The Bronze of Ideas: Dhokra Craft as a Lens for Design Thinking

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Abstract: Dhokra, an ancient and vibrant craft tradition in India, practices the ancient lost-wax casting technique to craft religious and decorative objects. The craft tradition, rooted in Bastar, Chhattisgarh, is beset by issues pertaining to market relevance, costlier raw materials, and decreasing artisan participation. The proposed research uses Dhokra as a model for design thinking and examines the utility of human-centric, cyclical processes as input for the development of environmentally sustainable craft innovations. The research follows a qualitative systematic approach, wherein there is an integration of systematic literature review, comparative case analysis, and follow-up set of primary field interviews. These are done within varied intervention settings, ranging from designer-initiated, company with social responsibility (CSR), and non-governmental organization (NGO) initiatives. The resultant set of data is then organized through thematic coding with NVivo and meaningfully synthesized through cross-case synthesis. The outcome consists of the evolution of the Empathic Co-creation for Sustainable Heritage (ECSH) paradigm. The result obtained in the current research confirms and ascertains the critical role of empathy, extent of co-creation, and prototyping capacities within the consolidation of design collaboration and artisan empowerment, as well as cultural integrity. The set of cross-case synthesis, as done through this research, ascertained the overall positive thrust toward relational immersion, cooperative problem framing, and adaptive capacity, as well as toward symbolic authenticity. The proposed ECSH paradigm enriches and enhances the existing sets of understanding within the scope of design approaches, by meaningfully merging the empathic understandings, co-creation as self-empowerment, and prototyping capacities within cultural adaptation. The proposed paradigm, within this research, aims to enable and develop environmentally sustainable craft innovation. The proposed research, within this thesis, positions Dhokra with all their meaning and complexity as `living systems within design.
Keywords: Artisans, Cultural Sustainability, Design Thinking, Dhokra Craft, Innovation, Lost-Wax Casting, Tribal Art

1.INTRODUCTION

1.1 Background
Among the inumerable material cultural practices in the massive territory of India, the Dhokra, also spelled Dokra, has the particular significance of being the most enduring tradition. The distinctive quality of this craft has to do with the use of the ancient lost-wax casting method, a craft that transforms wax figures into exquisite metal objects in the process of clay investment, firing, and metal pouring. Each piece has its own unique quality, as the texture and look of the metal can change based on the craftsmnds' skilled hands and the way the metal flows when casted into shape (Banerjee & Rani, 2024; Samanta et. al.,2022).

The aesthetic vocabulary of the Dhokras, characterized by vertical lines, filigree, and symbolic motifs, speaks not only of technical excellence but also of mythological, religious, as well as practical, undertones.

The production of Dhokras has a geographic distribution of localized groupings, as evident in Figure 1. These include the Bastar region in the state of Chhattisgarh, Bikna in West Bengal, as well as other areas in the state of Odisha, Jharkhand, Bihar, and Andhra Pradesh, as reported in the literature by Das, 2024; Seth & Thakur, 2024. These groups share a common metallurgical tradition, but each has its own cultural style. In the past, Dhokra metalworking has been associated with the ritual objects, metalware, and metal ornament production of hereditary blacksmith castes, like the Ghadwa, as reported by Banerjee & Rani, 2024, Patel, 2025. They began this trade as a means of fulfilling local needs as well as as a means of earning a profit, while in the process maintaining the symbolic significance of the metalworking process.
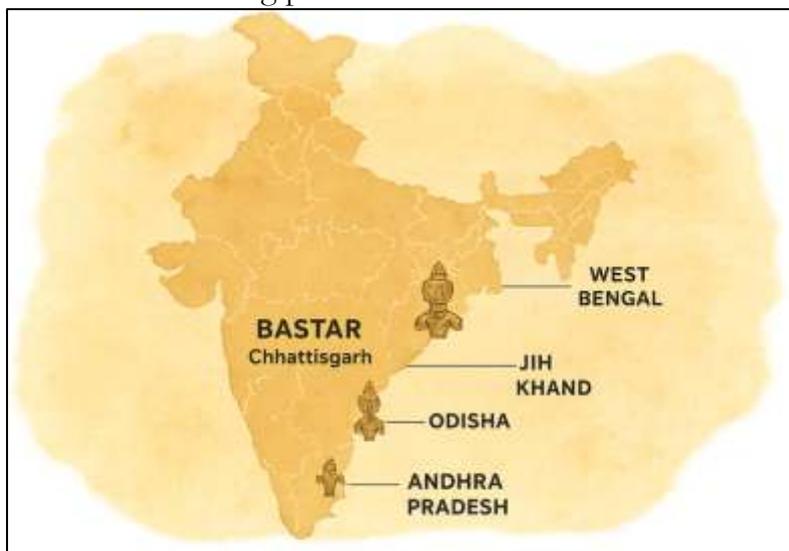

Fig.1: Dhokra Craft Map- India

At the moment, Dhokra is facing a crucial juncture in terms of challenges and opportunities. The competition in the market, the rising costs of materials, as well as the challenge of younger people becoming less engaged, are increasingly threatening the sustainability of Dhokra. One of the most observable issues in this scenario has been the migration of young crafts people to the urban labor market. One of the most important aspects of this migration has been the unpredictability of the income generated by crafts, which has largely turned out to be a challenge for people in the industry. The rise in the cost of brass materials has resulted in limitations in terms of production, while the creation of middle markets has resulted in the lack of justifiable financial returns. Even in situations where the demand has not reduced, as in the case of tourism and exports, the potential of creative expression has largely been negatively influenced by other people, like designers, buyers, or NGOs, in terms of setting trends and specifications (Banerjee et al., 2022; Dhar, Chawla, & Mulchandani, 2024).

At the same time, design thinking, as a human-centric, iterative, and interactive process that has recently found favor in innovation and design education, also offers a fascinating, if complex, paradigm for the reimagination of craft futures. In design, this process focuses attention on empathetic understanding, problem definition from the perspectives offered by lived experience, and the creation of iterative prototypes based upon received feedback (Brown, 2009; Walia, Datt, & Brereton, 2024). In skilled hands, the potential of design thinking exists as a bridge between tradition and innovation, enabling a complementarity between artisans and artists that honestly appreciates the importance of tradition while fostering innovative transformation (Saxena & Pandey, 2024).

This proposed work challenges the perception of Dhokra as merely an emblem of culture, but rather as a design process, reassessing this craft as a dynamic, rather than static, body of knowledge, which could, in theory, serve as the basis of environmentally informed design practices. The current research aims to address the manner in which people-centered design practices, inspired by the philosophies of both empathy and collaboration, can support the livelihoods of artisans, promote existing craft practices, and create items that appeal to the modern sensibility.

1.2 Dhokra's Material and Cultural Foundations

The Dhokra craft represents the quintessence of this embodiment, encapsulating the union between metallurgical knowledge, manual dexterity, and the rhythmic motion of rituals. According to the evidence made available by Samanta et al. in 2022, the process starts as the craftsman carves a model in wax over the clay base. Next, he pours layers of clay over the model before firing. This step results in the melting of the model's wax content. The next step involves pouring molten brass or bronze into the so-created empty space, resulting in the creation of the single cast in the artifacts produced.

The materiality of the Dhokra, therefore, remains inescapably entwined in its significance as a cultural motif. In this context, tracing the visual genealogy of the topic, authors Seth & Thakur in the year 2024 wrote, "This idea has been explored in the concept of symbolic language and technique, whose origins exist in the Harappan figures… This brings us to the hypothesis that there exists symbolic language as well as the continued use of the Harappan symbolic technique." The role of the Dhokra artifacts, namely horses, elephants, and tribal deities, remains instrumental in the religious practices in the region of Bastar. In the region of Bankura, in the state of West Bengal, there remain animal motifs, as well as domesticated life, in an endeavor to understand the rural agriculture-driven life of the people there. Patel in the year 2025 has revealed, "Modern artisans are also adapting the symbolic motifs as beautiful objects in response to the demands of the modern consumer, the marketplace."

Nonetheless, this adaptability also has the potential to create tension, as it may lead to the displacement of artifacts in terms of ritual significance owing to commercialization. Moreover, the limited availability of design education may obstruct the artisans' adaptability in coping with the shifting consumer expectations (Banerjee & Rani, 2024). The next question that arises in this consideration is: how can design thinking help the artisan practitioners adapt to the markets in their own terms, thereby retaining cultural heritage while innovating?

1.3 Socioeconomic Challenges and Institutional Ecosystems

Recent studies emphasize the vulnerable position of Dhokra's economy. According to Deshmukh et al. in 2024, there are three important vulnerabilities in the economy, which include the lack of sustainability in income, demand unpredictability, as well as overdependence on middlemen. A large number of artisans lack direct market exposure, largely operating through middlemen/exhibitions that lack negotiating power. The rising costs, owing to the growing price of metal, have been recognized as one of the influencing parameters in the intensification of vulnerabilities. On the other hand, the lack of youth involvement has reduced over the years, seen to be caused by the lack of proper educational as well as financial support structures in place, as posited by Kumari & Parashar in 2023.

According to Banerjee et al. (2022), the efforts made by the non-governmental organization, as well as the government, to revive these spaces through training activities, design workshops, as well as the use of Geographical Indications tagging, continue to overlook the call for systemic sustainability in favor of seeking aesthetic conformity. The view that the development of crafts needs to cover societal, cultural, as well as ecological

sustainability, as opposed to competition in the marketplace, has been offered by Dhar et al. in 2024, in line with the work offered by Walia et al. in 2024.

Challenges in material continue. Metallurgical efficiencies, costs of fuel, as well as health risks, remain as variables inhibiting the quality and scalability of production, as highlighted by Samanta et al. in 2022. Infrastructure issues, lack of foundries, testing labs, as well as availability of alloys in supply, continue to limit the innovativeness of artisans. Digital platforms, as well as e-commerce, act as innovative marketing media, as noted in Yadav, Tripathi, & Tripathi in 2023, but they require digital literacy as well as visual communication abilities, which are not easily attainable in rural settings.

The restoration of the craft in the Kankeri village in the state of Odisha, led by the efforts of Vedanta, represents the power of effective collaboration, involving training, support, and exposure to design, in greatly improving the financial well-being and confidence of the artisans, as was highlighted in the APN News Report of 2021. But this remains the exception rather than the norm, dependent as it is on corporate patronage or the support of NGOs.

1.4 Design Thinking and Craft Innovation

Design thinking, having gained lots of influence from the likes of IDEO and the d.school at Stanford, has seen a shift in its approach, moving in a direction that was not technological/business but more related to art, like crafts, and cultural heritage spheres (Brown, 2009; Walia et al., 2024). The core values upon which the organization was based, in terms of practices like empathy, co-creation, and iteration, were in line with the complexities involved in the process of the craft. The process of the craft was cyclical, materials based, and involved users too (Saxena & Pandey, 2024).

According to a study by Banerjee & Rani in the year 2024, the transformation of Dhokra art into design objects represents the stages in the process of design thinking. The process, as described, includes the following subsequent stages: It is necessary to understand the transformation in the context of users, redefine the objects, and proceed with the idea generation based on the shared process of sketching. Moreover, the process of prototype generation in wax, market evaluation, and the improvement based on the feedback received also assume significance. The process of design thinking, when done in collaboration, becomes a process of learning in an interdisciplinary manner, where the designer utilizes the tacit knowledge of the artisan, while the artisan gains the expertise in understanding the nuances of the modern scenario.

Despite this, some reservations exist concerning the proper use of this research finding. In the year 2024, Walia, along with other authors, published research work concerning the relationship between design thinking and the current scenario of long-standing practices in Rajastan. The research findings revealed the coexistence of points of convergence as well as divergence between the aforementioned two. Another research piece by Dhar et al. in the year 2024 highlights the difficulty in the process of ethical co-design, where the artisans must retain control over the process as well as the financial gains.

In the context of Dhokra, the potential available in the paradigms might trigger the development of sustainable futures, ranging from the creation of new product lines like light, jewels, and home wares, to process innovations like metal recycling and improved kilns. According to the study conducted by Saxena & Pandey in 2024, the addition of consumers in the process of co-creation can induce better relevance pertaining to handmade products, therefore paving the way for the adoption of sustainable consumer practices.

1.5 Toward a Human-Centred Model for Craft Sustainability

Current research shows that the potential for the most sustainable results can be achieved through the establishment of design-driven craft interventions as collaborative ecosystems,

as opposed to the design project approach, as identified in the work of Banerjee et al. in 2022, as well as Dhar et al. in 2024. In this context, innovative change can be observed in the manner in which the functional quality of the provision of goods, as well as the services, enhances the efficiency of supply chain networks. This also involves the design of systems regarding the governance process, as well as the efficiency of the knowledge dissemination process. By considering the integrative process offered through the research, the approach combines the use of empathic designs, as well as the process of participatory co-creation, along with sustainability as the management process for cultural heritage, in relation to the associated communities. This process has been defined as the Empathic Co-creation for Sustainable Heritage, as denoted in the ECSH construct. The addition of the ECSH construct to the Human-Centred Model for Craft Sustainability offers an integral strategy in terms of the protection of not only the existing knowledge but also the relevance it has in the modern world. One of the key focuses attributed to the ECSH construct involves the establishment of deep empathic connections with communities. They emphasize the importance of adopting the use of participatory methodologies, while also taking into consideration the importance associated with the values of the people, in relation to the significance of the local values, as well as the idea of preserving cultural identities. They work in line with the idea of adopting shared practices in regard to decision-making, in order to ensure the development of the heritage practices based upon the significance associated with the cultural heritage to the related communities, in line with the ECSH construct.

The Human-Centred Model of Craft Sustainability offers a synergistic approach that emphasizes the needs, drives, and well-being of the crafts people. This model emphasizes the importance of support for the livelihoods of the crafts people, improving the transfer of crafts knowledge, as well as the dynamic relevance of the crafts in the continuously shifting social, environmental, and economic circumstances. The combination of the two models promotes a symbiotic relationship, where empathetic co-creation inspires community buy-in, and the structured approach of human-centered design offers systematic routes for effective implementation.

Together, these aspects promote the creation of a heritage ecosystem that can be sustained, where crafts are not just conserved but also constantly renewed.

This integrative approach promotes innovation based on tradition, thus enabling artisans to collaborate in the design of their future. In addition, this approach promotes the sustainability of cultural practices in terms of equity and vibrancy between the various generations.

Figure 2 shows how the design thinking process models the iterative cycles of design thinking, as demonstrated in the figure below. The design approach, like the process of experiential learning, relies heavily on the feedback, reflection, and material experimentation cycles, which are imperative in the process of Dhokra art. The combination of these cycles in the social structure of Dhokra has the potential to democratize innovation, thereby enabling the artisans to act as co-authors as opposed to the current role as passive participants in the design process.
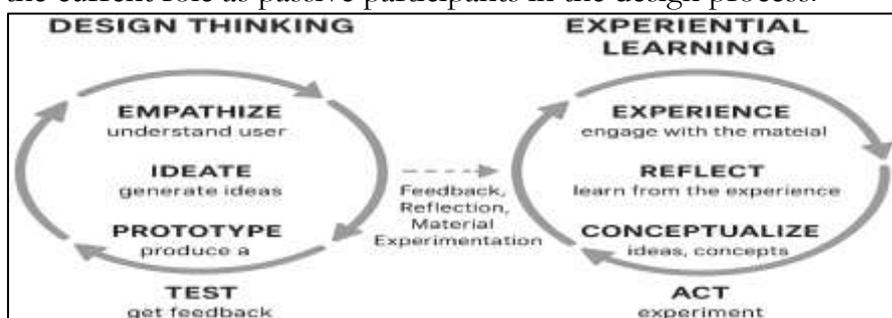
Fig 2: Iterative cycles of Design Thinking and Experiential Learning.
The issue of the role of technology in this scenario also invites more research. From the domain of research related to the convergence of craft and technology, as identified in the work of Batra et al. (2025) and another example in the work of Li et al. (2025), the use of digital documentation, generative technology, and co-design augmentation systems could help create a means of craft learning independent of, but not surpassing, existing traditions. While the non-digital intimacy of the craft tradition can never be replaced, it might be supplemented in terms of motif documentation, simulation of alloys, or prototyping for clients.

The key to the continued survival of the cultural heritage of the Dhokra tribe rests in the dynamic between the conservation of heritage traditions and innovation. The proposed ethics of design rest in the philosophy of empathy, respect, and the process of co-learning, as described in the work of authors in the year 2019.

1.6 Research Gap and Study Rationale

Although there exist extensive works that describe the developing aesthetic sensibilities and the environmental challenges in the craft, there exists a lacuna in the related literature that formulates design thinking as a theory-driven approach in the form of craft innovation. This has been elaborated in the existing literature, as described in the following, where the lacuna exists in the longitudinal work in crafts, as indicated in the existing body of knowledge (Banerjee etal., 2022; Walia etal., 2024; Saxena & Pandey, 2024).

This research fills one of the most continuously absent research spaces in the existing literature pertaining to craft, as it pertains to the use of design thinking as a means of apprehending the Dhokra tradition not just as artifacts, but as a dynamic, living system of creation. The Dhokra tradition could be seen as a complex process of the symbiotic development of techniques, religious meaning, home economies, and local ecologies that also form the fabric of this tradition. In this way, any attempts at design, product, or market access strategies are compelled to factor in cultural logics rather than just technological potentials (Baldassarre et al., 2024). This research emphasizes participant-centered design thinking, where the process of this concept could be seen in the form of co-creation workshops, prototyping, as well as process-driven user feedback. This research looks at the manner in which the latter acts as facilitators in the attainment of tangible results, in terms of the addition of product variants, innovative functional designs, forms, as well as process optimizations, as well as the teasing out of the process's intangible information, which includes artisan agency, knowledge exchange between members, as well as the strengthening of local networks. The most recent literature related to craft-driven growth strategies, as well as the socio-economic conditions in the Dhokra tradition, illustrate the needs for these particular cultural literacy design strategies in avoiding the detrimental implications associated with the concept of 'innovation' as it has been previously known in extractive models (Yadav et al., 2022).

In terms of methodology, the proposed project uses a comparison, cluster, ethnographic research methodology in the region of Bastar, in the state of Chhattisgarh, as well as in some identified Jhokra-producing regions in West Bengal. Every region has been identified as having a series of workshops as part of the process of co-creation, where the designer, together with the local experts in the artisanal trade, work in close collaboration in order to produce rapid prototypes, which, in turn, are fine-tuned over a series of rounds of testing. These workshops involve interventions in material prototyping, in addition to sharing personal stories, use profiling, as well as shared evaluations, as described in the most recent directions in co-design in the context of crafts, as outlined in Khalsa, 2024, as well as in Liu et al., 2023.

The expected outputs can be three-fold. Firstly, it has the potential to deliver empirical evidence regarding the way in which design thinking, when attuned to the culture, can facilitate innovation while sustaining, if not enhancing, the existing idioms and symbolic values associated with the craft practices. Thus, it has the potential to act as a model of sustainable craft innovation, one which, instead of merely market-driven, can address concerns related to material realities of crafts in developing societies like the proposed project (D'Itria et al., 2024). Secondly, from the theory itself, it has the potential to promote the discourse associated with the role of social design in the context of cultural sustainability, as it has the potential to describe the role of design strategies in the way in which they can be adapted to support the existing social systems of knowledge, the way in which they can support the existing ritual significance associated with the crafts, and the way in which they can resist the commodification process in the first place (Nofal, 2023). The last one has the potential to make concrete the way in which the project work can be translated into the form of model designs, models that can be easily adapted by policymakers, NGOs, as well as design institutions, in the context of the GI-tagged crafts/crafts owned collectively in order to achieve the goal of ethical development, as proposed by the project members in this regard (Sheng, 2023). This project has the potential to address the related issues as highlighted in the most recent comprehensive reviews associated with the issues of crafts, cultural heritage conservation, as well as the concept of design for development, as it has the potential to describe the importance of adopting models in which material experimentation, as well as outcomes related to livelihood, can be intimately interconnected (Cui et al., 2024).

1.7 Research Objectives:

To explore how design thinking can be integrated into the Dhokra craft ecosystem

To propose strategic models for sustainable innovation through design-craft collaboration

2. RESEARCH METHODOLOGY

2.1 Research Design

It was grounded in a perspective that suggests our comprehension of the world is rooted in individual experiences. Further, it infers understanding of the Dhokra craft as part of cultural practice emerges from a dialogue between the researcher and the study participants. Researchers of this genre of scholarship reject objectivity for practical knowledge and insight derived through interaction with people.

A multi-faceted research methodology was thus followed to meet the stated objectives by integrating a comprehensive SLR, a comparative CCA, and a preliminary in-field investigation. This step-by-step process made sure that the ideas were well thought out and based on real facts.

The structure of the study conformed to the five core stages of Design Thinking: Empathize, Define, Ideate, Prototype, and Test. This framework allowed findings from various sources, such as academic literature, case studies, and on-site research, to be systematically integrated in each of these stages. The workflow of the study proceeded as follows:

First, an SLR was performed, followed by CCA, field interviews, NVivo coding, cross-case synthesis, and finally the derivation of the ECSH framework.

This model allowed for repeated learning, whereby every step in the process used information from the previous steps. It thus supported the creation of the ECSH model focusing on collaboration and sustainability in heritage management.

2.2 Systematic Literature Review (SLR)

This review was carried out following the guidelines provided by PRISMA 2020. Literature for the review was obtained from databases such as Scopus and Web of Science, Google Scholar, and ResearchGate, using the Boolean expression:

• Search using keywords like "Dhokra," "lost-wax casting," "tribal metal craft," or "bell metal," along with "design thinking."

• Of these, 72 records were found from a search for only English studies between 2010 and 2025.

• After deduplication and quality screening, a total number of 22 relevant publications were identified, including peer-reviewed ones.

• Each text's authorship was detected through the use of coding.

• of author background, study context, methodologies, and their correspondence to stages in Design Thinking.

From this set of texts, three different examples were selected in order to show the variety of institutional approaches:

Designer-led: AnanTaya / AKFD Studio (Jaipur)

CSR-led: Tata Steel Foundation Craft Cluster Programme (Odisha & Jharkhand)

Community / NGO-led: Dastkar and Craftroots (Chhattisgarh)

Selection criteria included demonstrable application of design thinking, accessible documentation, and active engagement exceeding one year. Fifty-six documents were analyzed: 18 articles, 27 NGO/CSR reports, and 11 visual and media sources. Insights from this review also informed interview guides and the coding framework.

2.3 Primary Data Collection

Fieldwork was conducted from April 2024 to March 2025 at three main sites: Bastar, Chhattisgarh; Dhenkanal, Odisha; and Delhi craft fairs.

Ten in-depth, open-ended interviews were conducted: five with working craftspeople, three with product designers or program supervisors, and two with nonprofit or corporate CSR program officials.Each session was approximately 45-60 minutes in length, and the interviews were carried out in either Hindi or Odia. Translation assistance was provided when needed.

Moreover, two sessions recorded workshop activities and utilization of tools, and utilization of field notes and photographs to enable collaborative interaction. These observations were recorded. Aspects of the design-craft interface that are embodied and implicit are often overlooked in textual accounts.

2.4 Ethical Considerations

Participants in the study knew its purpose and consented to it. Their anonymity was maintained by codes. Digital files were encrypted and stored on secure drives, also according to guidelines from the Institutional Ethics Committee. All participation was strictly voluntary, and respondents could withdraw at any time without penalty.

2.5 Data Analysis and Trustworthiness

Data analysis used NVivo 12 Plus to combine depth and rigour. Two coding cycles followed the framework of Miles, Huberman & Saldaña (2020):

1. Open coding captures preliminary ideas like relationship-building and sharing of skills.

2. Axial coding meant the grouping of related ideas into themes or categories corresponding to DT phases, which finally resulted in 14 interrelated concepts.

Cross-checking the SLR, CCA, and field data made interpretation more consistent. The procedures included a series of validation checks to ensure reliability and transparency in analytics:

• **Credibility:** Member-checking with key participants verified interpretive accuracy.

• **Dependability:** A comprehensive audit trail of coding memos and analytic decisions was maintained.

- **Confirmability:** Reflexive journaling documented the researcher's positionality and evolving interpretations.
- **Transferability:** Detailed contextual descriptions and visual documentation enable replication or adaptation in similar craft settings.

Through these measures, the analysis achieved both depth and trustworthiness, providing a robust empirical foundation for constructing the ECSH Framework.

3. Data Analysis

The framework of the analysis was critical interpretivism, orienting the study towards meanings through the processes of coding, discovery of patterns, and integration with theory. The research merged three data streams, namely, SLR, CCA, and primary field interviews, into three linked stages.

The phases went from literature synthesis to case interpretation and then to cross-case thematic integration; data were managed, and visual maps were created using NVivo 12 Plus.

3.1 Stage 1 – Literature and Documentary Coding

The first stage involved the SLR dataset that consisted of 22 articles from peer-reviewed journals. Each source was obtained during the period from 2010 to 2025 from the databases Scopus, Web of Science, and ResearchGate. Each text was coded for its methodological stance, intervention type, and outcome orientation, and relevance to the five phases of Design Thinking, namely Empathize, Define, Ideate, Prototype, and Test).

This analytical framework for the matrix (Table 1) was developed by relationships among theoretical insights, case studies, and field observations. This demonstrates how the results became more relevant and accurate when different sets combined to produce it.

Table 1: Data Integration Matrix

Data Source	Nature	Purpose / Analytical Contribution	Aligned Stage of Design Thinking	Analytical Output
Systematic Literature Review (SLR)	Secondary	Establish theoretical base, extract recurring themes on empathy, co-creation, and innovation in crafts.	Empathize, Define	Conceptual codes (empathy immersion, co-creation intensity, sustainability)
Comparative Case Analysis (CCA)	Mixed	Compare intervention models—Designer-led, CSR-led, NGO-led—through documentary and field evidence.	All Five Phases	Within-case summaries, comparative matrices
Field Interviews & Observations	Primary	Capture artisans' lived experiences, designer–artisan interaction dynamics, and cultural negotiation.	Ideate, Prototype, Test	Thematic categories and illustrative quotes

Visual & Archival Records	Secondary	Contextualize material practice, motif evolution, and institutional mediation.	Prototype, Test	Visual coding nodes in NVivo, motif continuity patterns
Data Source	Nature	Purpose / Analytical Contribution	Aligned Stage of Design Thinking	Analytical Output

This phase gave us ideas for the field interview plan and how to code the data. Some of the ideas are empathy, getting in the middle of things, making things intense, keeping up with culture, and how the market responds. Researchers analyzed repeating patterns of documentary materials from CSR and NGO archival collections (n = 27) and visually recorded data (n = 11) to identify underlying intervention logics. The researchers created a preliminary map that links phases of design thinking to desired outcomes of empowerment.

3.2 Stage 2 – Within-Case Analysis

There are three categories: Designer-led: AnanTaya/AKFD Studio, Jaipur; Corporate Social Responsibility-led: Tata Steel Foundation (Odisha and Jharkhand), and non-governmental organization (NGO)-led (Dastkar and Craftroots, Chhattisgarh).

People treated it as a discrete unit of analysis. Related field documents, including transcripts and observation notes, were compiled into NVivo 12 Plus for hybrid inductive-deductive coding analysis was performed per the methodology prescribed by Miles, Huberman, and Saldaña, 2020.

Table 2: Within-Case Analytical Summary

Case Type	Primary Analytical Themes	Illustrative Observations / Quotes	Emergent Insight	Case Type
Designer-led (AnanTaya/AKFD)	Empathic immersion, aesthetic adaptation, shared authorship	"We refined the wax mould after seeing how the artisan handles it differently." — Designer	Long-term immersion fosters trust and design agility.	Designer-led (AnanTaya/AKFD)
CSR-led (Tata Steel Foundation)	Structured training, product diversification, limited creative autonomy	"We make faster now, but motifs must follow the brief." — Artisan	Institutional structure enhances efficiency but limits authorship.	CSR-led (Tata Steel Foundation)
NGO-led (Dastkar, Craftroots)	Storytelling-based co-creation, cultural continuity, participatory experimentation	"We suggested the bird symbol; it's from our ritual designs." — Artisan	Cultural embeddedness enhances empowerment and innovation sustainability.	NGO-led (Dastkar, Craftroots)

Table 2 depicts a comparative overview that summarizes several contextual differences found among the cases. It outlines the dynamics of trust, authorship, and autonomous behavior. The coding process underwent three cycles of iteration:

- Open coding (first cycle): Line-by-line analysis of primary processes
- Axial coding (second cycle): It is all about building trust, facilitating the transmission of skills, experimenting with materials, and motif adaptation.
- Pattern coding (third cycle): Abstraction of higher-order associations

The team kept two kinds of records, analytical memos and reflexive journals, to maintain the integrity of the process. Linkages were depicted in the visual network maps generated in NVivo, between clusters such as empathy and collaborative networks and the validation process patterns.

Table 3: NVivo Coding Framework

Coding Phase	Analytical Technique	Output / Example Codes	Aligned Design Thinking Phase	Resulting Category
First Cycle – Open Coding	Line-by-line inductive coding	trust-building, skill transfer, material experimentation, motif adaptation	Empathize, Ideate	Micro-level processes of collaboration
Second Cycle – Axial Coding	Clustering related codes	empathy immersion, shared framing, iterative prototyping, validation feedback	Define, Prototype	Mid-level relational patterns
Third Cycle – Pattern Coding	Abstraction to core patterns	Empathy Depth → Co-creation Intensity → Empowerment Outcome	All Phases	Cross-phase causal relationships

This multi-stage coding produced fourteen thematic clusters, which were later aligned with the five DT phases. This ensured methodological consistency between the empirical data and theoretical framing, as per Table 3.

3.3 Stage 3 – Cross-Case Thematic Integration

After analysing each case individually, a cross-case comparison was made aiming to develop a comparative analysis of the three organizational models. The synthesized data from this are shown in Table 4. was used for mapping relational (e.g., empathy, co-creation) and operational (e.g., prototyping, testing) elements of design thinking against the observed results of empowerment.

The patterns showed that deeper empathy and shared problem framing consistently improved collaboration quality. Higher intensity of co-creation was again linked to stronger innovation capabilities, adaptability, and retention of culture. Iterative prototyping, in turn, provided a better balance of authoring and mutual learning between artisans and design experts.

NVivo software helped us compare the frequency of theme occurrences and the strength of relationships between themes across the different cases. This confirmed that the depth of relationships coupled with the frequency of repetitions in which procedures are put together, determines how well craft innovation sustains over time.

This led to an overall complex, multi-faceted comparative schema which encompasses:

1. Empathic Immersion Depth
2. Problem Framing Approach
3. Co-creation Intensity
4. Iteration Frequency
5. Validation Mechanisms

The framework provided an interpretive bridge that guided the identification and development of the framework, which linked micro-level collaboration patterns to macro-level cultural and financial outcomes.

Table 4: Cross-Case Thematic Integration Matrix

Theme Cluster	Designer-Led	CSR-Led	NGO-Led	Cross-Case Pattern / Analytical Insight
Empathy Immersion	Deep, relational	Limited, instrumental	Contextual, community-based	Empathy depth predicts openness to collaboration.
Shared Problem Framing	Design relevance	Economic diversification	Heritage continuity	Alignment of values strengthens project sustainability.
Co-creation Intensity	Designer-driven initiation	Hierarchical, structured	Artisan-initiated, narrative-led	Higher co-creation intensity yields empowerment.
Prototyping Practice	Iterative, feedback-driven	Efficiency-focused	Collaborative, symbolically grounded	Iteration enhances learning and shared authorship.
Validation Mechanisms	Boutique exhibitions	CSR product lines	Local melas and fairs	Hybrid validation ensures cultural and market acceptance.

3.4 Validation and Reliability

Several validation strategies were used to reinforce methodology (Table 5):

- Data triangulation: Insights were cross-verified across SLR, caseload records, and in-person interviews.

- Peer checking: The participants were asked to review and confirm the interpretive accuracy of the thematic descriptions.

• Peer debugging: The analytical coherence of the study was cross-checked by two external design-research scholars.

• Audit Trail: The coding process was recorded and archived for transparency.

• Researcher reflexivity: the research team's interpretive decisions and factors that influenced their interpretations were documented during their fieldwork.

Lincoln & Guba's 1985 criteria were satisfied to establish credibility, dependency, reliability, and transferability, therefore enhancing the integrity and repeatability of the analytics procedure.

Table 5: Validation and Reliability Matrix

Criterion (Lincoln & Guba, 1985)	Technique Used	Implementation Detail	Outcome	Criterion (Lincoln & Guba, 1985)
Credibility	Member checking	Participants verified thematic summaries via follow-up communication.	Ensured authentic interpretation of artisan experiences.	Credibility
Dependability	Audit trail	NVivo logs, coding memos, and analytical journals maintained throughout analysis.	Enhanced methodological transparency.	Dependability
Confirmability	Reflexive journaling	Researcher positionality and interpretive decisions documented in field diary.	Reduced researcher bias.	Confirmability
Transferability	Thick description	Contextual narratives and visual documentation of clusters included.	Supported potential framework replication.	Transferability
Triangulation	Multi-source comparison	SLR, CCA, and field data analyzed in parallel to cross-verify insights.	Strengthened analytical robustness.	Triangulation

3.5 Analytical Output

The final analytical synthesis provided the ECSH framework, in which the triadic relationship among the following is encapsulated: the process of co-creation is a form of empowerment, and iterative prototyping is one way of conducting cultural adaptation.

This framework serves both as an illustrative model and a practical guide. This sustainable craft innovation is an example of the many ways in which a deep-seated feeling of

interconnection, collective creativity, and ongoing adjustment simultaneously encourage self-sufficiency and protect the cultural value of Dhokra and similar traditional craft techniques.

4. RESULTS AND DISCUSSION

4.1 Overview
The results integrate evidence from literature, comparative cases, and field observations. The outcomes are represented by the five steps of the Design Thinking plan: Understand, Define, come up with ideas, make a model, and Test, in order to explain how these steps function within the Dhokra system. The discussion interprets how the joint action of the relational and procedural dimensions of design thinking, namely empathy, co-creations, and iterative process, enables artisan empowerment and cultural continuity.

4.2 Empathize – Immersion and Contextual Understanding
The idea of empathy was the basis of all the three models: to understand other people's feelings. Immersion fosters understanding and respect in designer initiatives.

'The designer watched how we melt and pour wax for two weeks; then he shared his own methods', said by Artisan, Bastar.

CSR-led programs focused on productivity goals rather than relationships. The results show that quality of collaborative outcomes is determined by depth of immersion rather than its duration.

Conclusion: Empathy forms the connection that allows artisans to assume a role as more active participants in the research process.

Hypothesis 1 (H1): Strong empathy leads to higher levels of trust and cooperation.

4.3 Define – Shared Problem Framing
The problem framing varied between each different type of organization.
- Designer-led models emphasized aesthetic relevance and design renewal.
- CSR-led programs focused on income diversification and efficiency.
- NGO-led initiatives prioritized heritage continuity and motif preservation.

All cases, though differing in priorities, identified two common issues: market reach and stagnant products.

Conclusion: The Define phase offers a platform for negotiating the right balance between a company's core values and business goals.

Hypothesis 2. Precise goal setting in cooperation instils a feeling of ownership and ensures that socio-cultural and economic objectives coincide.

4.4 Ideate – Generative Co-Creation
The creative dynamics of ideation sessions proved to be very different: designers use sketches and mood boards while NGOs used storytelling and symbols.

With time, as the relationship grew stronger, artisans began to suggest designs. One said, "We suggested adding the shape of a peacock on the light fixture to make it symbolize our village.

These exchanges demonstrate the transition from a consultative approach to a collaborative one, with both design and functionality co-created by design professionals and craftspeople.

Conclusion: Co-creation was a force that drove this transformation of ideation as an individual's act to a shared act of authorship.

Hypothesis 3 (H3): Higher co-creation intensifies innovation, adaptability, and artisan empowerment.

4.5 Prototype – Making as Dialogue

It was a collaborative learning process, wherein prototyping emerged. Tests on small figurines for export showed feedback improved design.

According to one of the CSR Supervisors, "Our skill is enhanced, not replaced, by design when prototypes are refined using our suggestions."

Conclusion: The process of prototyping changes the traditional hierarchical relationships, recognizing artisans as collaborators in the design process and valorizing their specialized knowledge.

Hypothesis 4: Iterative prototyping converts hierarchical designer–artisan relations to reciprocal learning partnerships by fostering equality.

4.6 Test – Market and Cultural Validation

The testing contexts were different: some focused on boutique retail, others on channels for corporate gifting, and others on community approval gained through participation in local events.

Artisans opined, "If we get approval from our elders about the new design, then we feel pride in selling it." - An Artisan, Dhenkanal.

This blend of authenticity and ease earned community endorsement and resulted in a revenue increase of 30–50 percent.

Conclusion: Hybrid assessment is effective, combining economic performance and cultural resonance.

Hypothesis 5 (H5): Market success combined with community acceptance will guarantee true sustainability.

4.7 Cross-Case Synthesis

Three different intervention models are compared within the cross-case synthesis: designer-led, CSR-led, and This study identifies how 'design thinking' operates at the level of Dhokra craftsmanship.

A comparative matrix (Table 6) summarizes the key dimensions of design thinking and how it influences artisans' innovation and empowerment.

The correlations of empathy, co-creation, innovation, adaptability, and cultural retention follow a consistent trend as demonstrated in Table 6.

Table 6: Cross-Case Comparison of Design Thinking Application in Dhokra Craft Contexts

Design Thinking Phase	Designer-Led Model	CSR-Led Model	Community/NGO-Led Model	Key Cross-Case Insight
Empathize – Immersion & Contextual Understanding	Extended on-site immersion; relational empathy built through prolonged observation and dialogue.	Short, target-driven visits emphasizing productivity and deliverables.	Empathy rooted in community values; balance of cultural sensitivity and skill development.	Depth of empathy—not duration—predicts openness to co-creation.
Define – Shared Problem Framing	Focus on aesthetic relevance and design renewal.	Emphasis on income diversification and production efficiency.	Prioritization of heritage continuity and motif preservation.	Joint problem framing aligns cultural and

				commercial goals.
Ideate – Generative Co-creation	Sketches, moodboards, design brainstorming; designer-driven initiation.	Structured workshops guided by CSR trainers.	Storytelling and motif narratives foster artisan-initiated ideas.	Horizontal co-creation merges design adaptability with cultural meaning.
Prototype – Making as Dialogue	Iterative mock-ups refined via artisan feedback; shared authorship emerges.	Process optimization trials; limited artisan autonomy.	Collaborative making emphasizing material intuition and symbolic accuracy.	Iterative prototyping fosters epistemic equality and learning.
Test – Market & Cultural Validation	Boutique retail and exhibitions gauge consumer appeal.	Corporate gifting and CSR channels validate scalability.	Local melas and fairs validate community acceptance.	Hybrid validation—market + cultural—ensures sustainable adoption.

4.8 Theoretical Integration

This section uses the results of the cross-case synthesis to develop the Empathic Co-creation for Sustainable Heritage (ECSH) Framework. The ECSH Framework represents the extension of the Design Thinking model in the given context, specifically designed to address heritage craft systems like Dhokra.

The ECSH Framework encompasses three related elements identified by the comparative findings:

1. Contextual Empathy - The idea of contextual empathy encompasses a wide range, stretching well beyond the boundaries of user research, taking into consideration cultural translation, immersing oneself in the community, as well as trust-building. The designer becomes a learner in the design ecosystem, respecting the artisans as epistemic partners in the process of problem-solving, as well as material experimentation.

2. The idea of co-creation as empowerment involves the reframing of co-design as a democratic approach, in which decision-making authority allocation becomes a core consideration. Ideation, prototyping, and other activities involve the community as authors, adding creative agency to artisans while maintaining cultural authenticity.

3. Iterative Prototyping as Cultural Adaptation refers to the idea that the process of prototyping as a dialogical form of knowledge production has been recognized in the concept of iteration as the process of aligning functional innovation with symbolic continuity. This allows the product form to be grounded in values of heritage while meeting changing markets.

Taken together, these parameters factor ECSH as a duality, where it can be perceived as a model as well as a tool for innovation in the crafts for sustainability. This acts as an interface between design thinking and cultural sustainability, where the parameters of ECSH include adaptability, equality, and empathy.

The ECSH model derived from the empathic co-creation process (Fig.3) addresses the key findings of the research, developing a model where Contextual Empathy, Empowerment through Co-creation, and Iterative Prototyping as a form of Cultural Adaptation act as integral virtues in achieving innovation in the crafts, like Dhokra. The ECSH model can be described as the following three related entities:

Contextual Empathy, Co-creation as Empowerment, Iterative Prototyping as a form of Cultural Adaptation.
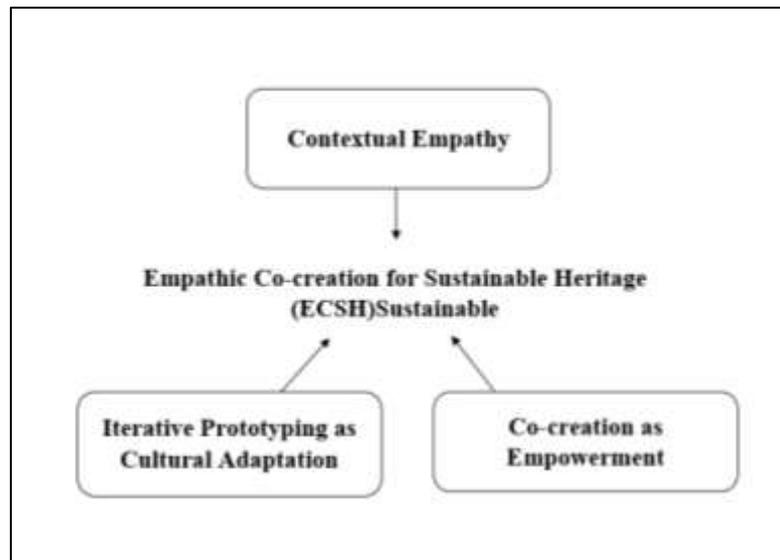

Figure 3: The Empathic Co-creation for Sustainable Heritage (ECSH) Framework. The approach situates artisans as partners in epistemic practices, stressing cultural continuity as well as the evolution of design. This is an overview of the key points in the proposition.

The development of deep empathetic understanding has been proven to create trust as well as promote effective collaboration. The strength of co-creation has been proven to influence the amplification of empowerment as well as innovation in the adaptability context. The process of prototyping helps in sustaining cultural unity in the context of the market-responsive design theme. The ECSH Framework, therefore, suggests a reconceptualization of design thinking in the context of traditional crafts. This reconceptualization takes place, not as a result of a top-down approach, but rather as a process of co-evolution between heritage knowledge and design intelligence.

4.9 Practical and Policy Implications

The research offers a set of pragmatic recommendations to reinterpret the role of Dhokra craft in light of the concept of design thinking, where the importance of empathetic, inclusive, and sustainable progress has been underlined. Firstly, the needs of Empathy Residencies should be met as part of the cluster development scheme. This will help designers interact directly with the crafts community, thus enabling context-driven design interventions. Secondly, the role of Institutional Learning Labs, achieved through the support of CSR activities and the role of NGOs, can act as co-creation spaces, thus enabling continued interaction between the crafts community, the designer, and the market. In the third place, there should be a balanced approach where cultural vital signs, like the motif consistency, skill transfer, and authenticity in materials, along with the more objective inputs of the economy, like income generation and market expansion, should be achieved. Finally, it is the urgent need to recognize the importance of ethical authorship, achieved through the use of co-branding, as well as the adoption of the concept of royalties. This is the most important factor that allows the recognition of the intellectual property

rights of craftspeople in joint productions. In this way, the efforts help in achieving the Sustainable Development Goals of decent work and economic growth, as well as the goal of sustainable cities, achieving SGDs 8, as well as 11.

4.10 Limitations and Future Research

Although the combination of qualitative research, field observations, and collaborative design workshops added validity as well as depth to the content of this research, there remain certain limitations to it. The results, as has been mentioned, are limited in terms of generalizability by two issues. First, the size of the research sampling remains small. Secondly, the research remains time-bound. These remain significant issues, considering the diverse population of the Dhokras in the regions of Bastar, Odisha, as well as West Bengal. Moreover, the lack of sequential data obstructs the efforts aimed at the chronological documentation of the development of the strategized adaptations, as well as the innovative designs, of the artisans over time. Therefore, in the future, research efforts should make use of research methodologies that could make way for extensive observation, thereby enabling the measurement of the impact of the iterative designs upon the socio-economic empowerment, skill diversity, as well as creative independence over time. The potential use of the impact research, entailing the cost-benefit, preoperative, as well as the postoperative, measurement of the income, the diversity of motifs, as well as the measurement of the efficiency of the production, has the potential to enhance the validity of the existing body of evidence in this regard. Moreover, the utilization of the Empathic Co-creation for Sustainable Heritage methodology, in the other existing craft systems like the Pattachitra paintings, Bidri metalwork, as well as the Madhubani paintings, could make way for the measurement of the adaptability challenges of this methodology in the particular crafts systems. The use of the comparative designs could potentially make way for the measurement of the way in which the designs could adapt in each material culture. This, in turn, could make way for the expansion of the existing theoretical understandings related to this issue, considering the dynamic domain of learning, innovation, as well as sustainability in the domain of crafts in particular. Finally, research efforts in the future should make way for the exploration of the multi-sited collaborative research endeavors, entailing the collaboration of the designers, as well as the anthropologists, in order to make way for the exploration of the in-depth interdisciplinary dialogical relationship between the designs, as well as the rich domain of the existing craft knowledge in particular.

5. CONCLUSION

The proposed research aimed to study the craft of Dhokra as an exemplar of a living design system and thereby understand how design thinking approaches can act as catalysts for innovative progress in the craft systems already defined. The study adopted a qualitative research approach, combining techniques of systematic literature review, comparative case study, and primary ethnographic research with craft practitioners, designers, and government representatives of three different models of interventions, namely designer-driven, CSR-driven, and community and NGO-driven. The use of the triangulation research technique helped gain an overarching understanding of how empathy, collaboration, and the process of iteration act as catalysts in the case of Dhokra craft.

The case studies produced some consistent patterns of relationships among the variables, and the presence of this deep state of empathy, described as deep emotional resonance, enabled higher levels of trust and experimental engagement. In addition, this high level of co-creation intensity resulted in an improvement of the artisans' autonomy and flexibility to pursue innovative approaches. Finally, the scalability of the resultant outcomes was, in turn, contingent on the presence of institutional scaffolding. The research thus proposed

the Empathic Co-creation for Sustainable Heritage (ECSH) approach, which may be considered as an extension of the design thinking paradigm and takes into account cultural expertise as well as co-authoring practices and refinements as part of sustainable craft development.

The ECSH Framework provides a theoretical contribution in that it proposes an entirely different paradigm for design thinking in a heritage context, thereby integrating tacit, community-based knowledge and design-driven innovation. The ECSH Framework reinvents empathy as something other than preparation, as something continuous and mutually constitutive; it describes collaborative creation as liberation, as something other than consultation, and describes prototype development as catalyst for cultural discourse. The research offers avenues for design educators, those involved in creating CSR initiatives, and policymakers, which range from integrating designer residency initiatives within craft clusters, setting up institutional co-creation labs, and creating metrics for assessing success by combining cultural vivacity and economic outcomes. The study under consideration employs a multi-faceted approach, combining the synthesis of evidence and concepts, thereby proving the effectiveness of design thinking in encouraging the symbolic and economic sustainability of traditional crafts. The synthesis is achieved by combining empathy and co-creation, which are critical components in understanding the role of design thinking in ensuring the sustainability of traditional crafts.

In summing up, Dhokra is something more than just an static signifier of cultural heritage – it is, on the contrary, a dynamic exemplar of cultural intelligence. Dhokra is already creating a replicable paradigm for the facilitation of well-balanced and ethical transformation through the craft sector.

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