

Enabling Sustainable Innovation in Fashion through Crafted Material Remediation

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1. Introduction

This paper proposes to study the use of fashion as an instigator of sustainable innovation. Through an analysis of the methodologies of creation and distribution of selected fashion accessories collections, it sheds light on the exploration of **material remediation as a catalyst for sustainable development**. Featuring four case studies of collections by fashion brand Vanina¹, the paper investigates the importance of **cross-disciplinary design frameworks** and **social entrepreneurship models** to accelerate sustainable innovation. Led in collaboration with non-governmental organizations focusing on waste management, women empowerment, education, and assistance to displaced persons, the collections selected include: (1) the 'Delicatesse' evening bags repurposing non-recyclable food packets through a process of handcrafted origami and parametric digital laser cutting, (2) the 'Conserved' collection developed as a capacity building project within refugee camps in Lebanon, (3) the 'Leaves' jewellery series exploring waste-based sustainable 3d-printing, and (4) the 'Les Éternelles' evening bags transforming plastic waste into a versatile marble-like texture. Each of these collections presents a different framework and allows to extract guidelines to enable material innovation, ethical production and sustainable manufacturing in a fast-paced fashion market.

¹ Vanina is a fashion brand co-founded in Beirut in 2007 by Joanne Hayek and Tatiana Fayad. Handcrafted in Lebanon and distributed internationally, the brand operates as a social enterprise aiming to use fashion as a tool for social and environmental change. The Vanina collections feature material remediation concepts and ethical production methods.

2. Material Remediation as Catalyst for Sustainable Development

2.1. Environmental Impact: Repurposing Non-Recyclable Waste through Crafted Luxury

*Add quotation about this

Fashion has the potential to tackle waste management through the use of upcycling. This practice extends beyond the traditional materials used in fashion products, such as textile and leather, to incorporate byproducts of everyday consumption that currently present a threat to the environment. Through the creative economy, particularly fashion luxury, discarded packaging elements that are usually considered too costly to recycle can be repurposed in a sustainable way. The collection of evening bags 'Délicatesse' exemplifies this idea. It is created using non-recyclable food packets: chips bags, which are consumed and discarded regularly, are considered too costly to be recycled due to the mix of aluminum and plastic layers that they are composed of. Once discarded, these packets usually end up in landfills or incinerators, presenting various threats to the environment. 'Délicatesse' tackles this issue through the creation of an alternative waste management system, turning discarded chips bags into luxury pieces. Through the development of a specific material transformation process of digital fabrication followed by handwoven origami, the brand was able to achieve material remediation: each 'Délicatesse' bag diverts between 10 to 32 discarded packets away from landfills.



Figure 1: 'Délicatesse' bag by Vanina: the Vol-Au-Vent style, closed and open. Images by Marya Ghazzaoui, courtesy of Vanina.

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This process of transformation is paired with a waste collection system that was enabled through a collaboration between the brand Vanina and the non-governmental organization (NGO) Arcenciel, whose environmental program tackles the waste issues of the country. Lebanon, the brand's home country, suffers from alarming pollution levels and lacks proper waste management infrastructure. By addressing the issue at a community level, at the scale of a neighborhood, the collection allowed to establish parallel waste collection systems, while raising awareness about the need to value waste and promote circular economy models. On a more global level, the line aims to raise awareness about this latent issue of the food industry. The 'Délicatesse' products, which were produced locally in Beirut in 2019 and shipped internationally through partnership with Net-A-Porter's sustainability platform Net-Sustain, were accompanied by a card with a message explaining the concept, materiality, and message behind the collection.

As seen in this case study, fashion presents an opportunity to offer alternative solutions to some of the current environmental challenges, while shedding light on some alarming consumption issues that require systemic change. In this particular case, approaching fashion design through cross-disciplinarity was key to enabling sustainable innovation through a zero-waste transformation of the material (as detailed in paragraph 3.1). Furthermore, the mix of the traditional craftsmanship techniques of origami, hand-sewing, and pleating, with the emerging technologies of parametric design and digital fabrication presents the opportunity to revalue problematic waste and repurpose it as a luxury material (as detailed in paragraph 3.2). And finally, the social entrepreneurship model of the brand, bridging between local non-governmental organizations and international luxury retailers is instrumental to enabling, accelerating, and scaling sustainable impact through high-end fashion.

2.2. Social Impact: Community Development through the Valorisation of Craftsmanship

Parallely to the repurposing of non-recyclable waste, the 'Délicatesse' collection engages community development through training and job creation in handcraft. With the help of its partnership with the local NGOs Arcenciel and La Voix de la Femme, the brand opened the door to women and men of different age groups and backgrounds, who had no particular experience in manufacturing, yet aspired to economic independence through work. This inclusive recruitment model allows the promotion of inclusivity through capacity-building: individuals recruited progressively evolve from apprentice to master artisan. The artisans, the majority of whom are women, can choose to work at their homes, at their private workshops, or at the brand's main atelier. This flexibility allows mothers and caregivers to be able to manage work in parallel with family duties and to adapt their work schedule to their other responsibilities.

Parallel to the artisans training model, the brand also works with experienced artisans that have learned traditional crafts from past generations and older family members, and practice them from their own workshops and micro-enterprises. As a consequence of the severity of the local economic crisis that has hit Lebanon in recent years, and competition from imported mass-produced goods,

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these crafts and livelihoods are threatened to disappear. Vanina's decentralized local manufacturing network, which has grown organically over the years and counts today more than 70 people involved in handcraft, aims to tackle this threat by promoting the valorization of craftsmanship and supporting sustainable micro-entrepreneurship.

Furthermore, in parallel to the economic development aspect, the decentralization of the manufacturing of the brand aims to impact the local community by fostering social cohesion. Lebanon is characterized by the co-habitation of communities: different religions and different origins. It is home to around 18 different religious sects, and counts the largest ratio of refugees per capita². In this particular eclectic social context, decentralized local production models contribute to enhancing social cohesion by creating cross-communitarian ties. Vanina's main atelier serves as a hub of creation where women from different backgrounds, origins and religions, collaborate regularly.



Figure 2: Picture of behind the scenes (Aisha + Norma). Photos by Marya Ghazzaoui; courtesy of Vanina.

The cohesion aspect also aims to tie the urban and rural areas of Lebanon. The project 'Conserved'³ exemplifies this idea. Created in partnership with NGO SDAID, Sawa for Development and Aid, it enabled the creation of a Vanina workshop in the rural area of the Beqaa between 2015 and 2017, and involved training and job creation of vulnerable communities that had found refuge in Lebanon to escape the war in their home country Syria. Also based on upcycling of packaging of processed food, conserved proposed to transform used tin-cans into a variety of handcrafted fashion jewelry and bags (Figures 3 and 4). The collection sheds light on the potential of fashion to engage community development through sustainable humanitarian action.

² Estimated at 1 refugee for every 4 nationals in 2022 based on OCHA's statistics.[online] Available: <https://www.unocha.org/lebanon/about-ocha-lebanon> [15 January 2023]

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Figure 3: 'Conserved collection': process and jewelry samples.

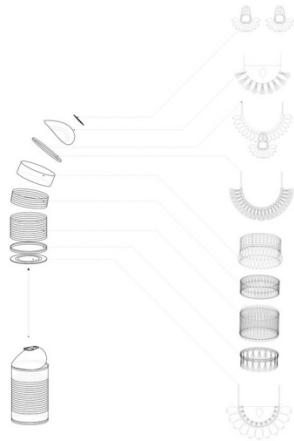


Figure 4: 'Conserved collection': the transformation of one tin can into bases for multiple accessories.

3. Accelerating Sustainable Innovation through Fashion Luxury

3.1. Instigating Cross-Disciplinary Sustainable Research and Development

As exemplified by 'Délicatesse', approaching fashion design through cross-disciplinary methodologies helps lead to sustainable innovation. The technique of material transformation of 'Délicatesse' for instance uses a parametric design software, Grasshopper for Rhino, usually used in architecture, to algorithmically generate laser cutting files that adapt to the varying sizes of collected food packets, thus allowing to achieve a process of zero-waste repurposing of non-recyclable waste.

The other case study, 'Les Éternelles', highlights the importance of investing in research and development (R&D) to achieve sustainable materiality in fashion. This R&D effort, instigated by the brand, can also contribute to the establishment of sustainable practices and waste management methods that could be used beyond the scope of fashion. 'Les Éternelles' collection is the result of several years of cross-disciplinary experimentations by Vanina, in collaboration with local artisans and manufacturers. Transforming discarded plastic into a new marble-like texture (as seen in figure 5), the material transformation was implemented in partnership with local artisans in their local workshop, operating as an independent micro-enterprise. Given the success of the collaboratively developed technique, the artisans shared with the brand that they have the ambition to personally expand this transformation process beyond fashion, with the creation of furniture and product design. This

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proposal of a new application was supported by the brand, to further enable the independence of the artisans and maximize the impact of the material remediation technique developed.



Figure 5: Extract of bags from 'Les Eternelles' collection by Vanina featuring the handcrafted transformation of waste plastic into a new marbled-like lightweight texture. Photos by Marya Ghazzaoui; courtesy of Vanina.

And finally, another instigator to sustainable innovation that is particular to the fashion industry is its global seasonal calendar of distribution, which encourages brands to innovate and propose new concepts and collections frequently. For instance, Vanina releases new collections four times a year, scheduled in parallel with wholesale markets and presentations in Paris. This speed of change can be a catalyst of sustainable innovation, particularly when supported by a social entrepreneurship model that allows to invest in research and development to prioritize impact through innovation.

3.2. New Craftsmanship: Merging Emerging Technologies with Traditional Handcraft

As seen in the 'Delicatessen' collection, the use of emerging technology in tandem with traditional crafts enables the transformation of problematic waste into material for luxury. The cutting of the

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packets using digital fabrication, in this case, laser-cutting, prepares for the handcrafted assembly: handwoven origami assembled meticulously by the artisans (figure 6).



Figure 6: 'Délicatesse' jewelry in the making. Laser-cut chips packet followed by handcraft. Image courtesy of Vanina.

Furthermore, the case study of the 'Leaves' jewelry collection exemplifies how the advancement of digital fabrication technologies can lead to sustainable innovation in fashion luxury ⁴. Created using a water-based 3d-printing technique, the line transforms discarded paper into jewelry, through a collaboration with MCOR Technologies. The pieces were inspired by traditional craftsmanship techniques of carving found in the region, based on fractal geometry. The digital fabrication is followed by a handcrafted process to remove the pieces from the block of paper and paint them and embellish them with crystals and chains. By turning discarded paper into a wood-like texture through a mix of handcraft and digital fabrication, 'Leaves' exemplifies how fashion can support innovation for sustainable material remediation.



Figure 6: 'Leaves' collection by Vanina: the 3d-printing process of jewelry using used paper (1), one of the 'Leaves' necklaces (2). Images courtesy of Vanina.

⁴ The Leaves collection was created in partnership with MCOR technologies and featured water-based 3d-printing of discarded paper into a new wood-like texture.

4. Fostering a Green Economy

4.1. Glocal Collaborative Model

'In a globalized, branded world, the true luxury of the future is handcrafted, indigenous and heritage crafts, reinterpreted into high-end fashion' (Brown 2015). In her study, Sass Brown highlights the importance of linking design and craftsmanship to enable new sustainable models in fashion. She emphasizes the role that global brands have to promote local craftsmanship.

As a brand based in Lebanon since 2007 and exporting its product internationally since 2009, Vanina's 'glocal' model serves to highlight the need to connect the global international trade network of fashion with local models of community development. Through participation in Paris fashion week and partnerships with international luxury platforms and resellers such as Net-A-Porter, Farfetch, Bloomingdales, Harvey Nichols, and others, Vanina is able to scale its business globally. In turn, this global expansion, enables local development through the creation of green jobs, the preservation of existing crafts (such as crochet, weaving, shoemaking, bags making, sewing, pleating, etc.), and the development of new craftsmanship techniques that contribute to the improvement of livelihoods.

In parallel to this expansion, the network of collaboration of Vanina organically evolved, both locally and globally. It is characterized by close human relations based on trust and shared values. *'Collaborations among all agents in a network, such as suppliers, distributors, customers (often involved in co-creation initiatives), and even competitors, can be drivers of innovative and sustainable business models in fashion.'* (Eckert, Crommentuijn-Marsh & Black 2022). As seen in the case studies, the collaborative approach to creation and business development behind Vanina is key to ensure sustainable development.

4.2. Social Entrepreneurship Model

Community economic development is of high importance in contributing to reducing inequalities, and the social entrepreneurship model plays a key role in fostering community economic development by acting as a socio-political and economic bridge between the public and private sectors (Wallace 1999). As seen in the case studies, the collaboration between the fashion brand Vanina and local NGOs allows the brand to engage further in community development and sustainable innovation. The approach, needs, and potentials of a fashion brand aspiring for sustainability are in many ways complementary to that of an NGO working in social and environmental development, and vice-versa. This complementarity leads to synergetic partnerships. The NGOs allow brands like Vanina to connect with local stakeholders and prioritize areas of high impact through collaborative projects. At the same time, the training, employment, and alternative waste management

instigated by the brand enable the NGOs to enhance the livelihoods of their beneficiary and accelerate their environmental development programs.

Closed-loop systems of manufacturing as seen in some of the case studies enable the implementation of community development projects. This approach, enabled through the social entrepreneurship framework, differs from the more typical corporate social responsibility (CSR) model and encourages an integrated form of impact generation. Furthermore, the social entrepreneurship model that Vanina adopts allows the brand to prioritize impact over profit, and thus enables sustainability-driven research and development through fashion. Furthermore, the financing and growth model of Vanina, as an independent business that grew by reinvesting all of its profits to finance the scaling of the enterprise, also highlights the added value of independent shareholder models, where the pressure of profitability from investors is inexistent, and therefore social and environmental value creation can be prioritized more easily. Nevertheless, this independent social entrepreneurship model comes with limitations and challenges, as emphasized in paragraph 4.3.

4.3. Challenges and Limitations

As seen through the case study of Vanina, the social entrepreneurship model is key to enabling impact-driven growth. However, currently, there is still a lack of a clear legal framework to define the social entrepreneurship model (García-Jurado, Pérez-Barea & Nova 2021). In Lebanon, for instance, the legal structure of a social enterprise is inexistent, forcing businesses such as Vanina to incorporate similarly to other for-profit enterprises. This leads to the reduction of their capacity to reinvest their profits to finance the growth of community development projects, as the corporate and profit taxes that are applied to such businesses are the same as others. Furthermore, there is a lack of both global and local standards and mechanisms of measurement of the social impact of entrepreneurial ventures (Rawhouser, Cummings & Newbert 2017), which makes sustainability reporting more challenging. That being said, entities and collectives with a mission to support the growth of social enterprises locally and globally, such as 'Alfanar' (supporting social enterprises in Lebanon), and 'StandForWomen' (supporting women-led small businesses), help compensate for the lack of legal structure and offer social enterprises financial and advisory support to help them sustain and scale. Through its collaboration with such entities, Vanina is able to benefit from an ecosystem of impact-driven business development while contributing to the empowerment of smaller businesses that share similar values through its growth.

Another limitation that we can note through the case study of Vanina is the fact that projects such as those mentioned in the paper cannot fulfill the entire creative and commercial needs of a lifestyle brand such as Vanina. These collections represent only a part of Vanina's product offer. One of the reasons for that is that the R&D needed to achieve such collections extends over several years and is costly and risky. Meanwhile, commercially, the products address a particular market niche, and

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to ensure the sustainability of its business model, the brand complements these collections with other, more mainstream styles that are manufactured using more traditional fashion materials. To maximize the sustainability of the entire model, the team at Vanina tries to source materials ethically: local, deadstock, recycled, or natural whenever possible. Yet, currently, Lebanon lacks local production of sustainable raw materials, and thus offers a very limited choice for local closed-loop sourcing systems. Vanina currently needs to import a large part of its raw materials to complement its upcycled pieces. This comes at a cost and negatively impacts the ecological footprint of the brand due to transportation and lack of full product traceability. To counter that, Vanina is currently exploring the possibility to partner with academic and research institutions to help speed up its R&D for sustainable material creation.

5. Conclusion

In conclusion, fashion luxury presents the opportunity to engage in social and environmental impact, by conceiving and implementing collections as community development projects. Cross-sector partnerships between global fashion brands and local NGOs are key to enabling such projects. Furthermore, the slow organic growth of a brand through a social entrepreneurship model offers advantages when it comes to accelerating sustainable innovation as it allows to invest in impact-driven R&D. Cross-disciplinary approaches to design and manufacturing, merging traditional handcrafts with emerging digital fabrication allow to sustainably transform discarded byproducts of mass-consumption into luxury, thus creating value and raising awareness about latent issues of contemporary society. This craft-based approach to sustainability also impacts on a social level, by enhancing livelihoods through capacity building and job creation. Finally, for such models to perdure and scale, the legal frameworks of social entrepreneurship need to be implemented, along with global trade agreements that would help support the expansion of traceable and sustainable products.

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