



RESEARCH PAPER

Weaving the Future: Finding a Balance Between Modernization and Sustainability in India's Handloom Industry

Amir Hussain^{1*}, Mohd Saeem Khan² and Mohd Yasir Arafat³

¹Assistant Professor, Social Work Department, University of Science and Technology, Meghalaya, India

²Assistant Professor, Department of Commerce, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

³Aligarh Muslim University, Aligarh, Uttar Pradesh, India

*Corresponding author: siswarkalan@gmail.com

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ABSTRACT

The handloom industry in India is an integral part of rural life and culture. Still, it has difficulty staying relevant because of mechanization, globalization, and changing consumer tastes. This paper looks at the threats to the sector's long-term health, such as competition from power looms, cheaper imports, fast fashion trends, and problems within the industry, such as low pay and limited market access. It looks at how technological changes like e-commerce, digital marketing, and financial technologies can help weavers reach more customers, rely less on middlemen, and make more money. The study also stresses the need to protect traditional weaves for future generations by documenting them, using Geographical Indications (GI) tags, and offering skill development programs. The paper suggests policy changes and industry strategies that will help keep culture alive while progressing with modernization. It does this by looking at successful case studies and best practices. The results show that the handloom sector needs integrated approaches to stay alive in the long term while still being essential to the economy and culture.

Keywords: Handloom industry, sustainability, modernization, e-commerce, cultural heritage, traditional weaving, mechanization, globalization, market access, artisan communities

The decline of traditional handloom weaving communities in rural and urban areas was due to several socioeconomic factors. From 1800 to 1960, colonial policies and global economic trends greatly affected the handloom industry in South India. They changed how people worked together and how things were made (Raman, 2022). Handloom weaving was a vital source of income for people living in the country, but it had trouble with innovation and long-term viability (Mamidipudi & Bijker, 2018). Many artisan communities in the industry, where the weavers live, how much money they make, and what religion they follow all affect how they make things (Saha & Sen, 2023). The

social cohesion of weaving communities, especially "homophilous-embeddedness," contributed to the spread of knowledge and the advancement of technology. However, this trait sometimes made it harder to adapt to changes in the market, as shown by the decline of the Saliyar community in Kerala (Kamath & Cowan, 2015). These things together caused traditional handloom weaving communities to change and, in some cases, go away.

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The handloom industry in India has had many problems, especially during the COVID-19 pandemic. One of the most significant problems has been the lack of good government policies (Mishra et al., 2023). Historical analysis indicates that economic outcomes in handloom weaving were shaped by local social conditions and colonial state interventions (Raman, 2022). The industry is marked by dense geographical clusters of artisan communities, with diverse spatial patterns of production linked to the unique identities of weavers (Saha & Sen, 2023). Handloom weavers have been able to adapt to new technologies and market needs, which has helped the industry grow (Mamidipudi & Oak, 2022). On the other hand, the difference between handloom and power loom weaving paths has happened because people with much money control the latter (Mamidipudi & Oak, 2022). The handloom industry is still strong, but has difficulty competing with machine-made textiles.

The Indian textile industry is the second largest employer in the world, after agriculture. It directly employs 45 million people and indirectly employs 60 million (Ministry of Textiles, 2023; CII Report). According to the Handloom Census 2023 and the

Indian Textile Journal 2022, India has 4.9 million looms. Of these, 2.4 million are handlooms, 2.5 million are power looms, and 70,000 are shuttleless looms. The sector makes up 2.3% of India’s GDP and is expected to be worth \$350 billion by 2030 (IBEF, 2023; McKinsey & Co.).

India is the sixth-largest exporter of textiles, sending \$44.4 billion worth of goods to the US, EU, and UAE in FY 2022-23 (Ministry of Commerce; WTO, 2022). The handloom industry employs 4.3 million people and makes 95% of the world’s handwoven fabrics (Handloom Census, 2023). The power loom industry makes 60% of all fabric and employs 7 million people (PDEXCIL, 2023).

India is the world’s largest cotton producer. 2022-23, it made 362 lakh bales, and cotton made up 60% of all textile raw materials (CCI Report, 2023). Tamil Nadu, Gujarat, Maharashtra, and Uttar Pradesh are some of the most important places for textiles (Ministry of Textiles, 2023). By 2025, the industry is expected to be worth \$250 billion, growing at a rate of 10% per year (CRISIL, 2023).

The PLI Scheme (₹ 10,683 crore), ATUFS, and NHDP are government programs that help with

Table 1: Statistics of the Indian Textile Industry

Category	Statistics	Source
Workforce	45 million direct workers, 60 million indirect workers	Ministry of Textiles, Government of India (2023); CII Report
Looms	4.9 million (2.4M handlooms, 2.5M power looms, 70K shuttleless looms)	Ministry of Textiles, Government of India (2023); Indian Textile Journal
Contribution to GDP	2.3% of GDP, 7% of industrial output	IBEF (2023); McKinsey & Company
Exports	\$44.4 billion (FY 2022-23), sixth largest exporter globally	Ministry of Commerce and Industry (2023); WTO (2022)
Handloom Sector	Employs 4.3 million people, produces 95% of global handwoven fabrics	Ministry of Textiles (2023); All India Handloom Board
Power Loom Sector	Contributes 60% of fabric production, employs 7 million workers	PDEXCIL (2023); Ministry of Textiles (2023)
Cotton Production	362 lakh bales (2022-23), the largest global producer	Cotton Corporation of India (2023); ICAC (2023)
Key States	Tamil Nadu (33% of exports), Gujarat, Maharashtra, Uttar Pradesh	Ministry of Textiles, State-wise Reports (2023)
Growth Projections	10% CAGR (2021-2026), \$250 billion domestic market by 2025	IBEF (2023); CRISIL Research (2023)
Government Initiatives	PLI Scheme (₹ 10,683 crore), ATUFS, NHDP	Ministry of Textiles (2023); PIB

modernization and job creation (Ministry of Textiles, 2023). These numbers show how important the sector is to India's economy and trade with other countries.

Problems the Sector Has to Deal With

Businesses, especially small and medium-sized businesses (SMEs), face problems and challenges as mechanization and globalization make things more competitive. Globalization has strengthened competition, so businesses must focus on being competitive and sustainable (Chen, 2016). Agricultural mechanization in the Global South presents prospective economic and social advantages, including enhanced labor productivity and food security, while simultaneously introducing environmental hazards (Daum, 2023). The COVID-19 pandemic has hastened the scrutiny of the globalization consensus, potentially undermining the unity essential for its persistence (Delios *et al.* 2021). Technological adaptation is essential for SMEs to endure and prosper in this competitive environment. Social capital, connections with multinational corporations, innovation, networking, and the use of technologies that boost productivity are all important factors that affect how SMEs upgrade their technology. However, to adapt successfully, you need a workforce with technology and the ability to spot new tech opportunities in a competitive environment (Prasanna *et al.* 2019).

Smallholder farmers in low-income countries encounter substantial obstacles to market participation, adversely affecting their income and well-being. Limited access to transportation, storage infrastructure, and market information is one of the main problems (Freedman *et al.* 2016; Villar *et al.* 2023). Age, education, household size, production volume, prices, income, livestock ownership, organizational membership, road access, market distance, extension services, and market information all affect whether or not someone will participate in the market (Kyaw *et al.* 2018). Efforts to make it easier for farmers to sell their goods, like using e-commerce, contract farming, and starting new markets, can help farmers make more money,

reduce poverty, and eat a wider variety of foods (Ma *et al.* 2024; Villar *et al.* 2023). However, rising markups in the primary foods industry, especially in low-income countries, make things even harder (Ma *et al.* 2024). To resolve these issues, policymakers must prioritize balanced policies that consider farmers' preferences and the dynamics of market power to improve market integration and promote inclusive business models (Ma *et al.* 2024; Kyaw *et al.* 2018).

Reasons for the Study

For businesses to stay alive in competitive markets, they need to be sustainable and modernize. The logistics industry knows that to get a long-term competitive edge, it needs to include sustainability factors in service quality (Ozbekler & Ozturkoglu, 2020). Technological progress is essential for small and medium enterprises (SMEs) to thrive in global competition, with elements such as social capital, innovation, and information technology propelling technological advancements (Prasanna *et al.*, 2019). The lodging industry has adopted digital transformation as an important part of staying in business, making it more competitive and improving operations, especially during the pandemic (Farias & Cancino, 2021). Using an "open sustainability innovation" approach in the food industry can help businesses deal with much competition, cut costs and time to market, and improve the environment and food security (Arcese *et al.* 2015). These studies show how important it is for different fields to be sustainable and modern, stay competitive, and survive long term.

Preserving cultural heritage is very important for economic growth and resilience, especially in developing countries. Research underscores the necessity of reconciling cultural preservation with economic development, as demonstrated by case studies in China (Xiao Song *et al.* 2020). Cultural heritage can improve the resilience of infrastructure and help the economy stay stable by bringing in tourists (Muhammad Kamran, 2020). Studies conducted in Ghana illustrate the economic significance of safeguarding intangible cultural

heritage, evidenced by a favorable willingness-to-pay for preservation initiatives (G. K. Vondolia *et al.* 2022). To manage tourism in a way that is good for the environment and protects cultural heritage, non-invasive technologies like ground penetrating radar, unmanned aerial vehicles, and virtual reality can be used. These tools can help create new heritage tourist attractions without harming existing monuments, as shown in a UNESCO World Heritage City case study (Adela Rueda Márquez de la Plata *et al.* 2022). This method helps keep things safe while still offering cultural and tourist attractions. This study seeks to address the following research inquiries:

1. What are the threats to the handloom sector's long-term viability in today's market?
2. How can technology, like e-commerce, make it easier for people to buy handloom products?
3. How can we keep traditional weaves alive while we modernize?

THREATS TO SUSTAINABILITY

1. Mechanization and Its Effects

1.1. How mechanized production lowers costs and beats handlooms

The Indian textile industry has made a lot of progress in mechanization, which has brought down the cost of making each unit compared to doing it by hand. When it comes to growing cotton, mechanized farming cuts labor costs by 47.8% and total production costs by almost 50% compared to traditional methods (Dhamodharan *et al.* 2024). Mechanization also makes energy use more efficient by lowering the amount of energy needed for labor from 2215.6 MJ/ha to 174.2 MJ/ha (Dhamodharan *et al.*, 2024). Automation has made textile manufacturing more productive, but it has also raised environmental concerns (Hasanuzzaman & Bhar, 2016). Mechanization solves the problem of not having enough workers and makes cotton farming more productive by using precise tools like seed-cum-fertilizer drills and mechanized planters (Sriram *et al.* 2024). Cotton pickers and strippers cut down on the time and money needed to harvest

while also increasing the yield and quality (Sriram *et al.*, 2024). But not many farmers in India use modern farming methods or machines, which means that there is a lot of room for improvement in the cotton industry (Sriram *et al.* 2024).

1.2. How mechanization affects the quality, uniqueness, and jobs in India's handloom industry

The mechanization of the handloom industry in India is both a problem and an opportunity for innovation and sustainability. Handloom weaving communities consistently innovate their technologies, designs, and markets, challenging the perception of handloom as an unsustainable craft (Mamidipudi & Bijker, 2018). However, mechanization can have a bad effect on the social and economic conditions of artisans, especially women who spin and weave (Ishrat *et al.* 2020). Even so, people still like handmade things, especially when they are given as gifts to loved ones, because they are thought to have "love" in them (Fuchs *et al.* 2015). To tackle issues in the handloom industry, design thinking can be used to make handloom machines better, which will lead to better output quality, more productivity, and better ergonomics (Samadhiya & Agrawal, 2022). These studies show how mechanization, quality, uniqueness, and jobs in the handloom industry all affect each other in a complicated way. They stress the need for balanced approaches that keep traditional craftsmanship while also welcoming new ideas.

1.3. How cheaper imports and global textile markets affect handloom products made in the US

The handloom industry in India has had a lot of trouble because of competition from other countries and cheaper imports, but it has shown that it can adapt and come up with new ideas. Some people say that British colonialism caused deindustrialization and the decline of handloom weaving (Harnetty, 1991), while others say that weavers adapted by making new products and using new technologies (Raman, 2022). Local social conditions, colonial policies, and caste dynamics all had an effect on

how the industry changed (Raman, 2022). India's textile exports have grown, even though the country doesn't have any foreign investment or special trade deals. Design has become a competitive advantage (Tewari, 2006). Handloom weaving communities keep coming up with new technologies, designs, markets, and ways of organizing their social lives. This goes against the idea that it is an old-fashioned, unsustainable craft (Mamidipudi & Bijker, 2018). These changes have helped the handloom industry stay an important way for people in rural India to make a living, after farming (Mamidipudi & Bijker, 2018).

1.4. Problems caused by mass-produced goods and trade rules between countries

Studies indicate that international trade policies profoundly influence the competitiveness of domestic manufacturing in India. Import competition, fueled by tariff reductions, results in heightened vertical integration among domestic companies, especially those exhibiting high productivity (Stiebale & Vencappa, 2021). It also encourages businesses to improve their corporate social responsibility as a way to stand out (Flammer, 2015). In response to competition from Chinese imports, Indian companies, especially those that make more than one product in states with pro-worker labor laws, are outsourcing more manufacturing jobs to other countries (Chakraborty *et al.* 2024). This move toward the informal sector could have an effect on worker welfare. Environmental regulations can hurt trade, jobs, and productivity in industries that pollute a lot, but these effects are usually small compared to overall production trends. Such regulations also encourage new ideas in clean technologies, but the benefits may not always be enough to cover the costs for the companies that have to follow them (Dechezleprêtre & Sato, 2017).

1.5. A change in what people want to buy, with a focus on fast fashion and synthetic materials

The move toward fast fashion and synthetic materials is bad for the environment in a big way. In the last 15 years, production has doubled to meet the demand for cheap, trendy clothes. This accounts

for 60% of textile production (Moorhouse, 2020). Celebrity culture and runway shows have made cheap fashion more available quickly, which is driving this trend (Moorhouse, 2020). But people are changing how they shop because they are becoming more aware of issues related to sustainability. Social media has a positive effect on people's desire to buy fast fashion, while promoting sustainability has a negative effect (Cayaban *et al.* 2023). Marketers can use psychological factors like social influence, habit formation, individual self, feelings and cognition, and tangibility to encourage sustainable consumption (White *et al.* 2019). Some brands are doing the right thing by offering services to take back, fix, and recycle their products (Moorhouse, 2020). Using social media to promote sustainability may be a good way to get people to buy sustainable fashion (Cayaban *et al.* 2023).

1.6. Weavers don't have access to new ideas, marketing, or resources

Traditional weaving in India is having trouble staying alive because of a complicated mix of new ideas, marketing, and limited resources. Handloom weaving communities consistently innovate in technologies, designs, and social organization (Mamidipudi & Bijker, 2018). However, the absence of industry standards and the effects of mechanization have resulted in declining socio-economic conditions for artisans, especially female spinners and weavers (Ishrat *et al.* 2020). For traditional handicrafts to be competitive and grow in a sustainable way, they need to be innovative (Shafi *et al.* 2022). However, artisans frequently lack the incentive to leverage institutional support, thereby intensifying sustainability issues (Ishrat *et al.* 2020). To tackle these issues, cultivating a personalized market orientation as an innovative strategy can improve the marketing abilities of artisan entrepreneurs. Customer orientation and personal selling orientation have demonstrated substantial positive correlations with marketing skills, potentially empowering artisans to adapt to evolving market dynamics and enhance their livelihoods without intermediaries (Meera & Vinodan, 2022).

ACCESS TO TECHNOLOGY AND MARKETS

1. How e-commerce helps businesses reach more customers

Digital technologies and e-commerce give Indian artisans and weavers a lot of chances to reach more customers. Information and Communication Technologies (ICT) help handicraft makers get around geographical barriers and reach more customers (Nandi, 2021). Artisan entrepreneurs can use individual-specific market orientation as a new way to improve their marketing skills, especially when it comes to customer orientation and personal selling (Meera & Vinodan, 2022). Online platforms help artisan entrepreneurs connect with each other, which can help their businesses succeed (Kuhn & Galloway, 2015). However, the geography of artisanal production, like in the handloom industry, is made up of dense clusters with different spatial patterns that are affected by the identities, locations, and socio-economic status of the weavers (Saha & Sen, 2023). Weavers and artisans in India can use e-commerce to reach more customers if they understand these factors and use digital technologies.

1.1. Potential of online platforms to connect weavers with national and global consumers

The ability of online platforms to link weavers with customers in their own country and around the world.

Social media and online shopping sites can make Indian handloom products much more visible in markets around the world. Information and Communication Technology (ICT) helps artisans get around geographical barriers and reach more customers (Nandi, 2021). E-commerce platforms offer avenues for small and micro enterprises (SMEs) to globalize, with governmental policies being instrumental in alleviating export barriers (Singh *et al.* 2022). Young people are using social media sites like Facebook, Instagram, and YouTube more and more, which is changing how they talk to each other and buy things (Selvi & Kalarani, 2020). People often think of handloom as an old-fashioned

craft, but weaving communities are always coming up with new technologies, designs, markets, and ways of organizing themselves (Mamidipudi & Bijker, 2018). By using these digital tools, handloom makers can show their work to people all over the world, keep traditional skills alive, and help millions of artisans in rural India and other places around the world make a living.

1.2. Reduction of dependency on intermediaries and increased profit margins

Businesses can make sure they get fair prices and higher profits by using different methods to cut down on middlemen. Using platforms for sale by owner can lower the cost of intermediaries (Wang, 2023). Blockchain technology can change the roles of middlemen, making operations more efficient and solving tough problems in global value chains (Tseng & Shang, 2021). Peer-to-peer (P2P) energy trading between residential and commercial multi-energy systems can facilitate equitable pricing strategies and cohesive demand-side management, resulting in cost reductions for both parties (Jing *et al.* 2020). The interaction between competition and delays in intermediation networks can impact efficiency; for instance, removing middlemen or shifting intermediation costs downstream may enhance seller profits (Manea, 2018). These methods give businesses the chance to cut down on middlemen, make sure prices are fair, and possibly boost profits by using technology and smart market positioning.

1.3. Digital Marketing Strategies for Handloom Products

Digital marketing strategies have become useful ways to sell handloom goods in India. Information and Communication Technology (ICT) helps artisans get around geographical barriers and reach more customers (Archita Nandi, 2021). Digital technologies and e-commerce platforms give rural businesses more exposure, market data, and new customers (Archita Nandi, 2021). The COVID-19 pandemic has sped up digital innovation and entrepreneurship in the handicraft sector, with artisans moving to digital platforms (Yadav *et al.*

2023). Artisan entrepreneurs can improve their marketing effectiveness by learning how to be customer-oriented and how to sell things in person through digital channels (Meera & Vinodan, 2022). Nonetheless, obstacles such as market disruption and reliable internet access remain (Yadav *et al.* 2023). Knowing how artisanal production clusters in certain areas, like Varanasi's handloom industry, can help with targeted digital marketing strategies (Saha & Sen, 2023). Digital marketing as a whole offers a lot of chances to promote and protect India's handloom heritage.

1.4. Using social media and stories to show how important handlooms are to culture

Storytelling is a good way to get people interested in cultural traditions, like the heritage of handloom weaving. Interactive digital narratives, including augmented reality exhibitions and online documentaries, can effectively preserve and showcase traditional crafts (Hauser *et al.* 2022; Podara *et al.* 2021). These methods get people more involved and could have an effect on tourism and the hiring of apprentices (Hauser *et al.* 2022). Direct storytelling techniques have been demonstrated to enhance customer engagement and donation performance in online crowdfunding for social causes (Robiady *et al.* 2020). Storytelling enhances the comprehension and significance of science and cultural heritage for general audiences by offering context and facilitating information retention (ElShafie, 2018). To keep people interested in cultural heritage storytelling projects over time, they should use ongoing marketing, data-driven evaluation, and interesting stories that appeal to specific groups of people (Podara *et al.* 2021).

1.5. Targeting niche markets like sustainable fashion enthusiasts

Handloom brands that want to sell to people who care about sustainable fashion can reach niche markets by learning about different types of customers and what makes them unique. Research categorizes consumers into four groups according to their slow fashion orientation, necessitating

customized marketing strategies (Jung & Jin, 2016). Sustainable marketing activities in conventional fashion markets enhance brand image, trust, satisfaction, and loyalty (Jaesuk Jung *et al.* 2020). Nonetheless, a disparity exists in user perception regarding the eco-language employed by fashion brands, as consumers exhibit both confusion and interest in sustainable practices (Peirson-Smith & Evans, 2017). Brands should focus on people with higher education and income levels to effectively reach eco-friendly customers (Horani, 2020). Handloom brands can create advanced marketing plans that appeal to people who care about sustainable fashion by using segmentation analysis and addressing social, economic, and environmental issues. This could raise awareness and support for sustainable consumption practices in the fashion industry.

2.1 Tools for supply chain efficiency and quality assurance

Recent research has examined instruments to improve supply chain efficiency within India's textile and handloom sector. A balanced scorecard and strategy map-based framework has been suggested for evaluating lean and green supply chain performance, with delivery performance, profitability, and operational cost recognized as essential metrics (Thanki & Thakkar, 2018). The ISM-MICMAC and DEMATEL methods have been used to look at the problems that make it hard to put sustainable supply chain practices into action. These problems include communication gaps and a lack of training (Vishwakarma *et al.* 2022). Structural equation modeling has been utilized to identify the adoption factors for supply chain finance in MSMEs, highlighting the significance of negotiation, collaboration, and the digitization of trade (Mulchandani *et al.* 2022). Furthermore, a holistic decision framework incorporating SAP-LAP, the Interpretive Ranking Process, and Bayesian Networks has been established to evaluate risk mitigation strategies for the adoption of circular supply chains in the textile sector (Mishra *et al.* 2023).

2.2 Financial technologies (e.g., mobile banking) to support weavers economically

Mobile banking and other financial technologies can greatly help weavers and other rural communities become more economically stable. Studies have shown that mobile banking increases remittances from cities to rural areas by 26%. This leads to more spending in rural areas, less extreme poverty, and better financial habits, such as saving more and borrowing less (Lee *et al.* 2018). Adopting FinTech makes the economy more stable by using AI, cloud computing, and data technology (Daud *et al.* 2021). In rural areas, the adoption of mobile banking is affected by performance expectancy, effort expectancy, social influence, and perceived risk (Kishore & Sequeira, 2016). For handloom weavers, acknowledging their continual innovation in technologies, designs, markets, and social structures is essential for sustainable development (Mamidipudi & Bijker, 2018). Policymakers and banks can come up with better ways to help weavers' economic stability and growth by using these financial technologies and recognizing the innovative potential of weaving communities.

PRESERVING TRADITIONAL WEAVES

1. Importance of Preserving Cultural Heritage

Traditional weaves in India are a rich cultural and artistic heritage that are closely linked to local identities and customs. Women weavers in Ri-Bhoi, Meghalaya, keep their cultural identity alive by making textiles that represent their tribe and culture. They do this even though the world is changing (Dias *et al.* 2020). Handloom weaving, an essential rural occupation, exemplifies ongoing innovation in technologies, designs, and social organization (Mamidipudi & Bijker, 2018). But the industry has problems, such as weavers dropping out, as seen in Majuli, Assam (Banerjee & Buhroy, 2020). In Pillayarpalayam, Kanchipuram, traditional weavers' homes have unique layouts that make room for both living and working spaces. However, many of these homes are being changed or replaced

by modern buildings (Vijayalaxmi & Arathy, 2022). These vernacular dwellings and weaving practices embody invaluable cultural knowledge and climate-responsive features, highlighting the importance of preserving this intangible heritage for future generations.

The loss of traditional craftsmanship and unique techniques can have serious effects on future generations. Research indicates that handicraft production in certain areas continues to utilize rudimentary methods, lacking sufficient support for artisans, thereby constraining its linkage to tourism and economic advancement (Wondirad *et al.* 2021). Traditional practices, such as the Sakha ohuokhai dance, are essential for passing down biocultural knowledge and heritage, keeping cultural identity and environmental awareness alive from one generation to the next (Crate, 2019). In cities, the slow change of trade streets can affect the unique identities and experiential value of historic areas. This means that conservation methods need to change to include long-standing but non-traditional businesses (Kashihara, 2020). However, individuals who actively shape their jobs can see positive changes in their personal resources and well-being. This means that encouraging creativity and independence at work may help keep traditional skills alive and growing (Vogt *et al.* 2016).

2. Initiatives to Document and Promote Traditional Techniques

Government programs are very important for keeping India's traditional weaves alive, but not all of them work as well as they should. Research indicates that handloom weavers in Varanasi are predominantly situated in dense geographical clusters, with production patterns shaped by socio-economic factors and religious beliefs (Saha & Sen, 2023). The government is working to protect traditional weavers' settlements in Kanchipuram, but many homes have been changed or replaced (Vijayalaxmi & Arathy, 2022). The handloom industry is having a lot of trouble, and the lack of good government policies is the biggest problem, especially after the pandemic (Mishra *et al.* 2023).

Recent government efforts to push for energy-efficient appliances, on the other hand, have had a positive effect on how people buy things. This shows that well-thought-out policies can change how people think and what they choose (Mohanty *et al.* 2021). These results show that policymakers and stakeholders need to work together to protect and promote traditional weaving practices in India.

Geographical Indications (GIs) have demonstrated potential for rural development and economic growth; however, their efficacy is inconsistent. GIs can help rural areas grow in population and diversify their economies (Crescenzi *et al.* 2021), and they can also add value, especially at the consumer and retailer levels (Cei *et al.* 2018). But the benefits for producers are different and depend on the area (Cei *et al.* 2018). To make GI work, we need to move from quantity-based to quality-based methods, put money into rural infrastructure, and make production more efficient (Bixian Lou *et al.* 2023). Some of the problems are low brand awareness, no improvements to the product, and not being competitive in the market (Bixian Lou *et al.* 2023). Small production volumes, territorial quality reproduction, and horizontal decision-making are all signs of successful GI projects (Nizam & Tatari, 2020). It is important for rural revitalization through GIs to continue that people work together and that legal standards for food production are changed to protect traditional methods (Nizam & Tatari, 2020).

3. Training Programs for Younger Generations

Getting young people in India involved in handloom weaving is important for keeping cultural identity alive and helping people make a living in a way that is good for the environment. After farming, handloom weaving is the second most important job in rural areas. Communities are always coming up with new technologies, designs, and markets (Mamidipudi & Bijker, 2018). The industry has changed a lot because of global trends and local economic conditions (Raman, 2022). Weaving helps people build their cultural identity. For example, in the Ri-Bhoi region, women who weave keep traditions alive by sharing knowledge, giving each other social support, and making textiles that are

culturally significant (Dias *et al.* 2020). The sector, on the other hand, has trouble finding a balance between making money and giving power to underprivileged weavers. Sangisathi and other sustainable business models try to meet these conflicting goals by carefully choosing suppliers and working with small weavers (Trehan & Sinha, 2020). It is important to get young people involved in handloom weaving to keep traditional knowledge alive, encourage new ideas, and make sure the industry stays strong in the long run.

Studies on labor migration in India show that the situation is complicated and that policies are difficult to make. Rural public works programs can lower the number of people who move to cities during the summer, which could raise wages in cities (Imbert & Papp, 2019). Nonetheless, obstacles to labor reallocation from agriculture may be less significant than previously assumed, despite the sector's lower average wages and educational attainment (Herrendorf & Schoellman, 2018). Interstate migrants encounter considerable integration challenges, with Kerala recognized as the most inclusive state among seven major destinations examined (Aggarwal *et al.* 2020). The COVID-19 crisis has shown how important it is for cities to have policies that include everyone and recognize how migrants help the economy. A new theoretical framework stresses the importance of agglomeration economies, building up urban infrastructure, and meeting the needs of migrants to help them return to and settle into cities. This approach suggests that migrants should be seen as partners in creating wealth instead of people who need help (Panwar & Mishra, 2020).

4. Working with fashion houses and designers

Combining traditional Indian weaves with modern fashion and design is a complicated process that requires designers and artisans to work together to find a balance between cultural heritage and current trends. This relationship, based on goals for post-colonial development, is still very important to Indian design education (Webb, 2023). Combining

traditional knowledge with modern practices needs an interdisciplinary approach that could help protect biodiversity and job security while also meeting the goals of sustainable development (Ray, 2022). Handloom weaving communities are always coming up with new ideas for technology, design, and marketing, which goes against the idea that handloom weaving is an old-fashioned craft (Mamidipudi & Bijker, 2018). Advanced technologies, such as content-based image retrieval systems utilizing deep feature fusion, can assist designers in efficiently accessing and adapting traditional textile motifs. These tools can speed up design cycles by combining human creativity with AI help. This could help traditional designs survive and grow as computers become more common (Varshney *et al.* 2024).

The combination of traditional weaves and modern designs has a big effect on what people in India want to buy. People who weave by hand are always coming up with new technologies, designs, and markets (Mamidipudi & Bijker, 2018). Women who buy things are very important for growth because they want designs that fit with India's modernization (Mamidipudi & Oak, 2022). Most Indian shoppers think of crafts as things that are made by hand. Craft design, price, authenticity, and social identity are all important factors in making a purchase (Koli, 2021). But the handloom industry is having trouble because of outdated technology and open import policies, which have hurt the production of weaving machines in the country (Malik, 2020). The handloom sector has shown resilience in the face of these challenges by adapting to new technologies and market needs (Mamidipudi & Oak, 2022). To keep growing, more people need to know about sustainable consumption and the government needs to get involved in certifying crafts (Koli, 2021).

5. Cases and Best Practices

Recent studies show how strong and creative India's handloom weaving industry is. People often think of handloom as old-fashioned, but weavers are always coming up with new ideas for technology, design,

and markets (Mamidipudi & Bijker, 2018). Using Design Thinking has made looms better, which has improved the quality of the output, productivity, and ergonomics (Samadhiya & Agrawal, 2022). In the past, handloom weavers adapted to new European technologies, which helped the industry grow. At the same time, women consumers pushed the market to grow by asking for modern designs (Mamidipudi & Oak, 2022). From 1800 to 1960, the industry changed because of global trends, local social conditions, and government policies (Raman, 2022). Caste was a big part of how the industry grew, and local groups worked to get policies that were good for weavers (Raman, 2022). These studies show that both technological progress and social factors have been very important in bringing back and keeping India's traditional handloom weaving industry alive.

Active community participation is very important for bringing back handloom weaving because it encourages new ideas, keeps cultural identity alive, and keeps traditional skills alive. Handloom weavers are always coming up with new ways to make things, new designs, and new ways to work together. This goes against the idea that handloom is an unsustainable craft (Mamidipudi & Bijker, 2018). In Ri-Bhoi, India, women weavers enhance their cultural identity through the exchange of knowledge, social support, and the creation of textiles that hold cultural significance (Dias *et al.*, 2020). The sharing of skills within communities helps handloom workers adjust to capitalist systems while still keeping traditional ways of doing things (Rai, 2021). In Turkey, women's cooperative weaving practices illustrate how social and material relationships enhance participatory capacity and foster community development (Öz & Timur, 2023). These studies show that being involved in the community not only keeps handloom weaving traditions alive, but it also lets them change and grow in modern settings, which helps them come back to life and stay relevant.

The COVID-19 pandemic has made the financial problems that handloom weavers in India face even worse. The main problems are ineffective government policies, branding problems, and

problems with putting tax policies into action (Mishra *et al.* 2023). Small, marginalized weavers have a hard time making money, so businesses in the sector need to be careful about who they choose as suppliers (Trehan & Sinha, 2020). Many weavers leave the industry because they can't compete with others (Banerjee & Buhroy, 2020). Financial instability prompts male weavers to pursue more sustainable economic opportunities, thereby placing the onus of preserving the weaving legacy on women (Basu, 2024). Women have to deal with complicated negotiations and gendered expectations in both their families and the community as a whole. The handloom industry needs better government policies, better branding strategies, and help for small weavers to deal with these money problems and make sure the industry stays strong.

CONCLUSION AND RECOMMENDATIONS

The handloom industry in India is a key part of rural life and cultural heritage, but it is under threat from many different sources that could make it unsustainable. Mechanization, especially from power looms, lowers production costs and is faster than handlooms, which affects quality, uniqueness, and job opportunities (Dhamodharan *et al.* 2024). Globalization brings in competition from cheaper imports and mass-produced goods. At the same time, changing consumer tastes toward fast fashion and synthetic materials makes traditional weaves even less popular (Moorhouse, 2020; Cayaban *et al.* 2023). Internal problems like low income, limited market access, and a lack of new ideas make the sector even more vulnerable (Ishrat *et al.* 2020). But new technologies also open up a lot of new possibilities. E-commerce and digital marketing can help weavers reach more customers, rely less on middlemen, and make more money by connecting them directly with customers in their own country and around the world (Nandi, 2021; Meera & Vinodan, 2024). Financial technologies, such as mobile banking, help the economy stay stable, while supply chain tools make things run more smoothly and ensure quality (Lee *et al.* 2018; Thanki & Thakkar, 2018). To protect traditional weaves, it is very important to use preservation strategies like

documentation, Geographical Indications (GI) tags, and skill development programs (Saha & Sen, 2023; Dias *et al.* 2020). Successful case studies show that community involvement, connections to markets, and the use of new designs can help handloom communities thrive again. However, problems like financial instability and weaver dropouts continue to exist (Mamidipudi & Bijker, 2018; Banerjee & Buhroy, 2020).

1. Recommendations for Policymakers

To make sure the handloom industry stays strong, policymakers should take specific steps:

- ⦿ Offer financial incentives, like subsidies or low-interest loans, to help weavers switch to modern tools like better looms and digital platforms. This will boost productivity while keeping traditional methods (Samadhiya & Agrawal, 2022).
- ⦿ Set up special funds for training programs that teach young people how to weave by hand, focusing on both traditional skills and modern marketing techniques to stop people from moving to cities and getting low-paying jobs (Dias *et al.* 2020; Trehan & Sinha, 2020).
- ⦿ Use Geographical Indications more to protect local specialties, and run campaigns to raise awareness of them to make the market more competitive and help consumers recognize them (Crescenzi *et al.* 2021).
- ⦿ To help rural weavers reach more markets, invest in digital infrastructure like reliable internet access and training on e-commerce platforms (Nandi, 2021).
- ⦿ Make sure that artisans are safe at work and that policies that encourage sustainable practices are followed (Kopperi *et al.* 2023).

Recommendations for Industry Stakeholders

Weavers, cooperatives, and businesses can take steps to make the most of opportunities:

- ⦿ Cooperatives should work with online marketplaces to show off their products and use social media and storytelling to show

how culturally valuable they are and attract niche markets like people who like sustainable fashion (Meera & Vinodan, 2024; Podara *et al.* 2021).

- ⊙ Work with fashion houses to add traditional weaves to modern designs. This will make them more popular and visible in cities and around the world (Webb, 2023).
- ⊙ Use mobile banking and digital payment systems to make transactions easier, help more people access banking services, and cut down on the need for middlemen (Lee *et al.*, 2018).
- ⊙ Put money into training for digital marketing and customer-focused strategies to connect directly with customers and boost profit margins (Yadav *et al.* 2023).
- ⊙ Promote peer-to-peer networks among artisans to exchange knowledge, resources, and market intelligence, thereby enhancing collective resilience (Kuhn & Galloway, 2015).

3. Future Directions

More research is needed to find out how modernization will affect cultural heritage in the long run, especially how technology affects the passing down of traditional knowledge (Dhar *et al.* 2024). Research ought to investigate the effectiveness of GI tags in improving economic returns for weavers and the influence of sustainable fashion trends in stimulating demand for handlooms (Cei *et al.* 2018; Jung & Jin, 2016). Additionally, examining scalable models for incorporating handloom products into global supply chains while upholding ethical standards could yield practical insights (Mishra *et al.* 2023).

CONCLUSION

The handloom industry in India is at a very important point in its history. It needs to find a way to keep its rich cultural heritage while also meeting the needs of a globalized, competitive market. The sector can improve its economic viability by dealing with threats through strategic modernization, such as using e-commerce, financial technologies, and new design partnerships (Nandi, 2021; Mamidipudi & Oak, 2022). At the same time, preserving traditional

weaves through documentation, GI tags, and youth engagement helps keep India's intangible heritage alive (Saha & Sen, 2023; Vijayalaxmi & Arathy, 2022). Policymakers and industry stakeholders must work together to create policies and practices that support the handloom sector's cultural significance while also providing jobs for millions of artisans. This will ensure a sustainable future for the sector.

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