

A Knowledge-Based Model for Implementing Eco-Friendly Packaging in the Iranian Cosmetics Industry

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Abstract

Purpose: To develop a comprehensive framework consolidating the body of knowledge on sustainable packaging adoption in the Iranian cosmetics and personal care industry, focusing on identifying the key dimensions and components that facilitate the acceptance and implementation of green packaging.

Methodology: An exploratory mixed-methods approach, combining qualitative and quantitative phases, was employed. The qualitative stage included a systematic review of 92 articles (2000-2025) and a fuzzy Delphi study with industry experts to define priorities. In the quantitative stage, a Delphi-based questionnaire was administered to senior managers of 194 companies. Data from 140 respondents were analyzed using structural equation modeling to validate and rank the dimensions and components.

Findings: The findings revealed that technological and environmental dimensions most strongly facilitate knowledge flow. Packaging innovations and the shift to biodegradable materials ranked highest, followed by sustainable design features such as full recyclability and circular design. Although the economic dimension—including cost-benefit analysis and return on investment—was influential, it was less prominent than the technological and environmental factors. Consumer green attitudes and managerial commitment also exerted significant supportive effects.

Conclusion: The proposed framework enables prioritization and focused attention on critical factors in sustainable packaging development and serves as a decision-making guide for managers and policymakers.

Value: The framework provides a structured approach to institutionalizing sustainable strategies within the cosmetics and personal care sector and enhances scientific clarity by identifying essential components and dimensions.

Keywords: *Environmentally friendly packaging, Sustainable packaging, Green packaging strategies, Factors affecting adoption of green packaging, Iranian cosmetics and personal care industry*

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Extended Abstract

Introduction: Sustainable packaging has become a central concern in the cosmetics and personal care industry, driven by rising environmental awareness, stricter regulations, and growing consumer demand for eco-friendly products. Companies are under pressure to integrate sustainability into their operations while ensuring economic efficiency, technological feasibility, and consumer satisfaction. In emerging markets such as Iran, sustainable packaging adoption faces barriers including limited access to knowledge, a lack of standardized frameworks, insufficient managerial guidance, and high upfront costs. Without a structured approach, organizations risk implementing fragmented strategies that fail to meet environmental and business objectives. Identifying the key dimensions and drivers of sustainable packaging adoption is therefore essential. A clear understanding of technological, economic, and environmental factors enables informed decision-making, targeted interventions, and strategies that optimize both ecological and financial outcomes—bridging the gap between theoretical knowledge and practical implementation.



Journal of
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Purpose: This study aims to develop a comprehensive framework consolidating the body of knowledge on sustainable packaging adoption in the Iranian cosmetics and personal care industry. Specifically, it seeks to identify, categorize, and validate the key factors that facilitate the acceptance, implementation, and institutionalization of green packaging strategies within organizations. The study examines technological, economic, and environmental dimensions to determine which elements exert the most significant influence on managerial decision-making and operational adoption. By constructing and empirically validating a structured model, it provides clarity on the critical components driving sustainable packaging initiatives, thereby enabling companies to prioritize resources and interventions effectively. Furthermore, the research bridges existing gaps in both literature and practice by integrating qualitative insights drawn from global and local studies with quantitative evidence collected from industry experts. This integrative approach ensures that the proposed framework is not only theoretically robust but also practically actionable, offering a valuable reference for managers, policymakers, and researchers aiming to advance sustainable packaging practices and promote environmental responsibility across the sector.

Methodology: An exploratory mixed-methods approach was employed, integrating qualitative and quantitative phases to capture both theoretical insights and empirical evidence. The qualitative phase involved a systematic review of 92 domestic and international studies (2000–2025) to identify key themes related to sustainable packaging adoption, including technological innovations, material selection, environmental impact assessment, and organizational enablers. These components were refined and validated through a fuzzy Delphi technique with industry experts across three rounds, achieving strong consensus (Kendall's $W = 0.71$). In the quantitative phase, a structured questionnaire based on the Delphi results was distributed to senior managers of 194 Tehran-based cosmetics and personal care companies, yielding 140 valid responses (a 72% response rate). Data were analyzed using structural equation modeling (SEM) in SmartPLS to assess construct validity, reliability, and the influence of each factor. This combined approach ensured that the framework was both theoretically sound and practically robust, capturing the complex interplay of technological, economic, and environmental factors in sustainable packaging adoption.

Findings: The analysis revealed three major dimensions influencing sustainable packaging adoption in the Iranian cosmetics and personal care industry: technological, environmental, and economic. The technological dimension emphasizes innovation in packaging materials, sustainable product design, and the adoption of eco-friendly production processes, highlighting the role of advanced technologies in facilitating greener operations. The environmental dimension includes comprehensive life cycle assessment, the selection of biodegradable and recyclable materials, and strict adherence to environmental standards and regulations, reflecting the necessity of aligning organizational practices with sustainability benchmarks. The economic dimension focuses on cost-benefit analysis, resource efficiency, and ensuring the long-term financial viability of green packaging initiatives, underscoring the importance of economic feasibility in strategic decision-making. Additionally, behavioral factors such as consumer attitudes, preferences, and awareness emerged as pivotal determinants that influence both organizational strategy and market acceptance. Among all identified components, sustainable design, the selection of biodegradable and recyclable materials, life cycle assessment, sustainable cost-benefit analysis, managerial commitment, and consumer attitudes were found to exert the strongest influence on adoption. These results highlight the interplay between internal organizational capabilities, external environmental pressures, and market-driven behavioral factors, providing a nuanced understanding of the conditions necessary for effective sustainable packaging implementation. Figure 1 illustrates the comparison of consensus levels across the three Delphi rounds, demonstrating the refinement and prioritization of key factors:

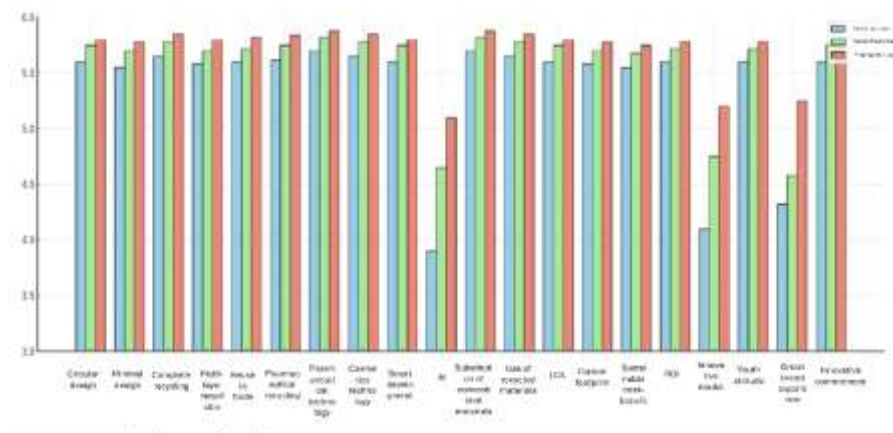


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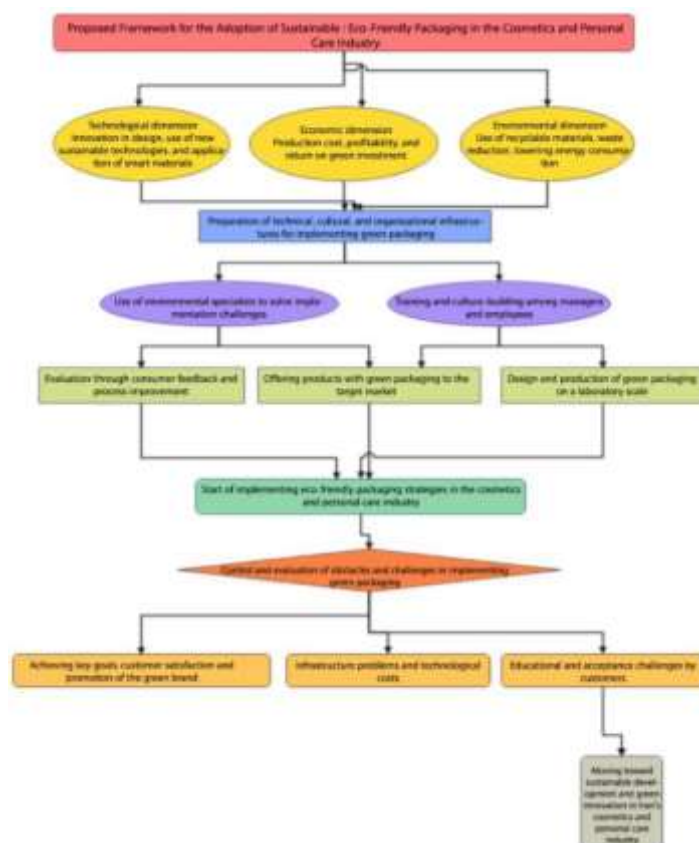


Figure 2. The proposed model

Conclusion: The proposed framework provides a structured and comprehensive approach to prioritizing and addressing the critical factors influencing sustainable packaging adoption in the cosmetics and personal care industry. By integrating insights from literature, expert consensus, and empirical data, it serves as a practical guide for managers and policymakers seeking to implement effective green packaging strategies. The framework supports strategic decision-making by identifying the most influential components, enabling organizations to allocate resources efficiently, optimize processes, and achieve both environmental and business objectives. Furthermore, it offers a foundation for continuous improvement and innovation, guiding companies toward long-term sustainability while aligning with evolving consumer expectations and regulatory requirements.

Value: This study makes a significant contribution to academic research and industry practice in the field of sustainable packaging. By presenting a validated, evidence-based model, it bridges the gap between theoretical understanding and practical implementation. The framework facilitates the institutionalization of sustainable strategies, enhances corporate environmental responsibility, and strengthens consumer trust. Moreover, it establishes a benchmark for future research and comparative studies, both within Iran and internationally, enabling the evaluation and adaptation of sustainable packaging strategies across markets. Ultimately, this research advances the broader goal of environmental sustainability in the cosmetics and personal care sector while preserving economic and operational effectiveness.

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**Journal of
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Vol 5

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**Journal of
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**Vol 5
Issue 2
Serial Number 16**

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