



Innovation Rooted in Tradition: Synthesizing Banarasi Brocade and Kota Doria as an Indian Knowledge System for Sustainable Craft, Cultural Continuity, and Community Enterprise

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Abstract

Indian Knowledge Systems (IKS) embody cumulative, practice-based wisdom embedded in cultural expressions such as crafts, agriculture, architecture, and community life. Handloom weaving traditions, in particular, function as living repositories of ecological intelligence, material knowledge, social organization, and intergenerational skill transmission. This paper examines the synthesis of two distinguished Indian weaving traditions Banarasi brocade of Uttar Pradesh and Kota Doria of Rajasthan as a model of “innovation rooted in tradition” within the framework of IKS. Rather than viewing this textile fusion as merely an aesthetic intervention, the study positions it as a sustainable pathway for cultural continuity, artisan livelihood regeneration, and community-based enterprise.

Banarasi brocade is known for intricate zari work, dense silk structures, and ceremonial richness, while Kota Doria is recognized for its lightweight, checkered *khat* structure and climatic suitability. Both traditions face challenges due to mechanization, imitation, and changing market preferences. Through practice-based textile experimentation, material analysis, motif adaptation, and cluster observations, this study demonstrates how their synthesis produces a lightweight brocade that retains cultural depth while gaining contemporary usability. The paper argues that this woven integration exemplifies key IKS principles: sustainability through low-energy handloom processes, cultural inclusion through inter-regional craft dialogue, and economic resilience through collaborative enterprise. By

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analyzing this textile synthesis as indigenous innovation, the study proposes that craft revival lies in creative continuity rather than static preservation, offering a replicable model for sustainable growth and artisan dignity.

Keywords: Indian Knowledge Systems, Banarasi Brocade, Kota Doria, Textile Synthesis, Artisan Livelihood, Handloom Innovation

1. Introduction

Indian Knowledge Systems (IKS) are real, practice-based wisdom contained in common cultural expressions rather than merely abstract theories maintained in texts (Mahar, 2025). These include societal structures, artisanal trades, agricultural cycles, architectural designs, and medical procedures that have developed over centuries as a result of intergenerational transmission, environmental adaptability, and empirical knowledge. Among them, the Indian handloom industry is one of the most concrete examples of IKS, where the process of weaving combines mathematical accuracy, ecological harmony, material understanding, and artistic symbolism (Mishra and Saiel 2025).

In India, textiles have always been more than just goods. They have served as historical memory bearers, ceremonial artefacts, social identifiers, and cultural texts (Pandey *et al.*, 2022). Depending on the local temperature, the fibres that were available, sociocultural preferences, and community organization, each location created its own weaving traditions. As a result, the loom was used on a regular basis to exercise traditional knowledge. Two excellent weaving traditions that exemplify this expertise are Kota Doria from Rajasthan and Banarasi brocade from Uttar Pradesh. Mastery in silk weaving, the use of metallic thread, and Mughal-inspired ornate patterning are all evident in Banarasi brocade. On the other hand, Kota Doria's lightweight, checkered khat structure demonstrates a sophisticated grasp of climate-responsive weaving (Pramanik *et al.*, 2024).

Even while both traditions have a rich history, they now confront issues including automated replicas, dwindling artisan revenue, diminished young involvement, and diminished commercial relevance. The synthesis of Banarasi brocade with Kota Doria, according to this article, is not just a textile experiment but also a revitalisation of Indian Knowledge Systems via innovation that is nonetheless grounded in tradition. This combination addresses sustainability, cultural continuity, and community entrepreneurship all at once by producing a textile that is lighter, breathable, culturally rich, and market-relevant.

2. Research Objectives

1. To analyze Kota Doria and Banarasi brocade as examples of Indian knowledge systems.
2. To examine both traditions' ecological, cultural, and technological facets.
3. To investigate textile synthesis as a novel approach to conventional weaving grammar.
4. To evaluate the contribution of this combination to artisan livelihood and sustainability.
5. To suggest a community enterprise model that relies on cooperation amongst clusters.

3. Literature Review

The majority of current research on Indian textiles may be divided into three groups:

3.1 Textile Heritage Documentation

Indian textiles have been thoroughly researched as heritage artifacts by scholars like Gillow and Barnard (2008) and Chattopadhyay (1995). They discuss historical backgrounds, materials, and motifs in their works, but they do not offer suggestions for modern revival.

3.2 Research on the Crisis and Revival of Handlooms

The collapse of handloom clusters as a result of power loom rivalry and a lack of innovation is discussed in Jain (2016) and Ministry of Textiles publications. They do not investigate design-led synthesis, but they do suggest policy initiatives.

3.3 Technical Analysis of Particular Customs

While Kumar (2017) describes Banarasi brocade processes, Joshi (2019) examines the geometry of Kota Doria. These studies focus only on traditions.

Table 1. Comparative Knowledge Features of the Two Traditions

Parameter	Banarasi Brocade (U.P.)	Kota Doria (Rajasthan)	Synthesized Textile Outcome
Core Material	Silk + Zari	Cotton + Silk	Silk–Cotton + Fine Zari
Weave Structure	Dense supplementary weft	Open checkered <i>khat</i>	Semi-open breathable brocade
Visual Identity	Ornamental floral motifs	Geometric grid	Motif within geometry
Fabric Weight	Heavy	Very light	Moderately light
Climatic Suitability	Low	High	High
Traditional Use	Ceremonial/bridal	Daily/seasonal wear	Contemporary festive wear
Market Issue	Too heavy	Too plain	Balanced luxury
Knowledge Type	Ornamentation mastery	Structural geometry	Integrated knowledge

4. Theoretical Framework: Indian Knowledge Systems

The term "Indian Knowledge Systems" (IKS) refers to the body of knowledge, customs, and ideologies that have developed over millennia of lived experience on the Indian subcontinent (Pandit, 2025). IKS is practice-based, community-driven, and passed down by participation, apprenticeship, and observation, in contrast to contemporary knowledge systems that are frequently text-centered and institutionalized. Textiles, architecture, medicine, crafts, and agriculture are all interrelated expressions of cultural expression and ecological adaptation rather than distinct fields (Seddighikhavidak and Jamal, 2022). The idea of harmony with nature is central to IKS. Utilizing locally accessible materials, renewable resources, and low-energy methods, production processes are made to be sustainable. One of the best examples of this idea is handloom weaving. The loom uses natural fibers like cotton and silk, runs without electricity, and follows manufacturing cycles that are more in line with human talent than machine pace. Because of this, handloom weaving is naturally sustainable and doesn't need outside sustainability frameworks. Decentralized production is a key component of IKS. Instead than being centralized in institutions, knowledge is dispersed throughout communities. Banaras and Kota, two weaving clusters, serve as knowledge centers where generations of people exchange expertise (Sanil, 2025). Learning takes place through the guru–shishya parampara, where practice rather than

instructions is used to convey tacit information, such as loom adjustments, pattern memory, and yarn tension management.

Additionally, IKS combines function with beauty. Textile motifs are bearers of historical tales, religious symbols, and cultural memory rather than ornamental elements. Mughal flower designs in Banarasi brocade symbolise cross-cultural interactions, whereas Kota Doria's geometric khat demonstrates climatic intelligence and mathematical accuracy.

The fusion of Kota Doria and Banarasi brocade is positioned within this theoretical framework in this research (Srivastava and Saxena, 2025). The merger honors cultural symbols (motif preservation), decentralised knowledge (inter-cluster collaboration), and ecological logic (lightweight, breathable fabric). It shows that innovation in IKS refers to contextual adaptability rather than technology disruption. The synthesis revitalises indigenous knowledge for modern relevance by operating inside traditional loom grammars.

Therefore, IKS offers the conceptual framework for comprehending this textile fusion as a continuation of living knowledge traditions that promote sustainability, inclusivity, and community business rather than as a creative experiment.

5. Technical Study of Banarasi Brocade

One of India's most renowned silk weaving customs, banarasi brocade has long been connected to ceremonial clothing, rituals, and monarchy. The incorporation of silk and zari using additional weft methods carried out on drawlooms or jacquard looms accounts for its technical complexity (Amjad *et al.*, 2025). Multiple shuttles, accurate pattern mapping, and a thorough comprehension of silk yarn behaviour are necessary for the weaving process. Usually made of pure silk, the foundation fabric adds strength and lustre. To produce intricate designs, zari, which is comprised of silver threads covered in gold, is introduced as an additional weft. Inspired by Mughal aesthetics, these motifs kalga, bel, jaal, and flowery creepers reflect centuries of cross-cultural interaction. The weaver must have extraordinary memory and expertise to translate designs into weave structures using the naqsha (design graph), which functions as a coded language.

The lush drape and heavy fall of Banarasi brocade are attributed to the weave's density. But this density also plays a role in its main drawback in modern markets. The cloth is less appropriate for contemporary lives that value comfort and adaptability due to its weight, zari cost, and labor-intensive production process. Furthermore, the market is now overrun with less expensive power loom imitations, which has decreased demand for genuine handwoven brocades. Due of the poor returns compared to the work intensity, younger generations in weaving families tend to steer clear of the art (Haqiqah *et al.*, 2025).

Despite these difficulties, Banarasi brocade is an intricate system of knowledge including mathematics, metallurgy, material science, and creative interpretation. Its themes have great cultural significance, and its zari technique is unmatched. Banarasi brocade offers the technical proficiency and decorative richness needed for textile synthesis in the context of this research (Srivastava and Saxena, 2025). Its aesthetic value may be preserved while resolving usability issues by modifying its themes and lowering structural density. For significant innovation that is based on history, it is therefore essential to comprehend its technical depth.



FIGURE:-1 Traditional Banarasi zari motif

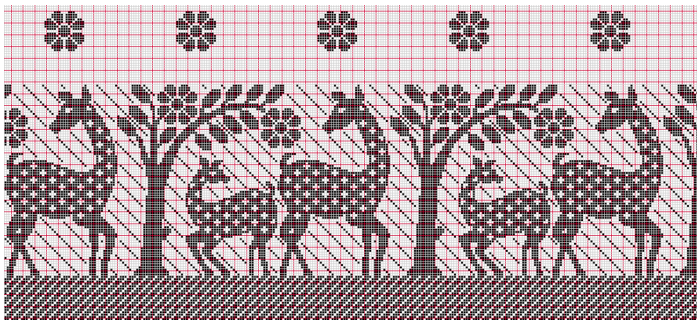


FIGURE:- 2 Weave graph of Traditional Banarasi zari motif

6. Technical Study of Kota Doria

A distinctive handloom cloth from Rajasthan, Kota Doria is renowned for its khat, or square check pattern. A lightweight, transparent, and breathable fabric that is perfect for hot weather is created by alternating cotton and silk threads in the warp and weft. To ensure consistent checks, Kota Doria weaving calls for exact control over yarn tension. While silk contributes a slight gloss and firmness, cotton offers stability (Hada and Meena, 2025). It is pleasant to wear every day in arid areas because of the weave's openness, which permits air circulation. This illustrates how the fabric structure incorporates local climate knowledge.

Kota Doria has less decoration than Banarasi brocade. Geometry, not themes, is what makes it beautiful. It has historically been used to sarees and turbans, which are prized for their comfort and style rather than their lavishness. But its simplicity has also turned into a barrier to its market. Kota Doria is sometimes seen as being overly simple in the upscale and celebratory areas. Its limited appeal to niche markets due to a lack of motif vocabulary and design involvement has resulted in poor artisan income and decreased demand (Pramanik et al., 2024). However, Kota Doria represents an advanced geometric, material-blending, and climate-adaptation knowledge system. Its khat grid provides the perfect foundation for adding more design components without sacrificing breathability.

Kota Doria supplies the structural basis for synthesis in this study. Because of its lightweight design, Banarasi zari motifs may be included without making the cloth heavier (MALIK et al., 2018). As a result, the primary facilitator of innovation is Kota Doria's technological intelligence.

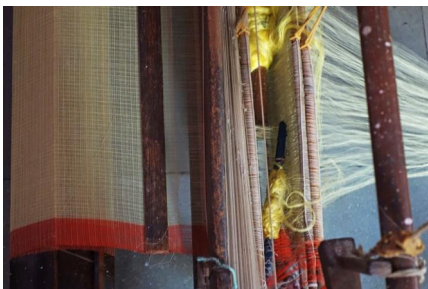


FIGURE:- 3

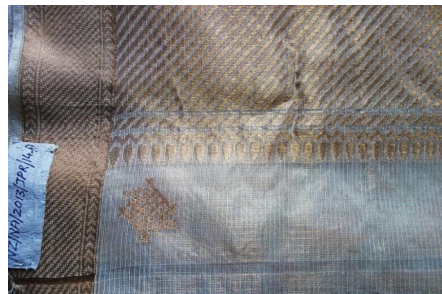


FIGURE:- 4

Handloom Kota Doria fabric and the *khat* structure.

7. Conceptualizing the Synthesis

To ensure that neither tradition was diminished, extensive conceptual design was needed for the fusion of Kota Doria and Banarasi brocade (Srivastava, 2025). Adding zari designs to the khat structure without changing its geometry or adding weight to the cloth was a difficult task.

Banarasi motifs have to be reduced in size in order to fit inside the khat's grid. Smaller motifs were carefully positioned inside the checks in place of big, dense flower designs (Hada and Meena, 2025). Silk-cotton yarn combinations were tried to preserve structural balance, and fine-count zari was employed to lessen heaviness. To allow for additional weft insertion inside the open weave, the loom arrangement has to be adjusted. To acquire the proper yarn tension and pattern clarity, many sample attempts were carried out.

The realization that Kota's geometry might serve as a design framework for Banarasi decoration was a conceptual breakthrough. Instead of superimposing one tradition on top of another, the synthesis made it possible for them to coexist peacefully. This procedure is an example of innovation in conventional grammar. Lightweight brocade is a new genre of textiles created by combining conventional looms, materials, and processes.

Table 2. Design Adaptation Strategy During Synthesis

Challenge Faced	Design Intervention	Result
Zari caused fabric stiffness	Used finer zari count	Maintained softness
Motifs distorted <i>khat</i>	Miniaturized motifs	Preserved geometry
Excess silk weight	Silk-cotton blend	Reduced heaviness
Loom tension imbalance	Warp-weft adjustment	Stable weave
Visual clutter	Motif spacing strategy	Clear aesthetics

8. Methodology: Practice-Based Research

This study employs a practice-based research technique, which generates information not only via theoretical speculation but also through the creation and testing of textiles.

Field visits were conducted to understand weaving practices in both clusters. Weaver conversations showed the possibilities and limits of the loom. Testing various zari thicknesses and silk-cotton ratios was part of the material experimentation. Many of the loom samples that were woven failed because of distorted checks or stiff cloth. Warp tension, motif scale, and yarn count were all adjusted through iterative experiments. Weight measurement, breathability evaluation, and drape observation were all part of the fabric testing process. Consumers and designers provided unofficial market input. This practical approach guaranteed that the synthesis was financially viable, culturally appropriate, and technically possible.



FIGURE:- 5



FIGURE:-6



FIGURE:-7

Handloom weaving practices showing manual loom operation and artisan engagement in textile production.

9. Results

The textile synthesis produced very promising results. The finished cloth featured exquisite Banarasi zari designs while maintaining the transparency of Kota Doria. It was appropriate for modern clothing since it was substantially lighter than traditional brocade. After initial instruction, weavers adjusted to the new method, demonstrating scalability. Because of its richness and ease, the cloth was well appreciated for use in festive and event attire. This synthesis showed how intelligent design intervention might reawaken traditional knowledge systems, resulting in sustainability, cultural continuity, and improved livelihood.

Table 3. Fabric Testing Observations

Test Parameter	Traditional Banarasi	Kota Doria	Synthesized Fabric
Weight	High	Very low	Medium-low
Breathability	Low	High	High
Drape	Stiff	Fluid	Fluid
Motif Visibility	High	Minimal	Balanced
Wear Comfort	Low	High	High
Artisan Adaptability	Known skill	Known skill	Easily adaptable

10. Analysis

The Banarasi–Kota textile synthesis study shows how ancient knowledge systems may solve modern issues of economic viability, cultural inclusion, and sustainability. This synthesis is an applied illustration of Indian Knowledge Systems functioning in a contemporary setting rather than only a design innovation. In terms of sustainability, the textile industry is still based on handloom techniques, which use very little energy in comparison to automated manufacturing. Utilizing natural fibers like cotton and silk guarantees ecological compatibility and biodegradability. Through integration with Kota's open khat structure, Banarasi brocade's density is reduced, making the finished fabric lighter and more wearable, extending its useful life. This is consistent with the slow fashion philosophy, which substitutes timeless design and longevity for mass manufacturing and disposability.

The synthesis facilitates communication between two weaving traditions that are geographically and artistically different. Kota provides structural intelligence and climate appropriateness, while Banaras gives zari mastery and decorative richness. By fostering information sharing and cultural inclusion, this interregional cooperation keeps artisan traditions from becoming isolated. For weavers, the new textile category offers a variety of economic prospects. Artists may create value-added textiles that fetch higher market prices rather than depending just on simple weaves or conventional sarees. Younger generations are encouraged to stay in the craft industry and their income is increased as a result.

From a technical standpoint, the synthesis shows that without automation, innovation may take place within the current loom structure. In order to maintain the authenticity of handloom weaving, the necessary modifications are skill-based rather than technology-based. As a result, the study verifies that this textile synthesis functions at the nexus of environment, culture, and economics, effectively and scalably expressing the concepts of Indian Knowledge Systems.

11. Discussion

The main focus of the conversation is how Indian knowledge systems see innovation. Innovation is frequently linked to technology disruption in today's design debate. This study, however, demonstrates that rather than replacing tradition, genuine innovation may arise through reinterpretation. The Banarasi–Kota synthesis honors cultural symbolism, artisan skill, and loom grammar. It arises from the logic of current activities rather than imposing

external design frameworks. Because artists are more inclined to embrace innovations that complement their traditional expertise, this is essential for the sustainability of craft. Additionally, the fabric dispels the myth that traditional textiles are either too basic or too heavy for contemporary markets. The synthesis produces a well-balanced textile that satisfies modern comfort and aesthetic demands by fusing the best elements of both traditions. The function of researchers and designers as facilitators rather than disruptors is another crucial element. Before interfering, a thorough grasp of craft is essential to the effectiveness of this synthesis. It emphasizes how crucial practice-based research is to textile innovation. The conversation also highlights how this kind of synthesis might serve as a template for other creative industries whose customs are dwindling because they are no longer relevant. Crafts must develop within their knowledge frames rather than being preserved as museum objects.

12. Implications

This study has implications for sustainable development, education, and craft policy in addition to textile design. According to the research, traditional crafts should be seen as knowledge labs for designers. Instead of forcing contemporary aesthetics, innovation might come from researching weaving processes, material behavior, and motif logic. The study emphasizes the necessity for governments to support inter-cluster cooperation. Government schemes often focus on individual clusters, but synthesis across traditions can generate new markets and revive multiple communities simultaneously.

This study encourages the inclusion of practice-based research in curricula for artisan education. To grasp the breadth of traditional knowledge, students should interact with looms, materials, and craftspeople. From an economic standpoint, this textile strategy provides a route for local businesses. Artists can lessen their reliance on a small number of traditional items and diversify their revenue streams by developing new product categories. In terms of the environment, the study reaffirms that industrial sustainability approaches are not necessary because sustainability in crafts is intrinsic.

13. Conclusion

The fusion of Kota Doria and Banarasi brocade shows that Indian knowledge systems are dynamic frameworks that may direct modern innovation. Without sacrificing traditional authenticity, this textile fusion maintains cultural symbolism, improves utility, and sustains artisan jobs. The study demonstrates that creative continuity, rather than just preservation, is the key to craft resurgence. New textiles that appeal to contemporary customers can be created by modifying themes, materials, and structures found in classic loom grammar. This study also shows that when innovation is grounded in tradition, sustainability, inclusivity, and enterprise are interrelated consequences. The cooperation between the weaving communities of Banaras and Kota serves as an example of how craft clusters may collaborate to produce goods with added value.

In the end, this textile is more than just cloth; it is an expression of cultural memory, living knowledge, and sustainable practice. It confirms that, when treated with dignity, inquiry, and inventiveness, Indian crafts may provide answers to today's problems.

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The authors have no competing interests to declare that are relevant to the content of this article.

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