

## BUSINESS ANTIFRAGILITY STRATEGIES IN THE COSMETICS INDUSTRY: MODELING DECISION-MAKING UNDER UNCERTAINTY

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**Iulia IVAȘCENCO**  
Academy of Economic Studies of Moldova  
Chisinau, Republic of Moldova  
[jivascenco@gmail.com](mailto:jivascenco@gmail.com)  
ORCID ID: 0009-0005-2427-289X

**Abstract:** *This paper investigates how antifragility strategies can be developed and applied within the cosmetics industry to turn volatility into a driver of growth. The aim is to provide a structured antifragility model for firms in emerging markets, particularly Moldova. The study draws on secondary data and cross-case analysis of international companies such as L'Oréal, Estée Lauder, Shiseido, and Coty, examining their responses to crises like the COVID-19 pandemic. Methodologically, the paper employs comparative synthesis and scenario-based evaluation to identify common resilience and transformation patterns. The proposed model integrates digital transformation, diversification, supply chain redundancy, and real-time consumer feedback. Findings reveal that antifragile firms do not merely recover from disruption, they strengthen their position by institutionalizing adaptability, stakeholder learning loops, and proactive innovation. For cosmetics businesses in developing economies, the model offers actionable guidance for embedding antifragility into strategy and operations. It supports decision-making under uncertainty by offering flexible tools that align with resource constraints, enabling sustainable growth in a turbulent global environment.*

**Key words:** *antifragility, decision-making, uncertainty, cosmetics industry, digital transformation*

**JEL:** M10, L21, O31, Q01

### 1. Introduction

The cosmetics industry operates at the intersection of innovation, consumer behavior, and economic turbulence. As one of the most brand-sensitive and rapidly evolving global sectors, it is continuously influenced by shifting consumer preferences, regulatory developments, and technological advances. The COVID-19 pandemic further intensified these dynamics, forcing companies to reassess their operational strategies, value chains, and engagement models.

Leading firms such as L'Oréal and Shiseido not only resisted the disruptive impacts of the crisis but exemplified antifragility by leveraging uncertainty as a platform for strategic reinvention (Ivașenco, 2022; Ivașenco, 2025). Their adoption of AI-based skincare diagnostics, virtual beauty consultations, and direct-to-consumer channels set new standards for agility and innovation.

This paper builds on the concept of antifragility, as articulated by Taleb (2012), and further supported by research into antifragility in Moldovan business conditions (Ivașenco, 2023). Unlike traditional resilience, which focuses on survival and recovery, antifragility suggests that organizations can thrive through stressors and volatility, evolving into more adaptive and robust systems. The paper positions antifragility as a superior strategic orientation, especially in turbulent markets where linear growth trajectories are rare and disruption is constant.

This research aims to develop a sector-specific antifragility model for the cosmetics industry and adapt it for practical implementation in emerging markets. The specific objectives are: to identify strategic responses to uncertainty among leading global cosmetics firms, to construct a four-layer antifragility model, and to explore its applicability for SMEs in Moldova through tailored recommendations.

### 2. Antifragile Business Design

#### 2.1 Foundations of Antifragile Business Design

The proposed framework for antifragile strategy in the cosmetics industry stems from three mutually reinforcing domains: strategic agility, sustainability-driven innovation, and uncertainty-oriented

decision-making systems. Strategic agility denotes a firm's ability to reallocate resources swiftly, pivot marketing approaches, and reconfigure supply chains in response to market shocks. This agility is not merely operational but deeply embedded into corporate culture, supported by leadership that embraces experimentation and rapid response mechanisms (Taleb, 2012).

Sustainability, once considered a branding advantage, is now integral to long-term competitiveness. Antifragile firms embed environmental, social, and governance (ESG) principles directly into their product design and supply network architecture. Brands like Shiseido have pioneered biomaterial packaging and clean product formulas not simply to comply with regulatory expectations, but to capture shifting consumer sentiment toward ethical consumption (Estée Lauder Companies, 2021; L'Oréal, 2021).

**Table 1. Strategic Responses of Four Global Cosmetics Companies**

Company	Agility Practices	Sustainability Initiatives	Crisis Responses (2020–2023)
L'Oréal	Fast digital product rollouts	Refillable packaging	Regionalized manufacturing
Estée Lauder	Agile team restructuring	ESG-integrated R&D	Home-care product pivot
Coty	Influencer-led testing	Circular economy initiatives	Streamlined supply networks
Shiseido	AI-powered diagnostics	Biomaterial innovation	Localized brand storytelling

*Source: elaborated by the author.*

Decision-making under uncertainty, the third pillar, involves cultivating a culture of iterative feedback and scenario testing. Rather than rely on rigid, long-range forecasts, antifragile companies incorporate adaptive intelligence: real-time analytics, micro-testing of marketing campaigns, and predictive modeling that accounts for multiple possible futures. These systems position companies not to avoid volatility, but to profit from it by moving faster than the competition when the landscape shifts (Taleb, 2012).

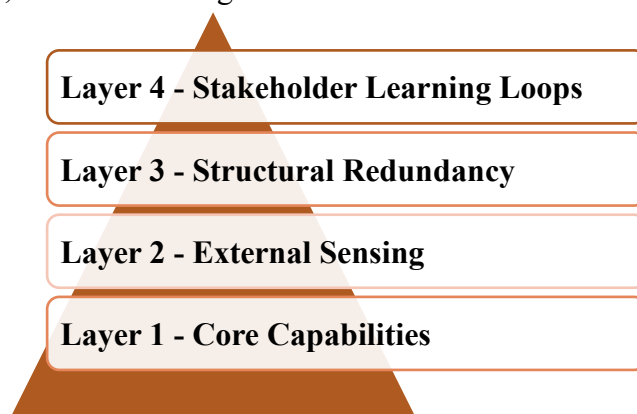
## 2.2 The Author's Model of Antifragility in Cosmetics

Drawing on a thematic synthesis of strategic responses employed by L'Oréal, Estée Lauder, Coty, and Shiseido (for more details, see Table 1), a comprehensive, four-layered antifragility framework has been developed. This model integrates functional, structural, and strategic mechanisms that allow cosmetics firms not just to endure crises, but to systematically grow stronger as a result of volatility. Each layer functions as a dynamic capability that enhances organizational adaptability and innovation capacity, particularly in complex, uncertain environments.

**Layer 1. Core Capabilities.** This foundational layer refers to the internal competencies that enable agile responses to market shifts. These include agile leadership, defined by distributed decision-making, rapid communication flows, and crisis-responsive vision. Modular product development is another essential element, allowing companies to iterate quickly, swap components in response to supply issues, and align products with emergent trends. For example, Estée Lauder rapidly shifted its R&D focus toward skincare and wellness during the COVID-19 pandemic, responding to increased consumer demand for home-based self-care solutions. In this model, core capabilities also extend to data-driven marketing and cross-functional collaboration, enhancing a firm's reflexes in times of turbulence.

**Layer 2. External Sensing.** This layer is concerned with the capacity to identify, interpret, and act upon early signals from the external environment. External sensing encompasses environmental scanning, AI-enhanced trend monitoring, and social listening across platforms like TikTok, Instagram, and YouTube. Shiseido, for instance, invests heavily in real-time consumer analytics and

ethnographic insights to detect shifting beauty norms, particularly among Gen Z in East Asia. Regulatory sensing is also a key function, companies must stay ahead of evolving legislation in areas like microplastic bans, animal testing regulations, and carbon disclosures. This layer correlates to “peripheral visioning,” a strategic foresight capability essential for pre-emptive adaptation. When functioning effectively, this layer ensures firms are not reactive but are proactively aligning with the direction of macro, meso, and micro changes.



**Figure 1. Four-Layer Antifragility Model for Cosmetics Firms**

*Source: elaborated by the author.*

**Layer 3. Structural Redundancy.** Structural redundancy refers to a firm's built-in capacity buffers and system redundancies that allow it to withstand shocks without operational paralysis. These include diversification of product lines (e.g., expanding from color cosmetics to wellness supplements), cross-regional supply hubs, multiple sourcing options, and flexible logistics arrangements. L'Oréal and Coty have adopted this approach through multisite manufacturing and dual-supplier strategies, thereby mitigating regional disruptions like Brexit or pandemic-related lockdowns. In antifragility theory, this layer maps to “redundant optionality,” which prioritizes robustness through parallel resources and decentralized infrastructures. It serves as the mechanical backbone of the antifragile enterprise, absorbing shocks and redistributing capacity in real-time.

**Layer 4. Stakeholder Learning Loops.** The final and most integrative layer involves embedding learning mechanisms within and across stakeholder networks. This encompasses real-time consumer feedback loops, post-crisis reviews, ecosystem mapping, and co-creation initiatives with suppliers, customers, and even competitors. Coty, for example, uses digital dashboards to track customer sentiment and influencer resonance on a weekly basis, adjusting messaging and product emphasis accordingly. Furthermore, learning is not limited to external audiences; internal learning, via team debriefs, employee suggestion systems, and training during crises, is equally important. This layer operationalizes the “iterative resilience engine”, where antifragility is achieved through continuous improvement and feedback-informed recalibration. It transforms turbulence into insight and insight into capability.

Collectively, these four layers form an interdependent architecture that allows firms to not merely bounce back but bounce forward. Volatility is not treated as an anomaly but as a developmental input. This antifragile model aligns with the core premise that learning, optionality, sensing, and adaptability should not exist in isolation, but be systemically embedded into the firm's strategic DNA. This integration makes the organization more flexible, faster, and better equipped to turn each disruption into an innovation inflection point (Procter & Gamble, 2022).

### **2.3 Decision-Making Under Uncertainty**

Traditional models of corporate planning assume a relatively stable environment with linear growth, gradual shifts in consumer demand, and relatively predictable supply chains. However, in the modern global economy, shaped by geopolitical uncertainty, rapid technological evolution, and volatile

consumer behavior, this assumption no longer holds. Decision-making processes that rely heavily on long-term forecasting and centralized authority can become bottlenecks during fast-evolving crises. Consequently, antifragile organizations adopt a fundamentally different mindset: one that embraces uncertainty not as a risk to be minimized but as a resource for strategic advantage (Taleb, 2012).

Antifragile decision-making begins with the cultivation of probabilistic thinking and scenario analysis. Rather than adhering to a single strategic plan, firms prepare for multiple plausible futures. This involves developing contingency plans, stress-testing strategies under extreme scenarios, and building dynamic response frameworks. L'Oréal, for example, used multi-scenario planning during the COVID-19 pandemic to address disruptions in retail, logistics, and global supply chains (L'Oréal, 2021). These included digital acceleration initiatives, reallocation of marketing budgets, and regionalized production adjustments.

Another pillar of antifragile decision-making is strategic optionality. This involves maintaining a portfolio of options, parallel suppliers, diversified sales platforms (brick-and-mortar, direct-to-consumer, third-party marketplaces), and modular product configurations, that can be activated as conditions change. This principle has been embedded in operations at firms like Procter & Gamble, which strategically decentralizes manufacturing and logistics capabilities to allow swift pivoting in the face of disruption (Procter & Gamble, 2022).

Importantly, decision-making speed and accuracy are amplified through real-time intelligence. Companies increasingly rely on digital dashboards, predictive analytics, and AI-powered tools to monitor key performance indicators, market sentiment, and external risks. These digital capabilities shorten decision cycles and support timely interventions, transforming reactive decision-making into anticipatory, data-informed actions. Internally, these tools allow leaders to visualize the health of their operations at a granular level and test small-scale interventions before scaling them.

Organizational culture plays a defining role in how uncertainty is addressed. Firms that reward initiative, tolerate intelligent failure, and encourage experimentation are better equipped to navigate complexity. This adaptive culture empowers local teams to respond directly to changing circumstances without waiting for approval from the top, reducing inertia. Estée Lauder, for instance, created agile response teams during the pandemic to handle region-specific issues independently, improving responsiveness and resilience.

Moreover, antifragile decision-making is inherently iterative. It thrives on feedback loops and learning from action. Firms must institutionalize post-crisis reviews, operational retrospectives, and real-time feedback systems to refine their responses over time. This process not only builds decision-making capacity but enhances the firm's memory of past shocks, enabling it to recognize patterns and react more quickly in the future.

Ultimately, antifragile decision-making combines strategic foresight, structural flexibility, data-driven responsiveness, and a supportive organizational culture. It is not a fixed set of policies but a living system that evolves through continuous learning and adaptation. In volatile and resource-constrained contexts such as the Republic of Moldova, this approach is particularly vital, it allows firms to be small but smart, constrained but creative, and unstable yet steadily improving.

## **2.4 Practical Implications for Emerging Markets**

Emerging markets like the Republic of Moldova face a complex interplay of structural constraints and developmental opportunities. Unlike developed economies, where organizations typically have access to stable infrastructures and robust institutional support, businesses in emerging markets often must navigate regulatory uncertainty, capital scarcity, underdeveloped digital ecosystems, and skill gaps. In such an environment, antifragility offers a powerful lens through which to reframe these challenges as potential strengths. By embedding adaptability, innovation, and decentralization into business strategies, cosmetic firms can convert environmental volatility into a driver of growth.

Antifragility in emerging economies begins with contextual awareness. For Moldovan firms, this means aligning business models with national development strategies, leveraging local biodiversity

for raw materials, and tapping into regional trade agreements for export diversification. Practical implications are explored below across several critical domains.

**Digital Transformation as a Low-Cost Antifragility Lever.** Contrary to popular belief, digitalization does not always require massive capital investments. Moldovan SMEs can deploy cloud-based platforms, no-code websites, AI-driven social media tools, and customer relationship management (CRM) software at very low cost. Platforms such as Shopify, WhatsApp Business, and Canva offer affordable, scalable solutions that allow real-time communication with customers, rapid deployment of promotions, and personalized engagement. In addition to e-commerce, digitalization also supports antifragility by enabling remote team collaboration, inventory tracking, and customer analytics, all of which reduce the business's dependence on physical infrastructure and increase its strategic optionality (International Trade Centre, 2022).

**Diversification of Revenue Streams and Product Portfolios.** In resource-constrained environments, diversifying product offerings allows firms to hedge against unpredictable demand. Moldovan cosmetic firms can experiment with expanding into adjacent markets such as herbal remedies, aromatherapy, or skincare for different age groups and skin types. Local climate and soil conditions provide access to unique botanical ingredients (e.g., lavender, honey, rosehip oil) that can be positioned for both mass-market and premium segments. Furthermore, diversification in packaging formats (e.g., travel-size products, refill stations) creates optionality in consumer behavior and distribution strategies. Resilience grows as firms reduce reliance on any single product, market, or season.

**Sustainability as Strategic Differentiator.** Sustainability is no longer a niche expectation; it is a core competitive requirement. Moldovan cosmetic businesses can build antifragility by embedding sustainability across their value chain. This includes sourcing from local regenerative farms, adopting biodegradable packaging, reducing water usage in formulations, and participating in circular economy practices. These initiatives not only reduce operational risks from future regulation but also open new consumer segments aligned with ethical consumption. As the clean beauty trend continues to grow, firms that embed environmental and social governance early will be better positioned for future scale and export readiness (NielsenIQ, 2023).

**Localization of Value Chains and Supplier Redundancy.** Localizing inputs provides firms with greater control over their operations, while also building economic resilience within their communities. By identifying multiple local or regional suppliers for key ingredients and packaging materials, companies can reduce vulnerability to international shipping delays or currency fluctuations. Establishing relationships with agricultural cooperatives and rural processing facilities enables dual benefits: stabilizing rural incomes and reducing firms' own exposure to upstream disruptions. Moreover, firms that maintain short supply chains benefit from faster lead times and enhanced traceability, both valued by modern consumers and regulators alike (GIZ, 2023).

**Access to Finance and Alternative Capital Models.** Given that traditional bank loans often remain inaccessible to SMEs in Moldova, antifragility demands experimentation with alternative financing mechanisms. Blended finance, crowdfunding, and microfinancing platforms provide ways to raise funds while building community buy-in. For instance, pre-sales through Kickstarter campaigns or local gifting cooperatives not only generate capital but validate market demand before scaling. Firms can also engage with impact investors, diaspora networks, or development partners like the EBRD and EU4Business, which offer grants for digital and green innovation (EBRD, 2020).

**Workforce Upskilling and Talent Adaptability.** Antifragile firms prioritize workforce resilience. In Moldova, this means upskilling employees not only in product formulation or sales, but in digital literacy, sustainability compliance, and crisis response. Modular training programs, offered in partnership with vocational schools or online platforms, can provide practical skills for content creation, customer service automation, or e-commerce operations. Investing in people generates agility: employees who can pivot roles, generate ideas, and troubleshoot are essential assets during volatile periods. This human capital flexibility mirrors the adaptive business structures at the core of antifragility theory.



**Public-Private Collaboration and Policy Engagement.** A critical yet underutilized strategy in emerging markets is proactive policy collaboration. Firms that engage in shaping local regulations, through chambers of commerce, innovation clusters, or export alliances, gain foresight and influence over the frameworks that govern their operations. They also gain early access to support instruments, such as tax incentives, grants, and technical assistance. Countries like Romania and Estonia have demonstrated that coordinated innovation hubs (e.g., bioeconomy parks, digital accelerators) can catalyze SME growth. Moldova can replicate these models with public-private investments in R&D labs, co-manufacturing spaces, and clean technology zones.

**Consumer Co-Creation and Cultural Alignment.** In an era of fragmented attention and identity-driven consumption, co-creating products with users generates relevance, loyalty, and resilience. Moldovan brands can integrate customer feedback through online polls, open test panels, or participatory social campaigns that invite customers to suggest ingredients, names, or packaging. This also enables continuous adaptation, every product becomes an experiment, every launch an opportunity for learning. Cultural alignment further enhances brand value: by incorporating traditional motifs, historical remedies, or regional languages into branding, companies anchor their identity in local pride while offering authenticity to foreign buyers. Such deep cultural resonance creates emotional antifragility, fostering community defense against market or reputational shocks. The application of antifragility principles in emerging markets is not an abstract ideal—it is a pragmatic roadmap for firms operating with constraints. Moldovan cosmetic companies can build agile, resilient, and adaptive businesses by integrating digital tools, diversifying their offers, localizing operations, embracing sustainability, and investing in human capital.

**Table 2. Practical Antifragility Tools for Moldovan SMEs**

Category	Tool/Strategy	Cost Impact	Resilience Benefit
Digitalization	WhatsApp Business, Canva, Google Workspace, Zoho CRM, AI-assisted product testing	Low	Rapid feedback, workflow automation
Finance	Crowdfunding (Seedrs, Kickstarter), EU4Business, blended finance, micro-loans	Medium	Diversified capital access, cash flow stability
Supply chain	Local ingredient sourcing, dual suppliers, regional packaging providers	Low-medium	Supply continuity, import independence
Workforce	Online upskilling (Coursera, Udemy), cross-functional training, agile teams	Low	Increased flexibility, rapid role reallocation
Product development	Modular formulations, low-batch production, open innovation with users	Low-medium	Rapid iteration, market-responsive innovation
Marketing	Influencer micro-campaigns, TikTok/Instagram reels, co-created branding	Low	Adaptive consumer engagement strategies
Distribution	Multichannel retail (own e-shop, marketplaces, offline pop-ups)	Medium	Sales channel redundancy
Policy and networks	Chamber of commerce partnerships, innovation hubs, public-private clusters	Low	Early policy adaptation, collective advocacy

*Source: elaborated by the author.*

When these strategies are supported by smart finance and public-private collaboration, even micro-enterprises can respond creatively to volatility. In doing so, they not only secure their position in the domestic market but evolve into regional innovation leaders, using every disruption as a catalyst for long-term transformation.

### 3. Conclusions

This paper contributes to the growing literature on antifragility by applying its core principles within the high-volatility environment of the global cosmetics industry. Through analysis of four multinational firms and the design of a layered model, we find that antifragility is not only achievable but essential in consumer-driven, innovation-sensitive sectors.

The model provides a practical foundation for SMEs in Moldova to rethink how they prepare for, absorb, and ultimately benefit from disruption. Antifragile thinking reframes resource constraints as innovation catalysts and enables companies to design organizations that learn faster, respond earlier, and adapt continuously.

*Practical Recommendations for Moldovan SMEs:* begin with low-cost digital tools to build consumer feedback loops (e.g., Instagram, Canva); partner with agricultural co-ops to source resilient, local ingredients; explore non-traditional funding such as diaspora support or blended finance grants; train employees in multiple roles to increase internal flexibility; engage with policymakers via business associations to co-create supportive innovation policies.

These recommendations demonstrate that antifragility is not reserved for large corporations—it is an accessible and scalable mindset that can empower even micro-enterprises to thrive through uncertainty.

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