

Innovating Cosmetic Packaging for Sustainability: Evidence from Tunisian Consumers and 3D Printing Prototypes

Wyssal Abbassi

University of Tunis El Manar, National Engineering School of Tunis, Tunisia

Wyssal is the corresponding author, and she can be contacted at: wyssal.abbassi@enit.utm.tn

Amel Jaoua

Department of Industrial Engineering, National Engineering School of Tunis, University of Tunis El Manar, Tunisia.

Salma Essouaied

IMT Atlantique, Université Polytechnique Hauts-de-France, France

Mahdi Trojette

Laboratoires Teriak, Tunisia

Abstract

The rising demand for eco-friendly beauty products is transforming the cosmetics industry, particularly in emerging economies. This study examines the interplay of user experience and circular economy (CE) strategies in designing sustainable cosmetic packaging for Tunisia—an emerging market with unique cultural and infrastructural dynamics. Using a hybrid methodology combining qualitative research (focus groups and semi-structured interviews) with 3D printing prototyping, we developed and tested eco-friendly packaging prototypes. Findings indicate that consumer preferences in emerging markets prioritize aesthetics, convenience, and affordability over ecological concerns. While the modular packaging concept was appreciated for its practicality, further refinement is necessary to meet premium product expectations. The insights derived from this study provide strategic recommendations for local and international cosmetic brands seeking to gain a competitive edge in emerging markets.

Keywords: *Sustainable packaging, User experience, Circular economy, Emerging market, Cosmetics, Additive Manufacturing*

Introduction

The cosmetics industry faces growing demand for eco-friendly products, creating opportunities for brands that embrace sustainability through packaging, responsibly sourced ingredients, and greener manufacturing (MarketResearch, 2024). Packaging is one of the largest sources of industrial waste (Coelho et al., 2020; Jacobsen et al., 2022), particularly in food and cosmetics (Boz et al., 2020; Kaestner et al., 2023), with the problem amplified in emerging economies due to weak waste management systems (Beheshti et al., 2024). In response, companies worldwide are rethinking packaging models. The circular economy (CE) has gained prominence as a closed-loop framework emphasizing reuse, repair, and take-back schemes to minimize waste (White et al., 2025). Applying CE principles to packaging could reduce up to 80% of its environmental impact (Liu et al., 2023).

Yet, research on sustainable cosmetic packaging in emerging economies remains scarce (Lofthouse et al., 2017; Kaestner et al., 2023). Existing frameworks often overlook beauty-specific needs and fail to integrate user experience with circular principles. This study addresses these gaps by focusing on secondary cosmetic packaging and exploring three questions:

RQ1: What consumer preferences and expectations shape sustainable packaging in emerging markets?

RQ2: How can CE principles be embedded in packaging design to enhance both sustainability and user experience?

RQ3: How can additive manufacturing (AM) enable innovative packaging that improves usability and reduces environmental impact?

To answer these, we conducted an experiment at the Learning Factory 4.0 of the National Engineering School of Tunis, leveraging qualitative data and additive manufacturing (AM) technology. AM is a key enabler for this work, as its capacity for customization, waste reduction, and user-centric production aligns directly with CE goals and offers new avenues for creating eco-friendly packaging that improves usability and aesthetic appeal (Sauerwein et al., 2019; Rosa et al., 2020).

Background

Packaging plays a crucial role in the product experience, as it often represents the primary point of interaction for consumers. Research indicates that packaging design functions as a powerful marketing tool (Lofthouse et al., 2017; Kaestner et al., 2023), significantly influencing the user experience, shaping attitudes (Hussain et al., 2015; Prakash and Pathak, 2017; Steenis et al., 2017), purchasing decisions, and overall buying behavior (Rokka and Uusitalo, 2008; Hubert et al., 2013; Hussain et al., 2015). In the cosmetics industry, this is particularly evident; packaging has evolved from a passive container to an active interface that engages consumers through a deliberate fusion of sensory cues—leveraging visual appeal, tactile textures, and informational clarity to build trust and emotional connection (Sitopu and Firdaus, 2024; Almaazmi et al., 2025).

Beyond sensory considerations, sustainability has become a defining dimension of packaging design. Packaging now serves not only as a medium for interaction but also as a signal of environmental responsibility, aligning with consumers' green values. Accordingly, sustainable packaging has gained prominence in design and production (Zhu et al., 2022), pushing firms to minimize material use while clearly communicating their environmental commitments (Dangelico and Vocalelli, 2017). The deterioration of climate conditions has further accelerated ecological awareness among manufacturers and consumers, fostering the

adoption of more eco-responsible behaviors. These shifts have contributed to the development of a circular economy (CE), in which companies and consumers collaborate to rethink traditional models of production and consumption, ultimately creating closed-loop systems that minimize waste (de Jesus et al., 2018). The Ellen MacArthur Foundation (2013, p. 7) describes CE as “*an industrial system that is restorative or regenerative by intention and design*”, seeking to eliminate waste by designing products optimized for cycles of disassembly and reuse. Transitioning to circular models reflects a collective commitment to environmental preservation and more sustainable patterns of consumption and production, providing an alternative to linear “take, make, dispose” systems (Bocken et al., 2016; White et al., 2025). This transition is not only an ecological imperative but also a strategic business opportunity. Sustainable businesses can yield significant financial returns (Høgevold and Svensson, 2012). Moreover, consumers demonstrate a willingness to pay more for recyclable and eco-friendly packaging (Prakash and Pathak, 2017; Steenis et al., 2017; Mahmoud et al., 2022), motivated primarily by environmental preservation, recycling, and a sense of responsibility (Orzan et al., 2018). In emerging economies, CE principles and eco-design strategies have proven effective in fostering favorable consumer attitudes (Gaur et al., 2021), while adopting a sustainable market orientation strengthens firms’ competitiveness (Mahmoud, 2016).

Kıymalıoğlu et al. (2024) extend this discussion by applying the Stimulus-Organism-Response (SOR) framework (Mehrabian and Russell, 1974) to analyze trends in sustainable packaging research. Their findings highlight a surge of consumer-focused studies after 2021, largely driven by global regulatory changes. However, their review also identifies persistent gaps, including the dominance of European contexts and the underrepresentation of socio-cultural factors and external environmental stimuli, signaling the need for more diversified empirical research. Consistent with this, recent studies show that in the cosmetics sector, packaging design strongly influences consumers’ responses— particularly among Gen Z— through visual and tactile cues, while sustainability, functionality, and cultural appropriateness further foster loyalty and willingness to pay more for eco-friendly options in emerging and multicultural markets (Almaazmi et al., 2025). Despite these promising trends, adoption of circular practices in these markets continues to face major barriers, including weak infrastructure, limited financial resources, and insufficient educational systems (Beheshti et al., 2024). This calls for innovative solutions to support the introduction and implementation of these practices in emerging economies.

Materials and Methods

This exploratory study employs a hybrid design, integrating qualitative insights with additive manufacturing prototyping. Tunisia was chosen as a representative MENA emerging market, where the rapid growth of the cosmetics sector (Statista, 2024) contrasts with post-Arab Spring economic instability and deteriorating waste management systems (Heinrich Böll Stiftung, 2020). While the MENA region is emerging as a hub for beauty innovation and sustainability-driven demand (Euromonitor International, 2023), Tunisian cosmetics firms are upgrading packaging standards to remain competitive in domestic and international markets (MarketResearch, 2024).

The initial phase of our study involved a 90-minute focus group with eleven Gen Z participants, mostly women (9), representing a key consumer segment in the cosmetics market. While many had an engineering background, their knowledge of cosmetics use and design expectations offered valuable insights for packaging development. A female IT engineer with expertise in additive manufacturing (AM) also contributed. In the second phase, we designed the prototypes of the external cosmetic packaging based on the insights gained from the focus-group discussions. The experiment was undertaken in the Learning Factory 4.0 of the National

Engineering School of Tunis, which can simulate an e-commerce retailing context, emulating a make-to-order approach in response to customer requests. In our study, we operated under the assumption that the cylindrical items could simulate cosmetic products (e.g., facial cream pots) requiring sustainable packaging for delivery. The school's FabLab provided technical support for prototyping and production, assisting with both design refinement and 3D printing processes. The final phase consisted of conducting a series of semi-structured interviews to test the prototypes with end-users and experts. We interrogated twelve female consumers from diverse age groups (25-48) and backgrounds, and six experts, including a manager from the Tunisian Packaging Technical Centre, a representative of a luxury cosmetics group, a manager from a well-known local brand, an industrial engineer specializing in AM technologies and maker spaces, and two pharmacists. Participants were asked, among other things, to provide their perceptions of the packaging's design, functionality, sustainability, market appeal, user experience, and recommendations.

Data from the focus group and semi-structured interviews were analyzed using thematic analysis following the six-phase approach outlined by Braun and Clarke (2021).

Findings and Discussion

Phase 1: Analysis of the focus group discussions (RQ1)

As summarized in Table 1, five key themes emerged regarding participants' perceptions and expectations about sustainable secondary cosmetic packaging. The first theme highlights strong environmental concerns, with participants expressing urgency about reducing waste and addressing pollution. They emphasized recycling as a solution to waste management and resource depletion, aligning with circular economy (CE) principles. The second theme focuses on attitudes toward recycling, where participants saw it as a crucial societal practice to reduce carbon emissions and mitigate climate change, calling for its wider adoption. There were also concerns about limited infrastructure, unclear regulations, and the energy-intensive nature of recycling, with some participants questioning its long-term viability and criticizing corporate greenwashing. The third theme centers on attitudes toward current cosmetic packaging, with participants criticizing excessive and oversized secondary packaging, often seen as disposable and wasteful. They considered reducing unnecessary packaging a priority for improving product sustainability and enhancing user experience. The fourth theme relates to desired design features, including recyclability through demountable components, durability for reuse, adaptability to product size, and the use of eco-friendly materials. Participants valued packaging that is robust yet lightweight, protects product quality, and remains practical and easy to recycle. The final theme highlights the potential for reusing packaging beyond its initial purpose, with participants suggesting storage, decorative uses, gift wrapping, and DIY projects. They also discussed motivators and barriers to returning packaging. Rewards such as loyalty points, discounts, or reverse logistics options were seen as strong incentives, while time, cost, and convenience were major barriers. The participants expressed reluctance to travel or pay extra just to return packaging.

Table I. Thematic analysis of the focus group discussion

Theme	Sub-Theme	Illustrative Quotes
Environmental Awareness & Urgency	Perceived environmental crisis	<i>"We are in the middle of an environmental crisis and we must all act as individuals to reduce our negative impact on the planet."</i>
	Collective responsibility & norms	<i>"Everyone must be sensitized because this helps reduce pollution... packaging requirements should include environmental impact."</i>
Attitudes toward Recycling	Importance of recycling	<i>"Recycling allows us to reduce waste and preserve natural resources."</i>
	Skepticism and structural barriers	<i>"Big companies use recycling for greenwashing... recycling is not applicable to all materials."</i>
Perceptions of Current Cosmetic Packaging	Disposable nature of packaging	<i>"As soon as we buy it, we throw it away... I have never reused it."</i>
	Oversizing and waste	<i>"We find packaging much larger than the product, oversized compared to what we buy."</i>
	Information and communication role	<i>"The most important attribute is the ingredients... you can use QR codes instead of large texts."</i>
Expectations for Sustainable Packaging Design (UX-related)	Desirable features	<i>"It should be adjustable, demountable, robust, shockproof, and keep the product at the right temperature."</i>
	Convenience & aesthetics	<i>"If the bottle is aesthetically beautiful, we keep it and use it for creative projects."</i>
Reusable cosmetic packaging	Barriers	<i>"I am not ready to travel far to return the packaging... it costs me time and money."</i>
	Motivators	<i>"We can use this and earn points. It's a way to build loyalty and ensure consumers return packaging."</i>

Phase 2: Package Design and Prototyping (RQ2)

The packaging design process involved defining the product's dimensions, which informed material choice and package adaptability. Using SolidWorks, we developed a modular, non-monolithic prototype composed of four interchangeable components: the i) Lid, ii) Base, iii) Sides, and iv) Terminal faces (see Figure 1). This design ensures scalability, allowing the package to be assembled to hold between one and four items without oversizing.

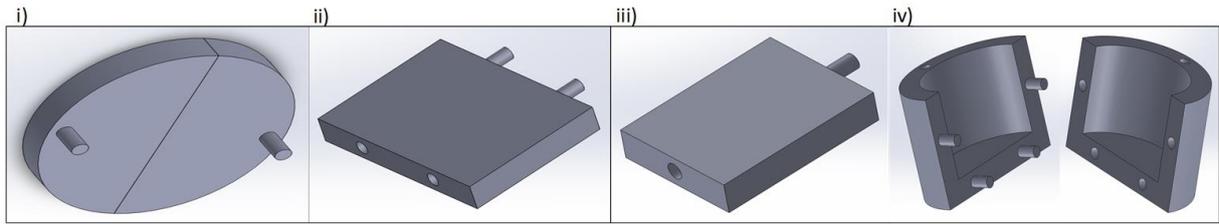


Figure 1. Package designed components

The components were 3D-printed separately and assembled to form a robust, reusable structure that can be disassembled and reconfigured for future orders. This modularity simplifies assembly, lowers costs, enhances the user experience, and maintains structural robustness. The components were then combined to meet different customer request types (Figure 2).

Capacity	Open package picture	Closed package picture
1 item		
2 items		
3 items		
4 items		

Figure 2. The designed packaging prototypes

Phase 3: Testing the prototypes (RQ3)

Interviews with consumers and experts provided detailed feedback on the prototypes and offered insights into perceptions of eco-friendly cosmetic packaging in Tunisia. Thematic analysis of the consumer sample is summarized in Table 2, with key findings and recommendations for policy and practice. Results indicate a growing awareness of sustainability, yet most participants still prioritized aesthetics, practicality, and cost over ecological considerations. Attractive design, ease of use, and potential for repurposing emerged as central drivers of purchase decisions. Barriers included weak recycling infrastructure, the perceived inconvenience of refill systems, and higher costs. Reactions to the prototypes were mixed: while many valued the innovative modular design, others criticized its lack of luxury appeal, describing the blue-and-white color scheme and shapes as evoking a “medical” feel. This echoes Magnier and Schoormans (2015), who showed that eco-packaging success significantly depends on its visual appeal, and that it must be designed to be attractive to positively impact consumer perceptions and choices. Reusability and adaptability were particularly appreciated when linked to secondary uses such as storing jewelry, accessories, or office supplies. Consumers expressed conditional openness to circular initiatives like package returns, provided tangible benefits were offered and hassle was minimized. Discounts or gifts were seen as motivators, whereas logistical difficulties and inadequate infrastructure discouraged participation. Clear recycling instructions and accessible drop-off points were identified as essential enablers.

Participants also recommended upgrading aesthetics to better align with premium cosmetics, suggesting materials such as glass, smooth textures, or wood, and colors such as gold, silver, or pink. To foster engagement, cosmetic brands should balance eco-friendliness with luxury cues, enhance functionality, and clearly communicate environmental benefits. Policymakers, in turn, must strengthen recycling infrastructure and consumer education. This aligns with Mahmoud et al. (2022), who argued that green packaging alone does not significantly influence purchasing unless firms actively educate and persuade consumers, ensuring that awareness translates into behavior.

Expert interviews reinforced these findings, highlighting both the potential of reusable cosmetic packaging and the challenges to its adoption. While experts praised the innovative, reusable concept, they also noted misalignments with current brand standards and market expectations. [*“It’s a good idea, especially because it can be reused or disassembled and even magnetized—it’s a nice concept. However, I notice that the jar inside doesn’t fit with the brands I work with”* -P1-Luxury Group].

Key challenges include integrating multi-component packaging into production, logistics, and retail systems, particularly with respect to synchronization, information management, and reverse logistics [*“this packaging consists of multiple components. To assemble it correctly, there must be synchronization between the product being delivered and the appropriate combination of components needed for the packaging. This requires an information system to support the process, making the challenge more about information management”* -P3 –Engineer].

Table II. Consumers' feedback on the prototypes

Themes	Key Insights	Recommendations for Policy and Practice
<i>Sustainability Awareness</i>		
<i>Environmental Awareness</i>	<ul style="list-style-type: none"> • Limited but growing awareness of eco-friendly packaging. • Aesthetic, practicality and cost are more critical for Tunisian consumers, often overshadowing ecological concerns. • Some participants acknowledge the importance of sustainable packaging but admit that it does not significantly influence their purchasing behaviour unless highlighted by the brand. 	<ul style="list-style-type: none"> • There is a need for increased consumer education on sustainable packaging benefits to shift purchasing behaviour. • Companies should clearly communicate the eco-friendly attributes of their packaging to increase consumer awareness. • Labels and branding should emphasize environmental benefits to influence purchasing decisions.
<i>Barriers to Sustainability</i>	<ul style="list-style-type: none"> • Practical constraints, such as cost concerns and convenience, hinder sustainable choices. • Some consumers perceive sustainable practices like refilling packaging as time-consuming. • Lack of ecological awareness in purchasing decisions • Limited infrastructure for recycling 	<ul style="list-style-type: none"> • Sustainable packaging should not compromise cost-efficiency and convenience. • Brands should focus on educating consumers about the long-term benefits of sustainable choices. • Policy makers and municipalities should invest in recycling infrastructure and standardize recycling practices
<i>User experience</i>		
<i>Key Factors in Packaging Assessment</i>	<ul style="list-style-type: none"> • Aesthetic Appeal: Many participants emphasized the importance of visual attractiveness. They expect cosmetic packaging to be elegant, refined, and modern. • Practicality: Participants indicated that packaging should be convenient for storage and organization in their vanity or travel bags. • Reusability: Reusability and recyclability are valued, especially if packaging can be repurposed. 	<ul style="list-style-type: none"> • The visual appeal of packaging must align with consumer expectations for luxury cosmetic products. • Functional and ergonomic designs should be prioritized for ease of use. • Offering versatile and reusable packaging solutions could increase perceived value. • Participants valued aesthetically pleasing and practical packaging • Refining colour schemes and shapes to align with luxury aesthetics is crucial.
<i>Positive Feedback</i>	<ul style="list-style-type: none"> • Participants valued the novelty and the originality of the packaging. • Some appreciated the aesthetic appeal of the prototype. • Modular design was praised for its functionality and practicality 	<ul style="list-style-type: none"> • Enhancing customization options (e.g., different colour choices) could attract a broader audience.
<i>Negative Feedback</i>	<ul style="list-style-type: none"> • For some participants the design lacked a luxurious or attractive look. • Some find the shape and colours unappealing. • Several participants noted that its shape and color gave it a 'medical' feel rather than aligning with cosmetics. 	<ul style="list-style-type: none"> • The modular design should be further refined to ensure practicality and elegance. • Eco-friendly packaging should be designed to align with consumer expectations of luxury and sophistication.
<i>Consumer Engagement with Circular Principles</i>		
<i>Willingness to Reuse or Recycle</i>	<ul style="list-style-type: none"> • Participants support refill and return systems, but they need to be accessible and incentivized. 	<ul style="list-style-type: none"> • Improve Recycling Infrastructure: Advocate for better waste management policies and increased recycling facilities.

	<ul style="list-style-type: none"> • Limited recycling infrastructure and high product cost sensitivity impact the adoption of sustainable packaging in Tunisia. • Participants are open to reusing or recycling packaging if it offers additional value and is convenient to return or repurpose. 	<ul style="list-style-type: none"> • Policymakers and cosmetics businesses should focus on improving recycling systems and consumer engagement strategies in Tunisia. • Ensure sustainable packaging options remain cost-competitive for local consumers. • Cosmetic brands should invest in awareness campaigns to educate consumers and promote sustainable practices in the industry. • Designing packaging with clear secondary uses and easy return mechanisms will enhance consumer engagement. • Integrating modular compartments and detachable parts enhance adaptability. • Partnering with local artisans to create upcycled products (e.g., turning packaging into decorative items) and market them as eco-luxury. • Developing refillable and returnable packaging systems could increase sustainability engagement. • Incentives such as discounts or loyalty programs) could encourage consumers to engage in sustainable behaviours. • Implementing a take-back system: Establish convenient drop-off points for packaging returns with incentives.
<i>Secondary uses for the designed packaging</i>	<ul style="list-style-type: none"> • Many consumers express interest in repurposing packaging for storage or organization • Participants suggested diverse secondary uses for the packaging, including jewellery/accessory storage, organizing small items (e.g., buttons, USB keys, hair clips), decoration or office supplies (e.g., thumbtacks, paperclips) 	
<i>Conditions for Returning the Packaging</i>	<ul style="list-style-type: none"> • Participants are more likely to return packaging if offered tangible incentives or financial rewards (discounts, refill options, or gifts). • The effort required to return packaging must be minimal; otherwise, most participants would not engage. • Developing consumer education 	
<i>Suggestions for Improvement</i>		
<i>Design & Aesthetics Aesthetic Improvements</i>	<ul style="list-style-type: none"> • Use luxurious texture to enhance visual appeal and align with cosmetic industry standards. • Move away from blue and white, as these colours were associated with medical packaging. • Preferred colours included gold, silver, pink, or black, as they align more with luxury cosmetic brands. 	<ul style="list-style-type: none"> • Balancing luxury aesthetics and practicality is crucial. • Offering multiple design variations to cater to different tastes could enhance consumer appeal. • Improving the luxury appeal and ergonomic features of ecological cosmetic packaging could increase its marketability.
<i>Materials & Functional Improvements</i>	<ul style="list-style-type: none"> • Improve the texture of the packaging, aiming for a smoother or shinier finish to improve tactile experience and for a more premium look. • Ensure the closure mechanism is airtight for better usability and product protection. • Simplify the opening and closing mechanism for easier handling. • Take into consideration other shapes such as cubic, rectangular, or compartmentalized formats to better fit various cosmetic products (e.g., mascaras, creams). 	

In Tunisia, adoption of circular solutions is further constrained by limited raw material availability and strong cost pressures. Experts emphasized that these local constraints— together with consumer skepticism toward secondary packaging—complicate the transition, even though eco-friendly packaging aligns with global trends such as refill systems and material simplification [*“We are in a country where we have no raw materials, of any kind. So, what we do today is often think about cost when creating packaging.”* P2 – Packaging Centre//*“I’ll speak about the local product that we produce. We could consider something like this, yes, as long as the cost isn’t too high.”* P4-Local cosmetics brand]. Scholars argue that in emerging markets, where economic constraints remain the main barrier, bridging the intention–behavior gap requires targeted interventions: making sustainable options more affordable and raising awareness through educational campaigns (Rani et al., 2025).

Finally, experts discussed the potential of additive manufacturing (3D printing) for sustainable packaging prototyping. They highlighted its environmental and innovation benefits, especially for iterative testing [*“We could launch a prototype like this on the market and even gather feedback. Testing it could provide insight into consumer reactions. Ultimately, it’s all about understanding the consumer’s opinion”* P4 – Local cosmetics brand], while cautioning that scalability and material recyclability must be carefully managed. In addition, advances in 3D printing enable the use of flexible, elastic fiber structures, offering potential to replace rigid components with reusable, adaptable packaging solutions [*“Another approach to explore is the flexibility of materials. Instead of rigid packaging, could we use materials like foam or rubber? ..., it is now possible to print elastic fiber structures. Could this concept be applied here maintaining the idea of reusable components but making them flexible rather than solid?”* P3 –Engineer].

Conclusions

This study examined Tunisian consumers’ perceptions of sustainable cosmetic packaging and their readiness to adopt circular solutions. Using a hybrid approach that combined qualitative insights and AM-based prototyping, we designed packaging that integrates user preferences with sustainability goals. AM technologies enable customized, single-part production (Spaltini et al., 2021) and create opportunities for co-creation with end users in emerging markets (Abbassi et al., 2022), enabling marketers to strengthen sustainable value propositions for environmentally conscious consumers. Our findings offer strategic guidance for cosmetic brands: developing user-friendly, eco-friendly packaging enhances customer experience and reduces environmental impact. Yet, effective adoption in emerging markets requires consumer education and addressing structural barriers such as weak recycling infrastructure, limited financial incentives, and low environmental awareness (Beheshti et al., 2024; Ajwani-Ramchandani et al., 2021).

As an exploratory study, this work highlights the value of involving consumers in packaging design but also underlines the need for further investigation. Material choices were limited by the filaments available in our laboratory, which did not fully align with consumers’ expectations for luxury aesthetics. Future research should expand material options to include a broader range of environmentally friendly alternatives, offering deeper insights into the balance between sustainability, functionality, and aesthetics

References

- Abbassi, W., Harmel, A., Belkahla, W., & Ben Rejeb, H. (2022). Maker movement contribution to fighting COVID-19 pandemic: insights from Tunisian FabLabs, *R&D Management*, 52(2), 343-355.
- Almaazmi, G., Alshuweihi, G., Almualla, H., & Aldandashi, A. (2025). Impact of packaging design on consumer behaviour in cosmetics, *International Journal of Science Academic Research*, 6(5), 10003-10009.
- Ajwani-Ramchandani, R., Figueira, S., Torres de Oliveira, R., Jha, S., Ramchandani, A. and Schuricht, L. (2021), "Towards a circular economy for packaging waste by using new technologies: The case of large multinationals in emerging economies", *Journal of Cleaner Production*, 281. Doi: <https://doi.org/10.1016/j.jclepro.2020.125139>.
- Beheshti, M., Amoozad Mahdiraji, H. and Rocha-Lona, L. (2024), "Transitioning drivers from linear to circular economic models: evidence of entrepreneurship in emerging nations", *Management Decision*, 62 (9), 2714-2736. <https://doi.org/10.1108/MD-02-2023-0279>.
- Bocken, N. M., De Pauw, I., Bakker, C., & Van Der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of industrial and production engineering*, 33(5), 308-320.
- Boz, Z., Korhonen, V., Koelsch Sand, C. (2020), "Consumer Considerations for the Implementation of Sustainable Packaging: A Review", *Sustainability*, 12(6), 2192. Doi: 10.3390/su12062192.
- Braun, V., & Clarke, V. (2021). Thematic analysis: A practical guide. SAGE Publications
- Coelho, P. M., Corona, B., ten Klooster, R., & Worrell, E. (2020). Sustainability of reusable packaging—Current situation and trends. *Resources, Conservation & Recycling: X*, 6, 100037.
- Dangelico, R. M., & Vocalelli, D. (2017). "Green marketing: An analysis of the literature." *Journal of Cleaner Production*, 144, 9-23.
- De Jesus, A., Antunes, P., Santos, R., & Mendonça, S. (2018). Eco-innovation in the transition to a circular economy: An analytical literature review. *Journal of Cleaner Production*, 172, 2999-3018.
- Ellen MacArthur Foundation (2013), Towards the circular economy Vol. 1: an economic and business rationale for an accelerated transition, Available at: <https://www.ellenmacarthurfoundation.org/> (Accessed: 19 February 2024).
- Gaur, J., Pandey, I., & Hungund, S. (2021). Adoption of circular economy: data-driven strategies based on empirical evidence from indian consumers. *Journal of Strategic Marketing*, 1–19. <https://doi.org/10.1080/0965254X.2021.1989014>.
- Euromonitor International (2023), Beauty and Personal Care in Middle East and Africa. Available at: <https://www.euromonitor.com> (Accessed: 15 June 2024).
- Heinrich Böll Stiftung (2020), Gestion des déchets plastiques en Tunisie: Vers une responsabilité partagée, Available at: <https://tn.boell.org/fr> (Accessed: 7 February 2025).
- Høgevold, N. M., & Svensson, G. (2012). A business sustainability model: a European case study. *Journal of Business & Industrial Marketing*, 27(2), 142-151.
- Hubert, M., Hubert, M., Florack, A., Linzmajer, M. and Kenning, P. (2013), "Neural correlates of impulsive buying tendencies during perception of product packaging", *Psychology & Marketing*, 30 (10), 861-873.
- Hussain, S., Ali, S., Ibrahim, M., Noreen, A., & Ahmad, S. (2015). Impact of product packaging on consumer perception and purchase intention. *Journal of Marketing and Consumer Research*, 10(1), 1-10.

- Jacobsen, L. F., Pedersen, S., & Thøgersen, J. (2022). Drivers of and barriers to consumers' plastic packaging waste avoidance and recycling—A systematic literature review. *Waste Management, 141*, 63-78.
- Kaestner, L., Scope, C., Neumann, N., & Woelfel, C. (2023). Sustainable circular packaging design: A systematic literature review on strategies and applications in the cosmetics industry. *Proceedings of the Design Society, 3*, 3265-3274.
- Kıymalıoğlu, A., Yetkiän Özbük, R. M., Aydın Ünal, D., Dirlik, O., & Akar, N. (2024). Unpacking Sustainable Packaging Through the Stimulus-Organism-Response Model: A Systematic Literature Review. *SAGE Open, 14*(4).
- Liu, W., Zhu, Z., & Ye, S. (2023). A Framework Towards Design for Circular Packaging (DfCP): Design Knowledge, Challenges and Opportunities. *Circular Economy and Sustainability, 3*(4), 2109-2125.
- Lofthouse, V., Trimmingham, R., & Bhamra, T. (2017). Reinventing refills: guidelines for design. *Packaging Technology and Science, 30*(12), 809-818.
- Magnier, L., & Schoormans, J. (2015). Consumer reactions to sustainable packaging: The interplay of visual appearance, verbal claim and environmental concern. *Journal of Environmental Psychology, 44*, 53-62.
- Mahmoud, M. A. (2016). Sustainable market orientation: a competitive strategic tool in an emerging economy context. *Journal of Strategic Marketing, 24*(7), 635-654. DOI:10.1080/0965254X.2016.1149210.
- Mahmoud, M. A., Tsetse, E. K. K., Tulasi, E. E., & Muddey, D. K. (2022). Green packaging, environmental awareness, willingness to pay and consumers' purchase decisions. *Sustainability, 14*(23), 16091.
- MarketResearch (2024), *Mass Beauty and Personal Care in Tunisia*. Available at: <https://www.marketresearch.com/> (Accessed: 5 August 2024).
- Mehrabian A., & Russell J. A. (1974). *An approach to environmental psychology*. MIT Press.
- Orzan, G., Cruceru, A. F., Bălăceanu, C. T., & Chivu, R.-G. (2018). Consumers' behavior concerning sustainable packaging: An exploratory study on Romanian consumers. *Sustainability, 10*(6), 1787.
- Prakash, G. and Pathak, P. (2017), "Intention to buy eco-friendly packaged products among young consumers of India: a study on developing nation", *Journal of Cleaner Production, 141*, 385–393. Doi: 10.1016/j.jclepro.2016.09.116.
- Rani, M. N., Poondla, M., Nikhade, N., & Krishna, H. (2025). Impact of Sustainable Packaging on Consumer Purchase Intention. *Academy of Marketing Studies Journal, 29*(4), 1-16.
- Rosa, P., Sassanelli, C., Urbinati, A., Chiaroni, D., & Terzi, S. (2020). Assessing relations between Circular Economy and Industry 4.0: a systematic literature review. *International Journal of Production Research, 58*(6), 1662-1687.
- Rokka J., Uusitalo L. (2008). Preference for green packaging in consumer product choices – Do consumers care? *International Journal of Consumer Studies, 32*(5), 516–525. <https://doi.org/10.1111/j.1470-6431.2008.00710.x>
- Sauerwein, M., Doubrovski, E., Balkenende, R., & Bakker, C. (2019). Exploring the potential of additive manufacturing for product design in a circular economy. *Journal of Cleaner Production, 226*, 1138-1149.
- Spaltini, M., Poletti, A., Acerbi, F., & Taisch, M. (2021). A quantitative framework for Industry 4.0 enabled Circular Economy. *Procedia Cirp, 98*, 115-120.
- Statista (2024), *Beauty & Personal Care -Tunisia*, Available at: <https://www.statista.com/> (Accessed: 5 August 2024).
- Steenis, N. D., Van Herpen, E., Van Der Lans, I. A., Ligthart, T. N., & Van Trijp, H. C. (2017). Consumer response to packaging design: The role of packaging materials and graphics

- in sustainability perceptions and product evaluations. *Journal of Cleaner Production*, 162, 286-298.
- Sitopu, J. W., & Firdaus, A. (2024). Analyzing the impact of packaging design on consumer purchasing decisions in the cosmetics industry. *Journal on Economics, Management and Business Technology*, 3(1), 1-8.
- Zhu, Z., Liu, W., Ye, S., & Batista, L. (2022). Packaging design for the circular economy: A systematic review. *Sustainable Production and Consumption*, 32, 817-832.