

The Impact of Artificial Intelligence and Sustainable Practices on Fashion Industry Startups in India

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<https://doi.org/10.64882/ijrt.v14.iS2.1173>

Abstract

In the sphere of entrepreneurship, the young generations of leaders are coming forward with new perspectives and innovative ideas. The fashion industry is tremendously going through significant transformation that is driven by the emergence of innovative startups. These new startups are challenging traditional business model technology to change and fulfil the evolving demands of consumers. The latest major trends include the use of artificial intelligence (AI) for personalized shopping experiences, sustainable practices to focus environmental concerns, and the involvement of augmented reality (AR) to enhance customer engagement. The international Startups like Heuritech, which uses AI technology to understand and analyze the latest trends of fashion, and Dopple, which provides personalized subscription of the children’s clothing, shows the shift of the fashion industry towards customization and sustainability. In India Reliance Retail- Azorte uses the digital technology along with the AI to provide its customer advantage of personalized shopping experience. With the growth of these startups, new standards for the industry are being set up. Also, the Fashion industry commerce is being redefined. The future of fashion now depends upon these agile and innovative companies, which are poised to lead the way in creating a more dynamic, inclusive, and eco-friendly fashion landscape. This descriptive and exploratory study provides valuable insights of Artificial Intelligence and sustainable practices in the startups in the fashion industry.

Keywords: Artificial Intelligence (AI); Sustainable Practices; Augmented Reality; Fashion Industry; Startups; Entrepreneur.

Introduction

The modern era of the 21st century is the face of upcoming talents and the young blood of Generation-Z. In this modern world, entrepreneurship is advancing, changing the shape of the economies in various parts of the world. Entrepreneurship is not new; it has existed from 1732 years ago when Richard Cantillon defined the word to describe any person who is willing to take financial risk to take up a new venture for earning profits. Entrepreneurship is a major concept for study for both the local and centralized levels. It is considered as the key element for the growth of the economy. In recent years, entrepreneurship has shifted its paradigm towards the new concept known as ‘Startups’. The definition of Startups is given as the new businesses that are in the preliminary stages of operation, striving to grow and these are typically financed by the investors or capitalists.

The startup ecosystem of India has evolved drastically after the launch of Startup India campaign by our Honorable Prime Minister Shri Narendra Modi. This campaign catalyzed the startup culture and assisted in constructing a strong entrepreneurial ecosystem in the country. In recent years, this startup ecosystem has experienced rapid growth with an eye on technology and e-commerce. In the sphere of the startup ecosystem, there is a lot of movement due to penetration of IT and the Internet. Now a new revolution is igniting in the startup ecosystem with the latest technology taking over the business world; this new technology is being called ‘Artificial Intelligence’. Artificial Intelligence and sustainable practices are currently blooming in various parts of the world, along with India.

Artificial intelligence has now become an integral part of almost every industry. Along with the various technological initiatives, the focus is also being pointed in the direction of sustainable development. The industries are now more concerned about the use of sustainable practices to save the planet and reduce the depletion of resources. Sustainability involves protecting the natural environment and the social wellbeing while making sure that there is no threat to economic growth and development. In recent years, it has become imperative to integrate the social and environmental considerations to make the business decisions and its operations overlooked. One such industry that has now started adapting to use these concepts of AI and sustainable practices is the fashion industry. Fashion is a style or design that is accepted and used by the majority of a group at a particular time; it is a worldwide phenomenon. It is a powerful force of constantly altering patterns of change in growth. Fashion is a means of self-expression that tells us a story about the people and their lifestyle. Due to the high demand of this industry, the young entrepreneurs are focusing on the startups in the fashion industry.

Review Of Literature

(Baporikar, 2014) Stated in her study “youth entrepreneurship in Indian scenario” about the youth entrepreneurship’s role that focuses on the scenario of India by accumulating the various factors, i.e business model for Youth entrepreneurship and challenges affecting it. Also, it describes its impact on reducing unemployment in her research paper.

(Andaleeb & Singh, 2016), through her study “A Study of Financing Sources for Start-up Companies in India,” discussed various stages of startups and different modes available at each stage of startup financing. The stages through which a startup has to pass consist of 6 phases of investment: self-funding or bootstrapping, friends and family, seed, growth (also known as the ‘Early Stage’), and expansion.

(Manshani & Dubey, 2017) in her study on women entrepreneurs in India and have stated several factors that promote & encourage women empowerment in entrepreneurial development.

(Jha, 2018) in her research study “Entrepreneurial ecosystem in India: Taking stock and looking ahead” concluded the role of education & training and other socio-cultural issues responsible for constructing the startup ecosystem in India.

(Kalyanasundaram et al., 2021) in their paper titled ‘Tech Startup Failure in India: Do Lifecycle Stages Matter?’ have revealed the causal factors and attributes responsible for the failure of tech startups in comparison to the successful ones.

(Chakraborty, S. et al., 2020) in their research titled “Predicting fashion trend using runway images: application of logistic regression in trend forecasting”, explains how the AI tools can be helpful in predicting the pattern and outfits in the fashion industry.

(Garg & Gupta, 2021) in their study, “startups and the growing entrepreneurial ecosystem” have investigated the role of startups in promoting the growth of the economy, incubator’s role in developing these startups, the importance of Intellectual Property (IP) protection, and different stages of series funding for startups.

(Ramos L. et al., 2023) in his research titled “Artificial intelligence and sustainability in the fashion industry: a review from 2010 to 2022.” investigated about the use of AI and sustainable practices that is impacting the fashion industry. Through this study, they concluded that AI is a magical tool used for promoting sustainability in fashion industry.

Research Objectives

1. To understand about the fashion industry and startups.
2. To understand AI and sustainable practices.
3. To study the role of AI on sustainability.
4. To study the impact of AI and sustainable practices on fashion industry startups.

Research Methodology

This study conducted here is based on the descriptive and exploratory research. The data used is based on the secondary sources. For the purpose of this study numerous sources, such as journal articles, research papers, websites, blogs, and search engines, have been used.

Significance Of the Study

This research intends to specify a broad understanding of the startup ecosystem, fashion industry, artificial intelligence concept, and sustainable practices. The study describes the influence of artificial intelligence and sustainable practices towards the growth and development of startups in the fashion industry. The research also describes the role of AI in the promotion and adoption of sustainability. The research study also describes the growth of startups in India, especially in the fashion industry, that have been primarily focusing on growth and socio-economic development of the nation through innovation and transformation using AI and sustainable practices. This research work further describes the opportunities and challenges associated with the success or failure of Indian startups in the fashion industry.

Theoretical Framework

Startups and its growth in India

India is growing tremendously, and so is the startup ecosystem in the country. The period from 2010-2020 has been quoted as the decade of innovation by the government of India. In the past few years, a lot of new startups have emerged and attracted much-deserved attention. Indian startup ecosystem stories are being enchanted worldwide, such as Phonepe, Paytm, or if we take into consideration education techs like Physics Wallah, Unacademy, or Byjus, Food tech startups such as Swiggy, Zomato.

Startup ecosystem in India has now transformed from a plant to tree, spreading its branches and roots across national and international boundaries. The government has launched several schemes to promote the startups in India, such as Startup India Action Plan launched by Hon’ble Prime Minister Shri Narendra Modi in the year 2016, Startup Seed Fund Scheme, Atal Innovation Mission (AIM), Samridh Scheme, eBiz Portal etc. The major cities like Bangalore, Hyderabad, Delhi (NCR), Mumbai, and Pune are becoming notable hubs for the startups, attracting talent and investment across the nation. The transformation from traditional practices of commerce to electronic commerce, or e-commerce, has also provided opportunities for startups in the fields of e-commerce, logistics, and online payment solutions. This shows that there is tremendous growth of startups in India.

India's strong entrepreneurial culture and potential for innovation are demonstrated by the country's growing startup scenario. The Indian startup ecosystem is well-positioned for future growth thanks to rising investment, encouraging government regulations, and a varied market. But maintaining this momentum will require tackling issues like competition and regulation. Indian startups are expected to have a big impact on how many industries develop both nationally and internationally as the market changes. A report projects that by 2025, the Indian fashion market will have grown to a value of \$115–125 billion, with a compound annual growth rate (CAGR) of 11–12%. With a 20% compound annual growth rate, the Indian e-commerce market is expected to reach \$99 billion by 2024. Indian fashion industries have a great opportunity to take advantage of this (Morreto et al, 2018).

Challenges faced by Indian Startups

The startup ecosystem in India faces several challenges that include lack of funding, knowledge and skill gaps, ineffective marketing, time management and productivity, regulatory environment, lack of mentorship and guidance, infrastructural limitations, shortage of experienced staff, bureaucratic hurdles, and savage rivalry from established organizations. Due to unclear regulatory formalities, lack of infrastructure, and problems scaling up operations, startups face substantial challenges & difficulties. In spite of these barriers, the startup ecosystem of India is still flourishing, and various efforts are designed by the government to promote and assist entrepreneurship in the country.

International Fashion Industry

The international fashion industry is a reforming and diversified universal that encompasses a comprehensive range of activities, from designing and production to marketing and retail. Leading fashion capitals like Paris, Milan, New York, and London are renowned for their prominent fashion weeks, where designer’s retrospective their newest collections and set trends that reverberate universally. The industry flourishes on cultural assortment, with brands drawing inspiration from many territories, creating a rich homogenization of styles. Fast-flowing technological preferences, peculiarly in the technology market and data-driven market, have swapped how consumers colonize with fashion, authorizing brands to accomplish universal litigation. Moreover, there is a greater emphasis on sustainability, with several brands embracing eco-friendly practices and materials in transitive to aggravate consumer cognizance and demand. Despite this, the industry also confronts conflicts, for instance, vigorous

competition, compliance challenges, and the need to accommodate to transpose consumer primacies. Conventionally, the universal fashion industry continues to expand, ambitious by creativity, innovation, and allegiance to sustainability.

Fashion Industry Startups

The fashion industry has witnessed a remarkable intrusion of innovative startups that transmute the landscape through technology, sustainability, and unique business models. Many of the startups focus on sustainable fashion, utilizing eco-friendly materials. Direct-to-consumer (DTC) models have gained strength, allowing brands to build stronger relationships with customers while reducing costs by eluding brick-and-mortar retail. Customization and personalization are also key trends, with startups encouraging technology to offer appropriate products that match peculiar preferences. Significant examples include Rent The Runway, a pioneer in clothing rentals that promotes a circular fashion model, and ThredUp, an online consignment store emphasizing resale to reduce waste. Other flourishing startups, like Everlane and Allbirds, prioritize transparency and sustainability in their offerings. Although these startups face challenges such as high competition and supply chain entanglement and establish and develop to build consumer trust in a full of people. Generally, fashion startups are in the leading or most important position of innovation, setting new standards and interpreting consumer presumptions in the industry.

Artificial Intelligence (AI) and Sustainable Practices in Fashion Industry

Artificial intelligence (AI) is described as the computers and machines that can simulate the human capabilities of problem-solving and decision-making. Artificial intelligence (AI) is programmed and designed to carry out tasks like pattern recognition, decision making, and natural language understanding that normally require human intelligence.

Sustainability refers to enduring current needs without threatening the requirements of forthcoming generations. It comprises preserving the natural environment and social well-being while making sure that economic growth and development do not pose risks and hazards. There are three major dimensions of sustainability: economic, social, and environmental. The economic dimension focuses on production, making sure the present needs are met without compromising with the future capacity. The social dimensions monitor the social parameters for social equity, security, and citizen participation in governance. The environmental dimension is responsible for the management of resources and control of waste to avoid exploitation of resources and environmental degradation. These dimensions are integrated, interrelated, or interconnected to sustainable development.

The production of clothing and accessories in the fashion industry, which is infamous for its shortcomings in sustainability, uses a lot of resources, especially water resources. It is one of the biggest users of water and frequently receives insufficient post-use treatment. Heavy metal and microplastic pollution in water sources is a problem in Bangladesh and other countries, causing health issues for the local population who drink the water.

In addition, there is a great deal of labor exploitation in the fashion industry, where employees are frequently forced to work long shifts that last longer than eight hours each day. The transport of apparel and accessories also impacts on the increase in greenhouse gas

emissions. Moreover, the fast fashion paradigm has sped up the production and disposal of clothing, indicating an increase in waste production and the use of non-sustainable resources.

Role of AI in promoting sustainability

The fashion industry is trying to find means and solutions to aid it meet sustainability targets in response to all these problems. To increase sustainability, the fashion industry is consequently relying more on AI. Artificial Intelligence (AI) is recognized as the computer science field that programs system capable of mimicking human cognitive abilities and decisive power. AI is currently being used in a variety of fields, including science, industry, and medicine.

(AI) in the fashion industry can be used to optimize several processes involved in apparel production. Furthermore, AI programmed algorithms aids businesses make optimum utilization of resources, which decreases costs and enhances productivity as well as efficiency and effectiveness. Also, since AI enables competent managing and utilization of natural and human resources, this assists society and the environment.

Artificial intelligence is evolving fast and by now has many users across various industries, including the fashion industry. From apparel production to prediction of consumer choices and preferences, AI is renovating the way fashion is manufactured, marketed, and utilized. With its competence to analyse vast amounts of data and learn from patterns, AI is opening innovative and fresh possibilities for designers, retailers, and consumers similarly.

An outline of AI's contribution to sustainability is provided below:

Resource Efficiency

- Supply chain optimization: AI applies the process of data analysis to enhance inventory management and logistics, reduce waste and emissions from storage and carriage.
- Energy management: AI techniques or programs monitors and optimize use of energy in buildings and manufacturing, reducing carbon emissions and uses.

Waste Reduction

- Projecting Maintenance: By making sure that machinery runs smoothly, artificial intelligence (AI) in manufacturing can predict equipment failures and minimize interruption and waste.
- Intelligent Waste Management: AI tools, like image recognition, contributes in material sorting and recycling, raising recycling rates and minimizes on landfill waste.

Circular Economy

- Design for Longevity: AI can aid with the formation of more resilient and easily recyclable products, which will support the economy.
- Product Life Cycle Analysis: AI tools asses the product's environmental impact over the course of its lifecycle and help businesses make more sustainable decisions.

Consumer Engagement

- Personalized Recommendations: Use of AI can help in consumer inclinations to highlight eco-friendly products and encourage environmentally conscious shopping.
- Awareness Campaigns: AI-driven insights are used by companies to design focused campaigns that inform customers about responsible consumption and sustainability.

Climate Monitoring and Management

- Analysis of Environmental Data: AI analyzes massive volumes of data to track developments in the climate, anticipate severe weather, and evaluate environmental changes, all of which help to improve resource management.

- Tracking Carbon Footprint: AI solutions assist businesses in measuring or estimating and controlling their carbon emissions, assisting in search of sustainability objectives.

AI provides effective tools to improve sustainability through raising productivity, reducing waste, and enhancing decision-making in a different category of industries. The use of AI led solutions by industries possesses potential to yield significant environmental benefits, thereby providing a more sustainable future.

Impact of AI and Sustainable Practices on the Fashion Industry Startups

The impact of artificial intelligence (AI) and sustainable practices on fashion industry startups is intense, promoting growth and mending business paradigms. Startups are making the most use of AI to strengthen their design convincingness in accordance with data interpretation to foresee trends and consumer preferences, which helps them constrain products that resonate with environmentally friendly consumers while reducing or cutting down the waste. By strengthening supply chains through AI-driven logistics, these startups can alleviate oversupply and rationalize activities, subordinate to sustainability goals. Moreover, numerous fashion startups are grounded on the integrity of sustainability, using AI to gauge substantial life cycles, enhance provenance judgements, and implement recycling initiatives. This centralization of aphorism practices not only pleases an expanding inhabitant of environmentally sentient consumers but also facilitates brand loyalty and trust. As a result, the consolidation of AI and sustainable practices positions these startups not just as competitors in the market but as leaders in a more liable and indigenous fashion industry.

S.no	Brand Name	Sustainable Practices
1	Mango	Uses organic & recycled cotton
2	Nicobar	Combine sustainable materials with contemporary designs inspired by Indian aesthetics
3	Upasna	collaborate with artisans and weavers, incorporating traditional techniques into their collections, promoting social and environmental sustainability
4	Buna Studio	Offers sustainable and ethically made clothing using natural and organic fabrics
5	No-Nasties	Focuses on organic, fair trade and vegan clothing
6	Doodlage	Famous for upcycled and recycled fashion
7	Kanelle	Collaborates with local artisan and uses eco-friendly materials and techniques.
8	Tula	Non-profitable organisation using Indian cotton organically produced by smallholder, rainfed farmers, with the yarn hand

		spun by skilled khadi / khaddar workers and colored with natural dyes where required with expert guidance
9	Pero	Steered by Aneeth Arora, through its contemporary design, they emphasise handwoven textiles, traditional embroidery and sustainable production methods
10	Bodice Studio	Founded by Ruchika Sachdeva is recognized for its minimalistic yet elegant designs, the brand focuses on organic fabrics, handwoven textiles and fair-trade practices
11	Khadi & Co.	Champions India’s iconic khadi fabric, promoting its use in contemporary designs. They support local artisans and sustainable production methods
12	House of Anita Dongre	Anita Dongre’s eponymous brand is renowned for its sustainable bridal wear and handcrafted ensembles her commitment to reviving traditional crafts while promoting sustainability is commendable
13	Fab India	Integrating eco-friendly practices into its supply chain through the promotion of natural dyes, organic materials, and responsible manufacturing processes
14	The Jodi Life	Commitment to sustainable and ethical fashion practices with the help of artisanal craft techniques, such as hand block printing, bandhini dyeing, and hand embroidery
15	Okhai	100% authentic and handcrafted products using ethical processes that are collaborative environment friendly and sustainable.
16	Red Sister Blue	Supports artisans and creates khadi products.
17	Bunko Junko	Uses upcycled materials to manufacture clothing accessories and home furnishing. Adopts zero waste policy, women empowerment, advocacy and education.
18	Hempkari	Offer sustainable clothing made from hemp
19	Maati	Uses recyclable cardboard boxes, paper tapes and corn starch bags for packaging their products.
20	PANISwimwear	Uses sustainable fabric like Carvicovita – made from pure regenerated fibre from post-consumer material.

Table 1: Brands promoting sustainable practices

Limitations

This study's limitation is that it is a thorough conceptual analysis of the startup ecosystem in India, relying primarily on secondary data. Using primary data and additional statistical tools, more research can be conducted on the opportunities and advantages of startups for business owners.

A noteworthy constraint of this research is its predominant dependence on extant literature and easily accessible sources. This method might unintentionally leave out some non-

academic, ongoing, or unpublished works that might offer insightful contributions to the field of artificial intelligence in a sustainable way. However, it is noteworthy that a wide range of pertinent web sources was painstakingly included, demonstrating a deliberate attempt to guarantee that the results reported in this work provide a representative and significant summary.

Moreover, this study mainly examines the contributions of AI to the sustainable fashion industry at a high level. In other words, it offers a wide perspective and general insights into the ways in which artificial intelligence is being used to advance sustainability in the fashion industry. It might not, however, cover all the minute details and particular nuances that some readers, especially those seeking in-depth technical or industry-specific information—might be looking for.

Conclusion

Indian startups are currently dispersed throughout the entire nation. It is important that sustainable practices and artificial intelligence are properly integrated into the startup ecosystem of the fashion industry. India's fashion startups encounter several challenges, such as inadequate infrastructure, lack of market knowledge, and regulatory barriers. Indian startups have the chance to be extremely successful and contribute to the economic growth of the nation because of a thriving ecosystem and expanding market.

In order to promote sustainability, this study sought to evaluate how artificial intelligence (AI) is being applied in the fashion industry. The examination of the chosen articles clearly shows how important artificial intelligence is to the fashion industry's shift to sustainable development. According to the research, there are numerous benefits that can be applied to different areas of the fashion industry, including data analysis, waste management and control, sustainable clothing design and sales, supply chain optimization, and management. The study comes to the conclusion that sustainable practices and artificial intelligence are important factors in the growth and development of startups across a number of economic sectors, the fashion industry being one of the most important.

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