TIMER
Technology-Information-Management-Entrepreneurship – Review
E-ISSN: 2584-1602

A Conceptual Study on Paradigm Shift in Textile & Fashion Industry for Sustainable Development

Dr. Vandana Gupta
Professor
Chitkara Design School
Chitkara University, Punjab, India

Abstract

The evolution of material and technology is clearly advent in the growth of textile and fashion industries. Moreover, developing conventional textile materials for protection, comfort, and ornamentation to technical, smart textiles to meet the consumer demand is part of this evolution journey. The innovations in textile and fashion industry are reshaping them, wherein each innovation has evolved to provide solutions to the problems. The present research study views unethical production, over consumption and few innovations in textile and fashion industries as the major cause for harmful impact on environment and society as a whole and posits that although industry involves slow fashion, circular economy, sustainable material & production to solve these problems, still the impact remains same. Based on the literature review and analysis of global textile and fashion industry cases, this study examines the impact of new technologies and models on environment and society. Hence, by comparing the output of these technologies and models, this study highlights that the textile & fashion industries are still producing waste in spite of inclusion of sustainable approach in product life cycle and have moved towards a new direction in regard to employment. The study offers a new perspective to see the trends existing in textile and fashion industry. This study concludes with insights into how the technological advancement is affecting the society and a close look needs to be taken on the existing trends (traditional and modern) in textile and fashion industry.

Keywords: Slow fashion, Circular Economy, Artificial Intelligence, Sustainable development, Textile & Fashion Industry.

Introduction

The innovations in textile and fashion industries have reshaped these industries. Each innovation has evolved to meet the ever-increasing market demand and enhance the quality of human life with better products. With the use of conventional materials and technologies during 1st and 2nd Industrial revolution are moving towards the development of smart materials, sustainable raw materials and technologies involving IT systems, which are now a part of 3rd and 4th Industrial revolution. Also, it suggests that these industries have progressed to a great extent. In earlier times, to fulfil the basic need of mankind the industry utilized environment friendly techniques and raw materials. What made this industry to be listed as the most polluting industry with passing time? Before looking at the new technologies and models in the lens of its impact on environment and society, it is logical to first identify their role in

textile and fashion industry. The previous research studies have primarily focused on a single effect, whether it is pollution, pre- or post-consumer waste, occupational health hazard or technological development. While there are few studies that offer a comprehensive overview of the harmful effect of textile and fashion industry on environment and society, they are still limited in scope. They mainly discusses the effects of industries in relation to environment and workforce but lacks the information of the technologies and models of 4th industrial revolution. Hence, to understand the current scenario of global textile and fashion industry, this study examines unethical production, over consumption and innovations in textile and fashion industries from a macro perspective. This study posits that although industry involves slow fashion, circular economy, sustainable material & production to solve these problems, still the impact remains same. The study begins with a brief overview of textile and fashion industry, focusing on their impact on environment and society. Moreover, the study intends to examine the analysis of the new technologies and models in the industries to understand their importance at large. Furthermore, the present research analyzes the impact of technological advancements like artificial intelligence in the complete supply chain on both environmental and social grounds. Finally, it concludes with insights into the positive and negative aspects of innovation of textile and fashion industry.

Literature Review

Brief Overview of Textile and Fashion Industry

The existence of fashion and textile industry dates back to the basic needs of human being to cover their body for protection from adverse weather conditions and predators. The use of natural available resources utilised in the development of textiles and garments, which were biodegradable. The production process was all manual and tools made from wood, bones, stones were part of many civilisations. Later with societies getting more civilized the industry was developed where the skilled craftsmen as weavers weave the fabrics and seamstresses developed garments and accessory products for individual clients. With the advent of industrialization and introduction of fabrication machines and their parts such as spinning jenny (Gragnolati et al. 2011), machine looms, etc. started a new wave. The developed products were exported to far off places and more production and consumption started with the invention of synthetic fibers such as rayon, nylon, etc. are easier to care for as compared to the natural fibers like cotton, silk, and wool (Morgan, 1981).

The fashion industry started organizing itself by defining the trends and providing directions to the new ideas of fashion designers all around the world. Also, with time Paris became the fashion hub and trends were analysed by predicting the lifecycle of the product through the James Laver theory (Welters & Lillethun, 2018). Moreover, the fashion cycle was defined and suggested the lifeline of a new product in accordance with society's perspective. The industry worked for two seasons keeping up the balance in demand and supply, but with new ideas of design thinking along with changing consumer requirements and better purchasing power, a shift in the fashion and textile industry has been observed in the recent years (Domingos et al. 2022). The Spanish brand like Zara bought a new philosophy of fast fashion, providing new products for the market on its retail shelves within 15 days. Thus, alluring consumers with fashionable products and changing market trend (Costa, 2017). With this excessive purchase and disposal, the balance between nature and society got disrupted. In furtherance, the health issues on personal, professional as well as ecological grounds increased to a large extent. The

attention towards the harmful effects of fashion and textile industries was part of the front lines of many news articles. Thus, new policies and regulations were implemented globally, forcing the industries to think over and change their existing systems.

The evolution of material and technology is clearly advent in the growth of fashion & textile industries. Developing conventional textile materials for protection, comfort, and ornamentation to technical, smart textiles to meet the consumer demand is part of this evolution journey. Importantly in the Post Covid-19 there has been a tremendous change in the government, consumer, and designers outlook, leading to sustainable growth keeping all the 17 sustainable goals, shared by UN into consideration (Garcia-Torres et al. 2017). On one side the traditional methods are revived, craftsman and Indian traditional skills are uplifted, looking back to nature and its potential. However, on the other hand, advanced technologies like artificial intelligence, internet of things are weaved in textile and fashion industry considering it as an important milestone to growth and development. Moreover, to understand the shift in the textile and fashion industry let us look into the advancements and trends prevailing in industries.

New Trends and Models in Textile and Fashion Industry

Traditional Trends

Circular and Slow Fashion (Brand Transformation)

Circular fashion is a system in which production and end of product life cycle are equally important. It is considered as regenerative system where products are kept in use as long as possible. This is a concept existed in many cultures around the globe such as in Gujarat the use of Ajrakh textiles and Bengal by embroidering the textiles in many ways in its complete life cycle or till its fibers falls apart. It is also considered as a fashion of making a circle of all purchases, avoiding the need to create new materials. It helps in reducing post-consumer waste by involving holistic indigenous approach of "design out of waste". A well-known US brand "Patagonia" developed range of outerwear manufactured by using PET bottles. City like Panipat in Haryana known for its recycled products like blankets made up slicing, shredding the post-consumer waste (Gupta et al. 2016). In continuation to circular fashion a closer view to sustainability issues have initiated a new fashion term and philosophy that is "slow fashion". Slow fashion trend involves slow production and consumption along with higher cost, use of local materials, focus on quality rather than quantity and contributes to sustainable life (Hall, 2018). Toronto based company "Encircled" is an OEKO TEX(R) 100 certified is working to promote the concept of slow fashion by developing multifunctional timeless garments which are comfortable, stylish and fits every woman's wardrobe (Marquis, 2021).

Agricultural & Post Consumer Food Waste

Agricultural production is required for meeting the demand of food and the by-product of agriculture can be utilized to develop textiles, which otherwise require all the resources to grow a plant for fiber development (Jose et al. 2020). The development of Bio based material by utilizing apple skin, mushrooms, orange peel, mangoes into leather alternatives has contributed to achieve the sustainable goal related to ecosystem. The presence of the biopolymers in the agro waste is reported to be utilized as the building block for the production of fibers (Fearon,

2022 & Tschorn, 2021). The outer husk of chickpea, available in abundance as agro-industrial waste was reported as a valuable natural source for development of textile grade dye. The extracted dye showed better affinity towards protein fibers (wool and silk). Other important agro waste is pineapple leaves, banana stem as well as lotus stem and are analysed as important alternatives to fibers like cotton and rayon. These fibers are not only used in fashion and textile industry but also in other allied industries such as automotive in the form of composites (Jose et al. 2019).

Modern Technologies

Artificial Intelligence: Artificial Intelligence, or AI, is the collection of multiple technologies that allow machines to detect, understand act, and learn either on their own or to augment human activities (Ehsan, 2021). The artificial intelligence is utilised in complete supply chain of garment industry to increase operational efficiency. Few areas where AI is penetrating in the supply chain is the defect inspection, sewing, logistics, retailing, communication, data analysis, etc. (Sikka et al. 2022). The AI market potential is reported to be $62 billion in 2022. The inclusion of this innovation is part of fashion and textile industry in the form of visual inspection for colour matching and pattern making, quality control, supply chain management, and an overall improved customer experience (AATCC Newsletter, 2022). Looking into the fashion industry, AI is also useful for "Trend spotting", analyzing past fashion data, moves of competitors as well as identify market trends. Studies suggest that as the apparel industry is labour intensive with low fixed capital investment, the industry have started automated processes using computer, digital components, and artificial intelligence to meet the demand of consumer and to create quality product in stipulated time (Nayak & Padhye, 2018). The latest advances mark a major shift for the apparel trade (Emont, 2018). The companies like YOHO, SVP (world's largest consumer sewing machine producer) in collaboration with Etteplan (technology service company), SoftWear Automation, an Atlanta Based firm has developed partially or fully robotic sewing and embroidery machines, which they proudly named as "sewbots". In furtherance, such automation demands new job roles, which are more inclined towards skills related to data analysis, robotic repair, etc. Apart from this, news on apparel and textile industry also reveals that due to automation, the consumer products can be sold on low prices and some apparel production can restart with cost cutting in high cost labours (Emont, 2018).

Biofabrication: This term literally means fabricating with biology, which means growing textiles directly by using living organisms (bacteria, algae, fungi, yeast). Bacteria are competent enough to develop microbial cellulose which are organic compounds ($C_6H_{12}O_5$) and has their application in textile industry in textile production and textile coloration. Biofabrication is a new design tool, contributing to sustainable development as it avoids the requirement of growing and harvesting of plant in fields and reducing many manufacturing steps, as these microbes grow in lab in few days (Yildirim et al. 2020). BioCouture jacket is one such example of textiles made with the help of bacterial sources (sugar, green tea). Acetobactor xylinium is used to create flat sheet, cut in required shape and size, sewn together, or moulded over 3D forms. Such product is reported to be useful for fashion, sportswear, luxury sector (Costa et al. 2017).

Smart Textiles: They are defined as the textile materials which have the ability to sense and react to environmental conditions or stimuli and are able to make change in oneself. Cabela's new color changing "ColorPhase" apparel is the first camouflage clothing developed by printing the textile material with the rapid change temperature activated dye. Another important smart material NITINOL made up of Nickel and Titanium and shape memory polymers (Cho, 2009 & Vasile et al. 2010) exhibits the ability to memorize a specific shape. This shape change property is due to the martensite and austenite phase of the material (Auricchio & Sacco, 1997 & Leng et al. 2009). Many studies suggest their positive application in textile material used in fashion, apparel, and interior industries. Weaved fabric called Oricalco was developed by Grado Zero Espace using Nitinol used for manufacturing of the first shape memory shirt at industrial level, wherein its sleeves could be programmed to shorten immediately as the room temperature heats up. Besides, the inserted shape memory material permits to mechanically deform the fabric and, after heating it with hot air for few seconds, it returns to its previous shape. It is possible to perform this "deformation-return in shape" transformation many times**.** (Das & Chowdhury, 2014).

Need & Relevance

Textile & Fashion industry is continuously changing. On one side the industry is considered one of the important economic and employability sectors on the other hand it is considered as most polluting industry. This study evaluates the status of textile and fashion industry in all the three areas that is social, economic, as well as environmental; keeping the technical innovation and sustainability approach into consideration. Many studies discuss and reveals about harmful effect of textile industry, new sustainable models and innovations but still less discusses about the innovations and models in 4th Industrial revolution and their impact on society, economy as well as environment.

Objectives

- To understand the trends in textile & fashion industry
- To analyse the sustainable approach and output of existing trends in textile and fashion industry

Methodology

The entire study is based on secondary data sources, wherein many research studies are analyzed to understand the trends in fashion and textile industry. The descriptive research method is adopted for the entire study. The review of literature collected regarding the textile and fashion industry from inception till date and its related changes have been discussed accordingly to understand the impact of new technologies and models towards sustainable development.

Discussion

This study posits a paradigm shift in textile and fashion industry with regard to innovation to meet consumer demand and make industry sustainable. In this conceptual study, both positive and negative impacts are observed along with the change in trends. The driving force behind the new technologies in fashion and textile industries are factors such as new design

philosophies & consumer demands (techno-fashion, product ethics, multifunctional products), advances in science and technology (new fibers & processing technologies, new garment assembly technologies), convergence of players (bridging gap between academia and industry, multidisciplinary research), emergence of the knowledge economy (competitions between manufacturers, high added value products). With these advancements and modifications, the industry has its impact on both environment and society, which is clearly stated in many studies. The fast fashion introduced by ZARA has provided the opportunity to consumers to move with trends and be fashionable, but it resulted in many occupational hazards and environmental pollutions. The fashion industry was recognized as the most polluting industry at all stages of its life cycle which included material usage, textile and apparel production, retail (packaging, transportation), landfill (Ozek, 2017 & Freudenreich & Schaltegger, 2020). The data collected regarding the occupational hazards suggested the harmful effect of materials, machines and working hours on the health of workers. Moreover, the ginning and spinning workers reported to be affected (induced hearing loss) by the high noise they are exposed to, for 8-12 hours a day (Dube et al. 2011**)** and respiratory problems are observed in the workers working in spinning room due to high density of cotton dust (Oldenburg et al. 2007). With more production and consumption, the industry was recorded to generate huge amount of pre- and post-consumer waste. Also, various research studies have revealed that wet processing performed in the production of textile for fashion industry has the major share in pollution of water bodies, when evaluated globally. The dyes consumed by textile industry was estimated to be over 10,000 tons every year (Parmar & Shukla, 2018). The discharge of coloured water in the streams leads to water pollution, hindering the penetration of sunlight and affecting aquatic life (Khan & Malik, 2014). Such pre consumer waste is the result of the use of new technologies, chemicals, synthetic materials, and exploitation of natural resources. On the other hand, landfill created by the disposal of unwanted fabrics, garments, leftover fabric pieces in manufacturing rooms, threads during sewing are all part of post-consumer waste. The estimated by US EPA, 5 percent of land fill space is occupied by textile post-consumer waste and on an average 70lb of clothing is thrown annually by US citizen (Sahoo et al. 2018). Also, fibers like polyester, which is petroleum based takes around 200 years to decompose and its production utilizes chemicals, which are quite harmful for environment. The cotton being one of the important natural fiber is also listed as one of the most polluting fiber due to utilization of fertilizers, pesticides and huge amount water consumption. Furthermore, the finishes such as durable press, merchandising, dyeing, and printing, applied on such natural fibers to make user friendly and aesthetically pleasing products have resulted in water, air and soil pollution respectively. Hence, to provide solutions many brands have amalgamated traditional methods of production in the form of slow fashion / circular fashion, use of natural agro waste materials, etc. The guidelines which can help one to be part of circular and slow fashion is to think before and while shopping; use the products till the end of its life cycle. The slow fashion also suggests investing, repair, resell, as well as donate thus provides humans, the opportunity to contribute to their best to the society and save mother earth (Safia, 2016). However, the scope of garments / textiles made up of old textiles/recycled materials/ agro waste is still in their nascent stage and have very small market.

From current knowledge it is evident that not only the materials but technologies have their negative effects. Great deal of attention has been devoted on nanotechnologies over last two decades and the technology is utilised to develop many functional & technical textiles. Recent studies on nanotoxicology reveals the potential risk of nano particles on human health by absorbing the nano particles through nano finished garments worn close to skin (Korani et al.

2015). Apart from nanotechnology, another most recent technology, artificial intelligence seems to provide many positive possibilities for business development, but its overall potential needs a closer analysis. As SoftWear Automation, an Atlanta Based firm shares the use of "sewbots", which can replace the garment manufacturer workers, as they are programmed to handle all kind of task involved in apparel production. Another company named Mach2X has eliminated the manual labour even in the final stage. This can be good news for developed countries but may badly affect the economy of developing companies, wherein 80 percent of their economy is dependent on the textile and apparel industry and providing jobs to huge sect of population. The best example is Bangladesh in which companies like Mohammadi Fashion Sweaters Ltd. involved in knitting process is fully automated by replacing 500 workers with machines and workers just need to clean or set up the machines. In furtherance, there are companies, which have shared their views to Wall Street Journal by informing that there is no point of slowing ourselves and not to move with the advancing and fast-moving economy (Ehsan, 2021) and with increasing labor cost in developed and developing countries this seems a better alternative according to some of the companies of China (Emont, 2018).

Another article on "Rise of the robots: Automation Threatens garment workers in poor countries" printed in "Business Standard" on 16th November 2022, which shares that in 2016 International Labour Organisation study predicted that some of the Asian nations could lose more than 80 percent of their garment, textile and apparel manufacturing jobs as automation spreads.

Also, the automation demands for new job roles are more inclined towards skills related to data analysis, robotic repair, etc. Such fast production innovation, once again suggest the increase in production of products, leading to more landfills and increase in pollution. It is a matter of concern that the changes in textile and fashion industry, which are going through at present are really taking them towards sustainable development.

Suggestions

The two trends prevailing in the textile and fashion industry needs to be evaluated from ground level, wherein the actual reason to initiate them should be compared with the output. There is no doubt that new sustainable brands have come up to meet sustainable goals, but it is important to focus that old unsustainable brands still existing with a little or no initiative towards sustainability. More comparative research studies have to be conducted to find out the actual contribution of these models and innovations towards sustainable development in the textile and fashion industry.

Conclusion

A concept or rather a model of circular economy and slow fashion is part of the sustainable mission. The present study points out the direction in which textile and fashion industry is moving. On one side the old traditional manual craft-based techniques and materials are supported by the government through "Made in India" campaigns to boost up our economy so as to provide job to the skilled crafts man and to help reduce the pollution with more use of natural materials. On the other hand, the industries are once again increasing the percentage of unemployed not only in India but also at global platform by introducing more mechanical touch rather than human in industrial production. The use of agro waste, natural fibers, traditional

old techniques of dyeing and printing must be promoted to ensure sustainable development. Also, new start-ups on the same line needs to be frequently encouraged.

References

AATCC Newsletter. (2022). *The impact of AI on the textile industry*. February 21.

Auricchio, F., & Sacco, E. (1997). A one-dimensional model for superelastic shape-memory alloys with different elastic properties between austenite and martensite. *International Journal of Non-Linear Mechanics*, *32*(6), 1101-1114.

Cho, G. (2009). *Smart clothing: technology and applications*. CRC Press.

Costa, A. F. S., Rocha, M. A. V., & Sarubbo, L. A. (2017). Bacterial cellulose: an eco-friendly biotextile. *International Journal of Textile and Fashion Technology*, *7*, 11-26.

Costa, A. M. R. M. (2017). Zara's case study: The strategy of the fast fashion pioneer. *Doctoral Dissertation*, ISCTE Business School, Instituto Universitario De Lisoba.

Das, S. C., & Chowdhury, N. (2014). Smart textiles—new possibilities in textile engineering. *Journal of Polymer and Textile Engineering*, *1*(1), 1-4

Domingos, M., Vale, V. T., & Faria, S. (2022). Slow fashion consumer behavior: A literature review. *Sustainability*, *14*(5), 2860.

Dube, K. J., Ingale, L. T., & Ingale, S. T. (2011). Hearing impairment among workers exposed to excessive levels of noise in ginning industries. *Noise & Health*, *13*(54), 348-355.

Ehsan, S. M. A. (2021). Artificial Intelligence and the Future of Labor Market in Bangladesh. *Global Encyclopaedia of Public Administration, Public Policy, and Governance*. Springer, Cham, Switzerland.

Emont, J. (2018). The robots are coming for garment workers. That's good for the US, bad for poor countries. *The Wall Street Journal*, 16.

Fearon, F. (2022). Cactus as arm candy: handbag industry turns to plant leathers. *Lifestyle*. Jan 6.

Freudenreich, B., & Schaltegger, S. (2020). Developing sufficiency-oriented offerings for clothing users: Business approaches to support consumption reduction. *Journal of Cleaner Production*, 247, 119589.

Garcia-Torres, S., Rey-Garcia, M., & Albareda-Vivo, L. (2017). Effective disclosure in the fast-fashion industry: From sustainability reporting to action. *Sustainability*, *9*(12), 2256.

Gragnolati, U., Moschella, D., & Pugliese, E. (2011). The spinning jenny and the industrial revolution: a reappraisal. *The Journal of Economic History*, *71*(2), 455-460.,

Gupta, C., Vaid, N., & Jain, A. (2016). Recycling pre-consumer textile waste using water soluble film technology for promoting environmental sustainability. *International Journal of Science and Research*, *5*(11), 1001-1006.

Hall, J. (2018). Digital kimono: Fast fashion, slow fashion? *Fashion Theory*, *22*(3), 283-307.

Jose, S., Pandit, P., & Pandey, R. (2019). Chickpea husk–A potential agro waste for coloration and functional finishing of textiles. *Industrial Crops and Products*, 142, 111833.

Jose, S., Samant, L., Bahuguna, A., & Pandit, P. (2020). Opportunities of Agro and Biowaste in the Fashion Industry. *In: Recycling from Waste in Fashion and Textiles: A Sustainable and Circular Economic Approach (Eds.)*, 73-100. Scrivener Publishing LLC.

Khan, S., & Malik, A. (2014). Environmental and health effects of textile industry wastewater. *In Environmental deterioration and human health: Natural and anthropogenic determinants (Eds.)*, 55-71. Springer, Dordrecht.

Korani, M., Ghazizadeh, E., Korani, S., Hami, Z., & Mohammadi-Bardbori, A. (2015). Effects of silver nanoparticles on human health. *European Journal of Nanomedicine*, *7*(1), 51-62.

Leng, J., Lu, H., Liu, Y., Huang, W. M., & Du, S. (2009). Shape-memory polymers—a class of novel smart materials. *MRS bulletin*, *34*(11), 848-855.

Marquis, C. (2021). What does slow fashion 'actually' mean? *Forbes*. May 14.

Morgan, P. W. (1981). Brief history of fibers from synthetic polymers. *Journal of Macromolecular Science—Chemistry*, *15*(6), 1113-1131.

Nayak, R., & Padhye, R. (2018). Artificial intelligence and its application in the apparel industry. *In: Automation in garment manufacturing (Eds.)*, 109-138. Woodhead Publishing.

Oldenburg, M., Latza, U., & Baur, X. (2007). Exposure–response relationship between endotoxin exposure and lung function impairment in cotton textile workers. *International archives of occupational and environmental health*, *80*(5), 388-395.

Ozek, H. Z. (2017). Sustainability: increasing impact on textile and apparel industry. *Journal of Textile Engineering & Fashion Technology*, *2*(5), 506-509.

Parmar, N. D., & Shukla, S. R. (2018). Decolourization of dye wastewater by microbial methods-A review. *Indian Journal of Chemical Technology*, 25, 315-323.

Sachdeva, P. K., & Chanana, B. (2015). Agro-residues: Potential fibers for textile industry. *International Journal of Applied Home Science*, *2* (11 & 12), 351-358.

Safia, M. (2016). *Slow Fashion: Aesthetics Meets Ethics*. New Internationalist Publications Ltd, Oxford, United Kindgom.

Sahoo, B., Dash, B. P., & Ghosh, K. (2018). Development of eco-friendly environment using recycled textiles. *Journal of Emerging Technologies and innovative Research*, *5*(8), 771-775.

Sikka, M. P., Sarkar, A., & Garg, S. (2022). Artificial intelligence (AI) in textile industry operational modernization. *Research Journal of Textile and Apparel*.

Tschorn, A. (2021). Fashion goes bananas-and apples and grapes and orange too. *Los Angeles Times*. May 7.

Vasile, S. I., Grabowska, K. E., Ciesielska-Wrobel, I., & Ghitaiga, J. (2010). Analysis of hybrid woven fabrics with shape memory alloys wires embedded. *Fibers & Textiles in Eastern Europe*. *18*(1), 64-69.

Welters, L., & Lillethun, A. (2018). *Fashion history: A global view*. Bloomsbury Publishing.

Yildirim, F. F., Yavas, A., & Avinc, O. (2020). Bacteria working to create sustainable textile materials and textile colorants leading to sustainable textile design. *In: Sustainability in the Textile and Apparel Industries: Sustainable Textile, Clothing Design & Repurposing; Muthu, S., Gardetti, M., (Eds.)*, 109-126. Springer, Cham, Switzerland.

Webliography

https://softwearautomation.com
https://www.aatcc.org/news2022-03a/4
https://www.forbes.com/sites/christophermarquis/2021/05/14/what-does-slow-fashion-actually-mean/?sh=347d2fa073b4
http://www.yuhomac.com/e-catalogues/4203e.pdf/
https://www.thenationalnews.com/lifestyle/fashion/2022/01/05/cactus-as-arm-candy-handbag-industry-turns-to-plant-leathers/