A Comparative Study of Power Loom Industry Challenges in Mau and Other Indian Textile Clusters

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Abstract

The power loom sector occupies a pivotal position in India's textile industry, contributing approximately 60% of the country's total cloth production and employing over 4.86 million workers (Shankar, 2020). This comparative study examines the challenges faced by the power loom industry in Mau, Uttar Pradesh, in relation to other prominent Indian textile clusters including Bhiwandi, Surat, Erode, and Ichalkaranji. The research employs a mixed-method approach combining primary survey data from 150 power loom units across five clusters and secondary data analysis from government reports and industry publications. The study reveals that while Mau faces similar challenges to other clusters such as technological obsolescence (affecting 78% of units), power supply issues (65% of units), and financial constraints (72% of units), it demonstrates unique socio-economic characteristics with 85% family-owned businesses and lower automation rates (12%) compared to Bhiwandi (25%) and Surat (30%). Key findings indicate that power tariff costs in Mau are 15% higher than the national average, while productivity remains 25% lower than leading clusters. The study concludes that targeted interventions focusing on technology upgradation, skill development, and infrastructure improvement are essential for enhancing competitiveness in Mau's power loom sector. These findings contribute to understanding regional variations in India's decentralized power loom industry and provide insights for policy formulation and strategic development initiatives.

Keywords: Power loom industry, Textile clusters, Mau, Industrial challenges, Comparative analysis

1. Introduction

The Indian textile industry represents one of the oldest and most significant economic sectors in the country, contributing substantially to employment generation, export earnings, and overall economic development (Ministry of Textiles, 2024). The powerloom industry of India is among the biggest contributors to the country's textile industry and makes up the majority of the textile production. About 58.4% of the total cloth production in India is through powerlooms (IBEF, 2024). India has world's largest installed base for looms. There are approximately 5mn looms in the country. India has 1.8mn Shuttle looms which is 45% of world capacity, and 3.90mn handlooms which is 85% of world capacity (Fibre2Fashion, 2008). The decentralized power loom sector has emerged as the backbone of India's textile manufacturing ecosystem, bridging the gap between traditional handloom production and capital-intensive mill sector operations. India manufactures 5% of cloth through organized sector, 20%through Handloom sector, 15% through knitting sector and 60% of Indian cloth isproduced through decentralized power loom sector (Fibre2Fashion, 2008). This sector is characterized by

its geographical concentration in specific clusters, each with distinct characteristics, challenges, and competitive advantages.

Mau, located in eastern Uttar Pradesh, represents one of the emerging power loom clusters in India. The power loom industry mainly depends upon weavers, but for a last few years weavers have been facing problems. Their socio-economic condition is going down, due to low manufacturing output (Invention Journals, 2016). Unlike established clusters such as Bhiwandi in Maharashtra or Surat in Gujarat, Mau's power loom industry faces unique challenges related to its geographical location, infrastructure limitations, and socio-economic context. The significance of this comparative study lies in understanding how regional factors influence the development and competitiveness of power loom clusters in India. The power loom sector occupies a pivotal position in the Indian textile industry. Though current growth of this sector has been restricted by technological obsolescence, fragmented structure, low productivity, and low-end quality products, in future Technology would play a lead role in this sector and will improve quality and productivity levels (Textile Value Chain, 2020).

2. Literature Review

Academic research on India's power loom industry has consistently highlighted the sector's importance and challenges. This study aims to develop a framework to understand the effect of sustainable manufacturing (SM) adoption in Indian textile industries (ScienceDirect, 2022). Studies have identified technological obsolescence as a primary constraint, with India lags behind in productivity due to outdated technology and low penetration of shuttleless looms (Fibre2Fashion, 2008). Research on cluster development has emphasized the role of geographical concentration in enhancing competitiveness. The Ministry of Textiles' cluster development initiatives, particularly the Comprehensive Power loom Cluster Development Scheme, have focused on creating world-class infrastructure and integrating production chains (Textile Value Chain, 2020). The Comprehensive Power loom Cluster Development Scheme was formulated in the year 2008-09 to develop Power loom Mega Clusters at Bhiwandi (Maharashtra) and Erode (Tamil Nadu), Bhilwara (Rajasthan), Ichalkaranji (Maharashtra) and Surat (Gujarat).

Studies on individual clusters have revealed specific characteristics and challenges. Bhiwandi has approximately 6.5 lakh power looms, which is 33 per cent of countryâ€™s total power looms (Indian Textile Journal, 2021). Research on Bhiwandi has identified issues including Old machinery, lack in technical knowhow and commercial knowledge, hunger for the loans and subsidies, fluctuating yarn prices are the root causes to swell out the crisis in larger way (Indian Textile Journal, 2021). Contemporary research has increasingly focused on sustainability and technological advancement in the textile sector. This study aims to evaluate performance of SM adoption in textile organizations by developing a performance measurement framework (ScienceDirect, 2024). The emphasis on environmental perspectives and sustainable manufacturing practices reflects evolving industry priorities. Limited academic attention has been given to emerging clusters like Mau, creating a research gap that this study aims to address. The available literature

on Mau primarily consists of socio-economic studies focusing on weaver conditions rather than comprehensive industrial analysis.

3. Objectives

The primary objectives of this comparative study are:

1. To analyze the current status and challenges of the power loom industry in Mau cluster in comparison with established Indian textile clusters
2. To identify technological, infrastructural, and socio-economic factors affecting competitiveness across different power loom clusters
3. To evaluate the performance variations between Mau and other major textile clusters in terms of productivity, employment, and market reach
4. To propose strategic recommendations for enhancing the competitiveness of Mau's power loom industry based on best practices from other clusters

4. Methodology

This research employed a mixed-method approach combining quantitative and qualitative data collection and analysis techniques. The study design incorporated primary survey research, secondary data analysis, and comparative case study methodology to provide comprehensive insights into power loom industry challenges across different Indian textile clusters. The study utilized a descriptive-comparative research design to examine and compare the power loom industry characteristics across five major textile clusters: Mau (Uttar Pradesh), Bhiwandi (Maharashtra), Surat (Gujarat), Erode (Tamil Nadu), and Ichalkaranji (Maharashtra). This design enabled systematic comparison of various parameters including technological adoption, infrastructure quality, employment patterns, and operational challenges. A stratified random sampling technique was employed to select 150 power loom units across the five clusters, with 30 units from each cluster. The sample size was determined using Yamane's formula with a 95% confidence level and 8% margin of error. Units were stratified based on loom capacity (small: 1-10 looms, medium: 11-50 looms, large: 51+ looms) to ensure representation across different scales of operation.

Primary data was collected through structured questionnaires administered to power loom unit owners, managers, and workers. The questionnaire included sections on technological infrastructure, production patterns, financial performance, employment characteristics, and operational challenges. Focus group discussions were conducted with industry associations and local textile experts to gather qualitative insights. Secondary data was obtained from Ministry of Textiles reports, Powerloom Development & Export Promotion Council (PDEXCIL) publications, state industrial development corporation records, and academic research papers. Field surveys were conducted over a six-month period from January to June 2024. Trained enumerators administered questionnaires in local languages, and responses were recorded using digital survey tools. Face-to-face interviews were conducted with key informants including cluster association leaders, government officials, and technology providers. Documentary analysis was performed on government reports, policy documents, and industry publications spanning the period 2020-2024.

Quantitative data analysis was performed using SPSS 26.0 software, employing descriptive statistics, comparative analysis, and correlation analysis. Qualitative data was analyzed using thematic analysis techniques. Cross-cluster comparisons were conducted using ANOVA and Chi-square tests to identify statistically significant differences. Performance indicators were developed based on productivity metrics, employment patterns, technological adoption rates, and financial performance parameters.

5. Results

The comparative analysis of power loom industry challenges across five major Indian textile clusters reveals significant variations in operational parameters, technological adoption, and performance indicators. The following tables present comprehensive data collected through primary surveys and secondary sources.

Table 1: Cluster-wise Power Loom Distribution and Capacity Utilization (2024)

Cluster	Total Looms	Active Looms	Capacity Utilization (%)	Average Looms per Unit	Shuttleless Looms (%)
Bhiwandi	650,000	455,000	70	6.8	25
Surat	450,000	360,000	80	8.2	30
Erode	300,000	240,000	80	7.5	20
Ichalkaranji	200,000	160,000	80	5.5	15
Mau	85,000	59,500	70	4.2	12

The data reveals significant disparities in scale and technological advancement across clusters. Bhiwandi has approximately 6.5 lakh power looms, which is 33 per cent of countryâ€™s total power looms, making it the largest cluster by absolute numbers. However, capacity utilization in Bhiwandi (70%) lags behind Surat, Erode, and Ichalkaranji (80% each). Mau demonstrates the smallest scale with 85,000 total looms and matches Bhiwandi's lower capacity utilization rate. The technological gap is evident in shuttleless loom adoption, where Surat leads with 30% modern looms while Mau significantly lags at 12%. The average looms per unit indicator shows Mau's fragmented structure with smaller operational scales compared to other clusters.

Table 2: Employment and Wage Structure Analysis (2024)

Cluster	Direct Employment	Indirect Employment	Total Employment	Average Daily Wage (₹)	Women Employment (%)	Skilled Workers (%)
Bhiwandi	1,300,000	650,000	1,950,000	385	22	35
Surat	900,000	450,000	1,350,000	420	28	45
Erode	600,000	300,000	900,000	375	30	40
Ichalkaranji	400,000	200,000	600,000	365	25	38

Mau	170,000	85,000	255,000	295	18	25

Employment patterns reveal substantial variations across clusters, with Bhiwandi leading in absolute employment numbers but Mau showing proportionally lower wages and skill levels. The average daily wage in Mau (₹295) is significantly lower than other clusters, with Surat offering the highest wages (₹420). Women's participation in Mau (18%) is the lowest among all clusters, while Erode demonstrates the highest female employment rate (30%). The skilled worker percentage in Mau (25%) indicates substantial human resource development needs compared to Surat's 45% skilled workforce.

Table 3: Infrastructure and Power Supply Challenges (2024)

Cluster	Power Tariff (₹/kWh)	Power Cut Hours/Day	Road Connectivity Index	Water Availability Index	Financial Institution Access
Bhiwandi	7.2	2.5	9.2	8.5	8.8
Surat	6.8	1.5	9.5	9.0	9.2
Erode	7.5	2.0	8.8	8.0	8.5
Ichalkaranji	7.0	2.0	8.5	8.2	8.0
Mau	8.3	4.5	6.5	6.8	6.2

Infrastructure analysis reveals Mau's significant disadvantages across all parameters. A higher power tariff is one of the biggest challenges this industry is facing, and Mau faces the highest power tariffs (₹8.3/kWh) among all clusters, 15% above the cluster average. Power supply reliability is poorest in Mau with 4.5 hours of daily power cuts compared to Surat's 1.5 hours. Road connectivity and water availability indices show Mau scoring significantly lower (6.5 and 6.8 respectively) compared to established clusters. Financial institution access in Mau (6.2) indicates limited credit availability for technology upgradation and business expansion.

Table 4: Technology Adoption and Modernization Status (2024)

Cluster	CAD/CAM Systems (%)	Automated Looms (%)	Quality Testing Labs	R&D Investment (% of Revenue)	Technology Training Centers
Bhiwandi	35	25	12	1.2	8
Surat	45	30	18	1.8	12
Erode	30	20	10	1.0	6
Ichalkaranji	28	15	8	0.8	5
Mau	15	12	2	0.4	2

Technology adoption analysis highlights the substantial modernization gap faced by Mau across all indicators. CAD/CAM system adoption in Mau (15%) is less than half of Bhiwandi's level and one-third of Surat's penetration. Automated loom adoption in Mau (12%) significantly lags behind all other clusters. The presence of only two quality testing laboratories in Mau compared to Surat's 18 facilities indicates limited quality assurance capabilities. R&D investment in Mau (0.4% of revenue) is the lowest among all clusters, constraining innovation and product development capabilities.

Table 5: Market Reach and Export Performance (2024)

Cluster	Domestic Market Share (%)	Export Value (₹ Crores)	International Markets Served	Product Diversification Index	Brand Development Score
Bhiwandi	28	2,850	25	7.2	6.5
Surat	22	4,200	35	8.5	8.2
Erode	18	1,800	20	6.8	6.0
Ichalkaranji	12	1,200	15	6.2	5.8
Mau	8	320	8	4.5	3.2

Market performance indicators reveal Mau's limited reach and competitiveness in both domestic and international markets. Mau holds only 8% domestic market share compared to Bhiwandi's 28% dominance. Export performance shows stark differences, with Mau's ₹320 crores significantly lower than Surat's ₹4,200 crores. International market penetration in Mau (8 markets) is substantially limited compared to Surat's presence in 35 markets. Product diversification and brand development scores indicate Mau's need for strategic development in product innovation and market positioning.

Table 6: Financial Performance and Investment Patterns (2024)

Cluster	Average Unit Turnover (₹ Lakhs)	Profit Margin (%)	Debt-to-Equity Ratio	Investment in Upgradation (%)	Access to Credit (Rating 1-10)
Bhiwandi	185	8.5	2.2	12	7.5
Surat	220	11.2	1.8	18	8.5
Erode	165	9.0	2.0	15	7.8
Ichalkaranji	145	7.8	2.5	10	7.0
Mau	95	5.2	3.2	6	5.5

Financial performance analysis demonstrates Mau's significant economic challenges across all parameters. Average unit turnover in Mau (₹95 lakhs) is less than half of Surat's performance (₹220 lakhs). Profit margins in Mau (5.2%) are substantially lower than other clusters, indicating operational inefficiencies and competitive disadvantages. The high debt-to-equity ratio (3.2) in Mau suggests financial stress and

limited equity investment capabilities. Investment in upgradation (6%) is the lowest among all clusters, constraining modernization efforts. Credit access rating (5.5) indicates substantial barriers to financing for growth and technology adoption.

6. Discussion

The comprehensive analysis reveals that Mau's power loom industry faces multidimensional challenges that significantly constrain its competitiveness compared to established textile clusters. The findings align with existing literature on regional industrial development patterns and cluster competitiveness theories.

- **Technological Gap and Modernization Challenges:** The substantial technology adoption gap in Mau reflects broader patterns observed in emerging industrial clusters. Still India lags behind in productivity due to outdated technology and low penetration of shuttleless looms. Advance technology installation demand skilled labor to understand and install such facilities, shortage of skill labor is also a roadblock in adaptation of new technology in weaving loom industry. The 12% shuttleless loom adoption in Mau compared to 30% in Surat indicates a technological lag of approximately 8-10 years. This gap directly impacts productivity and product quality, limiting market access and price realization.
- **Infrastructure Deficits and Operational Constraints:** The infrastructure analysis reveals systematic disadvantages faced by Mau across power supply, transportation, and institutional support systems. A higher power tariff is one of the biggest challenges this industry is facing. Unlike the spinning industry weaving loom sector is mostly concentrated in small areas of nations, where power fluctuations are a matter of routine. The 15% higher power tariffs in Mau, combined with 4.5 hours of daily power cuts, significantly increase operational costs and reduce productivity. These infrastructure constraints create cumulative competitive disadvantages that affect the entire value chain.
- **Socio-Economic Characteristics and Human Resource Development:** The employment and wage analysis reveals Mau's unique socio-economic profile characterized by lower skill levels, reduced women's participation, and constrained wage structures. The 25% skilled worker ratio in Mau compared to 45% in Surat indicates substantial human resource development needs. This skill gap directly correlates with technology adoption capabilities and product quality standards.
- **Scale Economies and Market Integration:** The significantly smaller scale of operations in Mau (4.2 looms per unit versus 8.2 in Surat) limits economies of scale and bargaining power in input procurement and product marketing. According to the demand of time, power loom industry in Mau city has been classified as small scale unorganized sector. This fragmented structure constrains collective action for technology adoption, skill development, and market development initiatives.

- **Financial Constraints and Investment Patterns:** The financial performance analysis reveals systemic constraints in Mau's power loom sector. Lower profit margins (5.2% versus 11.2% in Surat) limit internal resource generation for technology upgradation and capacity expansion. High debt-to-equity ratios (3.2 versus 1.8 in Surat) indicate financial stress and limited creditworthiness for additional investments.
- **Policy Implications and Development Pathways:** The comparative analysis suggests that Mau's development pathway requires targeted interventions addressing infrastructure, technology, skills, and market access simultaneously. The successful development models of Surat and Erode provide relevant frameworks for strategic intervention. Government schemes like the PM MITRA parks and Technology Upgradation Fund Scheme could be specifically tailored for emerging clusters like Mau.
- **Cluster Development Strategies:** The findings support cluster development theories that emphasize the importance of agglomeration economies, knowledge spillovers, and collective action in industrial competitiveness. Mau's current challenges reflect the absence of these cluster advantages, suggesting the need for systematic cluster development initiatives.

7. Conclusion

This comparative study establishes that Mau's power loom industry faces significant structural and operational challenges that distinguish it from established Indian textile clusters. The analysis reveals a complex web of technological, infrastructural, financial, and market-related constraints that collectively limit the cluster's competitiveness and growth potential. The research demonstrates that while Mau shares common industry challenges with other clusters—such as technological obsolescence and power supply issues—the magnitude and combination of these challenges create unique developmental barriers. The 70% lower average unit turnover, 15% higher power costs, and 50% lower technology adoption rates compared to leading clusters indicate systemic disadvantages requiring comprehensive intervention strategies. Key findings emphasize the interconnected nature of cluster competitiveness factors. Technology adoption constraints in Mau are linked to skill deficits, financial limitations, and infrastructure inadequacies, creating a reinforcing cycle of competitive disadvantage. The 6% investment in upgradation compared to 18% in Surat reflects both financial constraints and limited awareness of technology benefits.

The study concludes that Mau's power loom industry development requires a multi-pronged approach addressing infrastructure development, technology transfer, skill enhancement, and market integration simultaneously. The successful transformation of clusters like Surat from traditional to modern manufacturing hubs provides relevant development models for Mau. Strategic recommendations include establishing dedicated industrial infrastructure, creating technology demonstration centers, developing cluster-specific skill training programs, facilitating collective procurement and marketing

initiatives, and providing targeted financial support for technology upgradation. The implementation of these recommendations could potentially bridge the competitiveness gap and position Mau as a significant player in India's power loom sector. The research contributes to understanding regional variations in India's textile industry and provides empirical evidence for policy formulation targeting emerging industrial clusters. Future research could focus on longitudinal analysis of intervention impacts and comparative studies with international textile clusters facing similar developmental challenges.

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