaciones económicas y ambientales, y cómo su intersección con la internacionalización puede potenciar los beneficios. Además, exploramos las oportunidades y desafíos, como la necesidad de políticas públicas favorables y la colaboración interdisciplinaria. Invitamos a los investigadores a enviar sus estudios al IJI para avanzar en el campo de la ecoinnovación.

Palabras clave: comentario editorial, ecoinnovación, investigación en ecoinnovación, oportunidades y desafíos en ecoinnovación

Introduction

Eco-innovation refers to the development and implementation of new products, processes, services, or business practices that result in significant environmental benefits, in addition to improving companies' economic performance and competitiveness (Khaw et al., 2023). This concept encompasses technological, organizational, and social changes to reduce environmental impact and efficiently use natural resources. Examples of eco-innovation include the development of products made from recycled materials, more efficient industrial processes,

and circular business models that promote the continuous reuse and recycling of materials (Carrillo-Hermosilla et al., 2009; Rennings, 2000). Aligned with the United Nations' Sustainable Development Goals (SDGs), eco-innovation represents an essential catalyst for achieving a greener and more inclusive economy.

The importance of eco-innovation cannot be underestimated in the current context of increasing environmental concerns. As we face challenges such as climate change and ecosystem degradation, the need for sustainable practices becomes increasingly urgent. Research indicates that the adoption of eco-innovation strategies can significantly mitigate CO2 emissions, which account for about 82% of global pollution (Khurshid et al., 2023). Sectors such as transportation, which consumes 64% of the world's oil and is responsible for 23% of CO2 emissions, have shown promising changes with the transition to renewable energies and more efficient technologies (Khurshid et al., 2023; Tariq et al., 2022).

Aware of the critical importance of eco-innovation, the International Journal of Innovation (IJI) positions itself as a platform for disseminating research in this area. The IJI is committed to encouraging studies exploring the intersection between innovation and sustainability, promoting the publication of works that advance knowledge and implement sustainable practices. By providing a space for researchers to share their findings, the IJI aims to stimulate the development of innovative solutions that can be applied across various sectors.

This editorial aims to discuss the opportunities and challenges organizations face and the possibilities for research into eco-innovation. We will explore current research, highlighting important findings on how eco-innovation can promote sustainable development. We will address the challenges faced by researchers and outline a future research agenda, emphasizing the need for collaborative and integrative approaches. This editorial aims to encourage the

submission of relevant research to the International Journal of Innovation (IJI), contributing to advancing knowledge and implementing sustainable and innovative practices.

Emerging Opportunities in Practice

Eco-innovation stands out as an essential response to global environmental challenges, presenting a hopeful avenue to harmonize offering a promising path to reconcile economic development with environmental sustainability. However, to fully benefit from its potential, researchers and professionals must engage in dynamic and collaborative approaches, widely sharing their studies and research. Researchers emphasize that eco-innovation is viable with collective support, highlighting the essential role of government in providing subsidies for research and development, tax incentives, and favorable regulations (Khan & Idrees, 2023). Other authors argue that, although companies cannot directly pass the costs associated with eco-innovation onto consumers, they reap significant benefits in terms of social and environmental responsibility (Hartmann et al., 2022; Sierzchula et al., 2014).

Eco-Innovation Driving Sustainable Structural Transformation

Recent studies highlight that companies are being encouraged to adopt eco-innovative practices in sectors with significant environmental impact, such as agriculture, tourism, and industry (Puertas & Marti, 2021). Other studies emphasize that eco-innovation, permeating the entire product life cycle, is driven by implementing innovative ideas in design, manufacturing, and commercialization, resulting in a considerably smaller ecological footprint than conventional products (Zhang & Gu, 2021).

These studies indicate that opportunities emerge as solutions to mitigate negative impacts to the environmental impacts, highlighting the urgent need to adapt to natural resources, which tend to become scarce for the economy, society, and natural ecosystem. Authors identify eco-

innovation as a key strategy to promote a sustainable Circular Economy, aiming at material restoration and waste reduction to mitigate adverse environmental impacts (Thakker & Bakshi, 2023).

Moreover, eco-innovation facilitates the transition to advanced energy production methods, encompassing various sources, energy conservation, and emission reduction (Khan et al., 2024). Another study (Ebadian et al., 2020) highlights the advantages of biofuels in the transportation sector for decarbonization, showcasing its growing market driven by diverse policies, including blending mandates, tax incentives, and public financing mechanisms.

Eco-innovation represents an opportunity to address some of the challenges faced by low-income populations through the internalization and specialization of open markets (Chen et al., 2024). Additionally, well-defined environmental regulations promote eco-innovation in companies, resulting in higher productivity (Khan et al., 2024), while patents for eco-innovation are becoming increasingly relevant as market opportunities (Haller et al., 2024).

Analyzing the national and continental levels, researchers highlight the policies implemented by the Chinese government to promote environmental protection and energy efficiency, underscoring the need for greater adoption of eco-friendly practices, especially among small and medium-sized enterprises (Zhang et al., 2020). In terms of renewable energy generation, excluding hydroelectric, China leads, producing almost 17% of its energy from renewable sources in 2021 (Khan et al., 2024). The European Green Deal has set ambitious goals, such as reducing net greenhouse gas emissions by at least 50 to 55% by 2030 and achieving zero emissions by 2050, through measures like waste recycling and ecological and social innovation (Haller et al., 2024).

Challenges in Practice

However, we cannot underestimate the complex challenges accompanying the eco-innovation journey. Resistance to change, financial constraints, knowledge gaps, governance issues, and different stages of development among countries and companies are just some of the obstacles that need to be addressed with determination and collaboration. Researchers and professionals are called upon to converge in interdisciplinary efforts, seeking innovative and sustainable solutions to resolutions to surmount these obstacles.

Organizational Resistance and Paradigm Shift: Obstacles in Implementing Eco-Innovation

Resistance to change is a common barrier faced by companies seeking to adopt more sustainable business models (Khan et al., 2024). This process often requires time and effort to establish a new organizational mindset and foster a sharper awareness of the importance of improving products and services in an environmentally responsible manner (Tariq et al., 2022).

Moreover, disparities in development between countries and companies influence eco-innovation across various political dimensions, such as energy consumption, environmental taxes, and economic growth (Khan & Idrees, 2023). Since the 1990s, the UN and other multinational agencies have focused their endeavors on various initiatives to address the negative externalities of greenhouse gases (Khurshid et al., 2023). For example, the Conference of the Parties (COP26) recommended that member countries adopt technological advancements and structural transformations to mitigate climate change issues, including promoting eco-innovation (Padhan et al., 2023).

Despite the commitments made at COPs to reduce greenhouse gas emissions (Haller et al., 2023) and establish carbon neutrality targets (Fethi & Rahuma, 2020), fulfilling these promises remains a challenge due to the unique political, economic, and social structures of each

country (Thakker & Bakshi, 2023). The uncertainties related to the climate policies of some countries can lead to reduced investments (Khan et al., 2024), affecting the region's economy and environment. Financial constraints are a particular concern for developed countries, such as the United Arab Emirates and Saudi Arabia, regarding resources for greenhouse gas mitigation and sustainable development, highlighting income and GDP as part of this challenge (Duan & Liu, 2023).

These challenges and governance issues represent only some of the obstacles that need to be addressed with determination and collaboration. It is imperative that researchers and professionals collaborate in interdisciplinary efforts, striving to devise innovative and sustainable solutions to overcome these challenges.

Current Research in Eco-Innovation

Current research in eco-innovation has focused on identifying the drivers of its adoption and its impacts on companies, reflecting the dynamic needs of the market and the growing importance of environmental issues. Studies indicate that competitive pressure, market-based instruments, technological capabilities, customer demand for green products, and environmental organizational capabilities are significant drivers of eco-innovation. These factors improve companies' environmental performance and indirectly positively impact economic performance, as observed in research on Chinese companies (Cai & Li, 2018). Moreover, eco-innovation is seen as an essential tool for achieving sustainable economic growth, mitigating environmental impacts, and promoting comprehensive transformation across economic, social, and environmental dimensions (Fatma & Haleem, 2023).

The research agenda in eco-innovation has evolved, not limited only to the implementation of new technologies but also involving institutional and social changes

(Berkhout, 2011). This multidimensional approach, including technological, social, and institutional innovations, is crucial for better understanding the challenges and opportunities associated with eco-innovation. Integrating well-structured environmental and economic policies is essential to encourage adopting eco-innovative practices and ensure their long-term sustainability. Research highlights that interdisciplinary collaboration is essential as it combines knowledge from different disciplines to develop more effective and innovative solutions to environmental problems (Berkhout, 2011).

The interdependence between eco-innovation and internationalization is another significant area of research. Companies that adopt eco-innovative practices tend to internationalize more easily, while internationalization can further encourage the adoption of eco-innovations. This symbiotic relationship is vital for sustainable development and the global competitiveness of companies. The analysis of research patterns reveals that technological capabilities, regulatory pressure, and consumer demand for green products are central to the adoption of eco-innovation in international contexts (Šūmakaris, Ščeulovs & Korsakienė, 2020).

Current research highlights that the drivers of eco-innovation are diverse and vary according to the stage of development and diffusion. Specific factors driving eco-innovation include innovations in products, processes, organizational structures, and investments in environmental R&D (Khaw et al., 2023). Resource and institutional theories reveal that regulations, market factors, environmental management systems (EMS), and cost economies are fundamental to driving eco-innovation. These drivers are essential for different types of eco-innovation and help promote sustainable practices within companies (Hojnik & Ruzzier, 2016).

Additionally, research has highlighted global trends in assessing eco-innovation, with a growing focus on sustainability, resource efficiency, and emission reduction. Studies reveal that

one of the main challenges in assessing eco-innovation is the lack of standardized data and the complexity of measuring long-term impacts. To overcome these challenges, there is an emphasis on improving evaluation methodologies and the need for greater international collaboration, which would help create a more integrated and effective approach to measuring and promoting eco-innovative practices (Ziółkowski, 2013).

Another important area of research highlights various eco-innovation technologies that facilitate the transition of companies to more sustainable practices. These technologies help minimize negative environmental impacts and promote sustainable business practices. Furthermore, there is an emphasis on the need for a multidisciplinary approach to integrating eco-innovation into business processes, addressing technological, organizational, and market challenges. Recommendations for the successful implementation of these technologies include strategies that involve collaboration between different sectors and the integration of supportive government policies (Kuo & Smith, 2018). The use of digital technologies, such as artificial intelligence, is emerging as an innovative tool to promote more sustainable practices (Haller et al., 2023).

The growing interest in eco-innovation in the corporate environment is evidenced by the significant increase in scientific publications on the topic in recent years. This body of research adopts a multidisciplinary approach, showing how different disciplines contribute to developing and implementing eco-innovation practices in companies. The main areas of focus include green technologies, sustainable management practices, and regulatory policies that encourage the adoption of eco-innovation. The integration of these practices holds the potential for substantial enhancements in both the environmental and economic performance of companies, thereby fostering sustainable competitive advantage (He et al., 2018).

The current focus of research in eco-innovation is on identifying and optimizing adoption and impact drivers, emphasizing the importance of a multidisciplinary and collaborative approach. The integration of policies and the promotion of sustainable technologies are essential to advancing the global sustainability agenda, providing a solid foundation for the competitiveness and sustainable development of companies (Albino et al., 2014; Sáez-Martínez, Ferrari & Mondéjar-Jiménez, 2015).

Proposed Areas and Themes for Future Research in Eco-Innovation

Below, we propose some possibilities for future research in the field of eco-innovation. Table 1 provides a summary of research areas and themes that are important for advancing the global innovation and sustainability agenda. This table aims to offer initial and actionable guidance for researchers who wish to contribute significantly to developing and implementing eco-innovative practices. It is not an exhaustive list but rather serves as an initial starting point, providing avenues for further study and exploration. Works based on these areas and themes would be well received if submitted to the International Journal of Innovation (IJI).

Table 1

Proposed Areas and Themes for Future Research in Eco-Innovation

Search area	Future Research Topics
Eco-innovation in public policies and Governance	- Impact of subsidies and tax incentives on the adoption of eco-innovation (Khan & Idrees, 2023). - Development of favorable regulations to promote sustainable and innovative practices (Hartmann et al., 2022). - Innovation in the evaluation of integrated environmental policies and their long-term effects.
Interdisciplinary collaboration and eco-innovation	- Innovative methods to foster collaboration between distinct disciplines (Berkhout, 2011). - Innovative collaborative approaches to solving complex environmental problems. - Integration of knowledge from different fields for more effective innovations.
Innovation and Sustainable Technologies	- Identification and development of innovative technologies that minimize negative environmental impacts (Kuo & Smith, 2018). - Assessment of the impact of green and innovative technologies on the environmental and economic performance of companies. - Case studies of successful implementation of eco-innovative technologies
Assessment Methodologies in Eco-Innovation	- Development of robust and standardized methodologies for eco-innovation assessment (Ziółkowski, 2013). - Measurement of the long-term impacts of environmental innovations. - Comparison of different innovative assessment methodologies and their effectiveness.
Resistance and Barriers to Change in Eco-Innovation	- Analysis of economic, institutional, and cultural barriers to the adoption of eco-innovation (Hojnik & Ruzzier, 2016). - Innovative strategies to overcome organizational resistance to change. - Impact of high initial investments on SMEs' ability to adopt sustainable and innovative practices.
Internationalization and Eco-Innovation	- Relationship between eco-innovation and internationalization of companies (Šūmakaris, Ščeulovs & Korsakienė, 2020). - Technological capabilities and regulatory pressure as factors in the adoption of eco-innovation in international contexts. - Study of international policies that facilitate eco-innovationn.
Economic and Environmental Benefits in Eco-Innovation	- Analysis of the long-term benefits of eco-innovation in terms of social responsibility and sustainable competitiveness (Hartmann et al., 2022; Sierzchula et al., 2014). - Economic impact studies of eco-innovative practices in different sectors. - Investigation of improvements in environmental and economic performance resulting from eco-innovation.

Source: Authors (2024)

Final Remarks

Eco-innovation represents a fundamental response to global environmental challenges, providing an opportunity to align economic development with environmental sustainability. For eco-innovation to reach its full potential, researchers and professionals must adopt dynamic and collaborative approaches, widely sharing their findings and studies. The importance of collective support, especially through government subsidies, tax incentives, and favorable regulations, is essential to promote sustainable practices (Khan & Idrees, 2023).

Current research in eco-innovation highlights the need for interdisciplinary collaboration to develop effective solutions to environmental problems (Berkhout, 2011). Additionally, the creation of robust and standardized evaluation methodologies is essential to capture the multiple impacts of environmental innovations, ensuring that sustainable policies and practices can be validated and scaled up (Ziółkowski, 2013).

However, research faces significant challenges, such as economic, institutional, and cultural barriers and the need for high initial investments (Hojnik & Ruzzier, 2016). Overcoming these obstacles requires greater collaboration among governments, businesses, and academic institutions, promoting sustainable technologies and a multidisciplinary approach to research processes (Kuo & Smith, 2018).

The International Journal of Innovation (IJI) is committed to supporting and disseminating research that explores the intersection of innovation and sustainability. We invite researchers to submit their studies and findings on eco-innovation, helping advance knowledge and implement sustainable practices. Papers addressing the areas and themes highlighted in the table of this editorial commentary would be especially welcome, providing a solid foundation for the competitiveness and sustainable development of businesses.

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