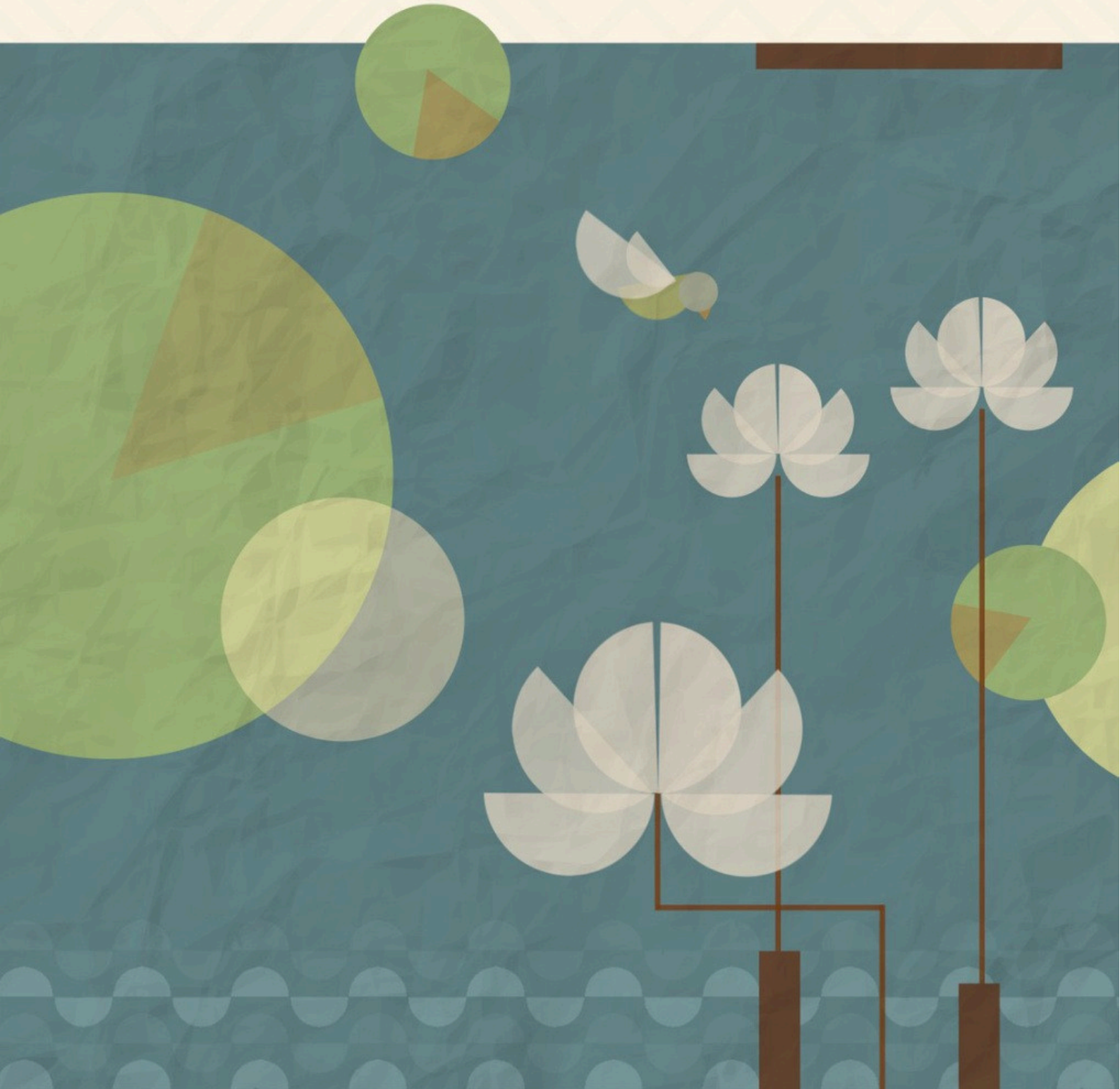
Volume 1 Issue 1, Jul - Dec 2025

Published by:
Silpa-Sadana
Visva-Bharati

Journal of Craft & Design Research

ISSN: 3108-0332



Department of Silpa-Sadana
Visva- Bharati

Presently, Silpa-Sadana is a Department under Palli Samgathana Vibhaga (Institute of Rural Reconstruction), located at Sriniketan Campus of Visva-Bharati, a Central University. Silpa-Sadana was established as an integral part of Tagore's Sriniketan experiment on Rural Re-construction. It is a pioneering institute in India in developing and revitalizing cottage industries and craft, since its inception. Rathindranath Tagore was the pioneer in shaping this department to fulfil the vision and mission of his father. In his opinion, ".... This institution has immense possibilities of being developed into a full-fledged Polytechnic in cottage industries and utilized for the purpose of producing skilled craftsmen, foremen, craft teachers and designers, an army of whom is an essential pre-requisite for the development of industries in India". However, Silpa-Sadana is probably the only institute in India where academic activity was not initiated from the very inception, rather it initiated the production of craft-based items for the socio-economic empowerment of the rural mass, academic activities were started later on to augment the production activities, instead. Silpa-Sadana has always been ready to adopt need based academic curriculum as its prime activity. It never ignored the production activity or the extension activity as a supplementary to teaching and research. The present Silpa-Sadana is devoted to providing various technical training and production activities in various craft-based trades for the benefit of the rural sector, especially, apart from offering various academic programs e.g., Bachelor of Design (B. Des.), Masters of Design (M. Des.), and Ph.D. under UGC structure.

ISSN 3108-0332

About *Journal of Craft & Design Research*

Aims and Scope

The aim of the *Journal of Craft & Design Research* is to advocate and promote research on current and emerging craft, including in-depth studies on materials and methods, processes, concepts, aesthetics and style. This will cover any discipline area of the applied arts and crafts, including craft education.

Special emphasis is given on studio practice, and on the transformations of indigenous forms of craft activity throughout the world. Research articles on indigenous and innovative product design in the domain of ceramic & glass, furniture & interior, textile & apparel, batik, artistic leather craft, handmade paper making, and other traditional/indigenous crafts are highly appreciated.

The aim of this journal is to facilitate and promote dissemination of research ideas and applications on craft and product design at nationally/internationally recognized academic level.

The journal encourages contributions based on merit and originality, and it also encourages peerreviewed research and review articles from worldwide research contributors dealing with the specified domain.

The Editor-in-Chief strongly encourages submissions in:

- Traditional crafts and their practices
- Current and emerging craft research, including research into materials, processes, methods, concepts, aesthetic and style
- Applied arts and crafts, including craft education
- New developments in artifact design
- Impact of socio-cultural aspects in product design
- Eco-friendly product design
- Sustainable and energy efficient product design
- Design learning strategies and design pedagogy.
- Application of ergonomics and computer tools in product design

Journal's Primary Details:

Starting Year	2025
Frequency	2 issues per year [Issue 1: July - December] [Issue 2: January - June]
Format	Print (Hard copy)
Subject and Language of Publication	Multidisciplinary, English
Publisher Details	Silpa-Sadana, Visva-Bharati, Sriniketan, Birbhum, West Bengal - 731236, India

Publication office:

Silpa-Sadana, Visva-Bharati, Sriniketan, Birbhum, West Bengal – 731236, India.
Email: **editor.jcdr.silpasadana@gmail.com**

Read the Instructions for Authors for information on how to submit your article.

Journal of Craft & Design Research

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The editorial team is in strong agreement to ensure that the content to be published in *Journal of Craft & Design Research* is ethically sound. To achieve this goal, the editorial team is in favour of closely following the advice laid out in the guidelines and flowcharts on the COPE (Committee on Publication Ethics) website. We have also developed our research and publishing ethics guidelines. If you have missed to read these, we urge you to do so first. They will help you avoid the most common publishing ethics issues.

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Research articles should not exceed 10000 words [display items (illustrations including tables and figures) should not exceed 10 numbers; and references should be limited to 40-45]. It should discuss current trends in research in traditional knowledge. The articles should include an appropriate title, abstract, keywords, introduction, materials and methods, results, discussion, conclusions, references, and appropriate illustrations including tables, figures and supplementary information, that will help a general reader. The author(s) should also provide acknowledgements and funding details if any, conflict of interest, and author's contribution statements, at the end of the manuscript before the reference section.

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Review articles should not exceed 15000 words. In this case, the display items should be limited to 10 numbers including tables and figures; and references should be limited to 70-80. These articles should encompass surveys and discuss the developments in the domain related to traditional knowledge. They must dwell more on research work done during the last couple of years in the field. The authors should integrate their own work with that of others with acumen and authenticity. Mere compilation of references by a third party is strongly discouraged. Kindly contact the Journal Editor at **editor.jcdr.silpasadana@gmail.com** for further clarifications, if any.

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The ***Journal of Craft & Design Research*** is a **Bi-annual Double Blind Peer Reviewed** Journal being published by Silpa-Sadana, Visva-Bharati (a Central University), with a view to showcasing communications substantiating the results of original work of research / review on current and emerging craft, including in-depth studies on materials and methods, processes, concepts, aesthetics and style. This will cover any discipline area of the applied arts and crafts, including craft education.

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2. Authors must warrant the originality of the paper in that the contents of the paper in part or in full have not been published or submitted elsewhere while the paper is under review.

3. Only original Research Articles or Review Papers of specialized topics within the scope of the journal will be encouraged.

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Pages **should not to be numbered** and the matter/ manuscript should be arranged in the following order:

- Article Title (font size 14 bold Sentence Case),
- Name(s) of Author/s (font size 12 bold),
- Affiliation and short address (font size 11 Italics),
- Abstract, ▪ Keywords, ▪ Introduction,
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- Conclusion,
- Acknowledgement (if any)
- References References should be relevant and complete **as per APA style** in **10 Font size** (not more than 50). For Review Articles, textual matter after Introduction can be classified as per the requirement.

Author(s) Name and Address:

The names of all the authors with initials, if any, should be given along with only the **name(s) of institution, City and Country.**

Corresponding Author should be marked with asterisk (*), and **Full Address, Pin Code & Contact Details along with E-mail** should be mentioned.

No mention of Dr. / Prof. etc. for any author is encouraged.

Abstract:

Abstract is mandatory for all articles. It should highlight all aspects of the study in brief not exceeding 300 words. **Abstract should be structured** divided into following sub-headings: **Background, Methods, Results, Conclusion,** and the **Scope/Significance of the paper**. References should be avoided in Abstract.

Keywords:

Maximum up to **6 Relevant Keywords** in **Alphabetical Order** after the Abstract.

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1. Introduction

1.1 abcde 1.2

abcde

2. Materials and methods

2.1 Abcd etc.

3. Results and Discussion

4. Conclusion

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The introduction should be brief and pertinent. It should provide adequate background information and the scope of the paper to facilitate better understanding of the readers. Literature review should not be extensive, rather it should be relevant only to indicate the objective of the paper.

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The experimental section should provide a clear, unambiguous description of materials, methods, and equipment in sufficient details to permit reproducibility of the work elsewhere. Data should be arranged in a unified and coherent sequence so that the main conclusion emerging from the work is included. Data/results should be presented either in tabular or graphical forms. The results should be followed by proper discussion/interpretation in a lucid form.

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References to published literature should be placed at the **end of the paper and numbered consecutively**.
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https://apastyle.apa.org/style-grammar-guidelines/references/examples

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Tables and Figures should be **included in the manuscript** (i.e., in the body of the article **within the text at the relevant places**) only, and not attached separately at the end of the manuscript. They should be numbered as per the number of the main (section) heading and should bear brief-yet meaningful titles. Column headings should be brief and meaningful.

Example:

Tables/figures coming under: **3. Results and Discussion should be numbered 3.1, 3.2 etc**.

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Figure numbers and captions should be written **below the figures** (e.g., **Figure1: Xyz**)

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Journal of Craft & Design Research

Editor-in-Chief
Prof. (Dr.) Ashis Mitra

Address
Silpa-Sadana,Visva-Bharati, Sriniketan,
Birbhum, West Bengal - 731236, India

First Issue : July - December 2025

Published by:
Silpa-Sadana, Visva-Bharati, Sriniketan, Birbhum, West Bengal - 731236, India.

ISSN : 3108 - 0332

Cover Design, Artwork, Typesetting & Formatting:
Ritwick Halder
Dr. Ashis Mitra

Printed by:
Canvas J. R Ghosh Garden,
Kolkata- 7000153

Distributed by:
Silpa-Sadana, Visva-Bharati, Sriniketan,
Birbhum, West Bengal - 731236, India.

EDITORIAL

Craft & Design Education and Research — significance, present status and future

In a world which is grappling with sustainability, identity, and rapid technological change, thorough research on traditional crafts and design has become more significant than it is today. The reasons are manifold, e.g., craft & design research help preserve cultural heritage; it facilitates sustainable innovation through ecological thinking into material choices, production methods, and lifecycle analysis thereby embodying low-impact, resource- efficient methods inspiring sustainable design systems; it empowers artisan communities by supporting artisan livelihoods by connecting local skills to global markets through ethical design frameworks; it enhance design thinking; it facilitates bridging the digital and the physical world, and so on. The present status of craft & design research reflects a dynamic and changing environment that is adapting to sustainability demands, technology breakthroughs, and cultural changes. Here is a succinct summary of the key developments and trends:

- Interdisciplinary integration through merging craft research with design thinking creating hybrid methodologies that blend intuitive, material-based knowledge with organized innovation methods. There's a
- strong move toward practice-led research. Co-creation models are gaining more popular, empowering craftspeople/artisans through collaborative design workshops and participatory field studies. There is a growing trend to leverage craft research to support sustainable and ethical production, especially in regions
- with rich cultural heritage. There's an increasing focus on cultural revitalization which includes storytelling, identity, and place-based design, especially in postcolonial and decolonial contexts. Researchers are
- documenting and reinterpreting indigenous practices to preserve intangible heritage while adapting them for contemporary relevance. Academic institutions (i.e., Universities and Design Schools) and other organizations are introducing various Craft futures programs to emphasize practical material research and the changing
- roles of designers and craftspeople. Moreover, conferences and publications are showcasing global case studies in craft-led innovation, sustainability, and pedagogy.

Global craft and design education are experiencing a dynamic shift, integrating legacy, innovation, and sustainability to represent local identities and global issues. Institutions worldwide are emphasizing on interdisciplinary research and experiential learning by integrating hands-on craft practices with design thinking. Countries such as India, Japan, and Mexico are spearheading initiatives to integrate indigenous knowledge systems into formal education, thereby safeguarding cultural heritage while adapting it for contemporary relevance. Other initiatives all over the globe through education include fusion of technology or digital tools with heritage craft practices; social inclusion, social empowerment and community engagement through participatory models; prioritization of sustainability and ethical practices through eco-conscious design development which aligns with United Nations' Sustainable Development Goals (SDGs) especially in areas of cultural sustainability and inclusive growth. Craft and design education in India, in particular, is a rich tapestry woven from tradition, innovation, and social relevance. Silpa-Sadana of Visva-Bharati is the pioneering institute in India in developing and revitalizing cottage industries and crafts since its very inception. Apart from Silpa-Sadana, National Institute of Design (NID) Gujarat, Industrial Design Centre (IDC) Mumbai, Indian Institute of Crafts & Design (IICD) Jaipur, are some of the pioneering institutes in India now-a-days in integrating craft into design education, emphasizing cultural continuity and community engagement. Indian design schools are now offering academic programs blending global design principles with local craft knowledge. Many curricula, however, still have difficulty in maintaining a balance between craft-based pedagogy and industrial relevance, particularly in semi-urban and rural contexts. There's a growing emphasis on Community-Centric Learning (CCL) through collaborative projects between students and artisans. Organizations like the India Design Council (IDC) are encouraging national policies that incorporate craft into industry and education, and striving to promote design excellence. Some international collaborations, too, are facilitating in many ways to elevate design education standards and expand opportunities. However, there are still disparities in access to high-quality design education, particularly for underprivileged sections. The future lies on empowering artisans, integrating sustainability into all facets of design thinking, and bridging the gap between tradition and innovation.

Prof. (Dr.) Ashis Mitra
Editor-in-Chief

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SHORT COMMUNICATION

ARTICLES

Historical Journey of Crafts in Santiniketan from the Colonial to Tagorian Period and Thereafter

Prabir Kumar Choudhuri

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Through this short communication, an investigation of synergy between Place, Culture and Economy has been done, and in this context, it is tried to interfere into the Santiniketan-Sriniketan area, as the place was created and experimented by Tagore and his successor. It is preferred to call this place as natural hub for craft culture, its flourishment, and economic values**.**

Historically, the Santiniketan-Sriniketan area is surrounded by villages as Supur, Raipur, Surul and few others; each one having glorious past of its own. Santiniketan and these villages are in the lower basin of the River *Ajoy* which has been originated on a small hill about 300 metres high, south-east of Deoghar in Jharkhand. It flows through the southernmost part of Birbhum demarketing Burdwan district and joins the Bhagirathi River at Katwa. This part of *Ajoy* extending from Katwa to Illambazar served as the main river route for the purpose of trading of Salts, animals (specially horse), Indigo and other house hold articles in the area. Large Boats and Vessels were used to be anchored at few small anchorages, locally known as *Ghat* spreading over villages like *Supur, Raipur and Surul*, adjacent to today's Santiniketan and Sriniketan. Two such *ghats* (port) names **'*Math talar Ghat*'** and **'*Nun bhanga Ghat*'** used for crushing the salt into dust [1]. The ancestors of Raipur Jaminder, Lalchand Singha brought about 1000 handloom weaver from Chandrakona of Midnapur district while he shifted his residence from Midnapur to Raipur. The weavers settled at the villages like Mirzapur, Chandanpur, Raipur, Sukh Bazar, Surul, Sian and Ballavpur in 1764. They were very efficient to weave coarse fabrics of small size. 1000 fabrics were woven per day and these were sold to Mr. John Cheap who was engaged as the representative of British Government (1793). This river basin was also served as a fertile land for indigo cultivation during the second half of eighteenth century. Superior quality of Indigo colour were manufactured in Supur-Raipur area which were shipped to European market. Thus, Indigo along with Silk became the important commercial commodity for transportation through this river rout. Another important thing was the trading of animals particularly Horse. Horses were supplied to entire north-eastern states, Bihar, North Bengal, Nepal etc. through this port.

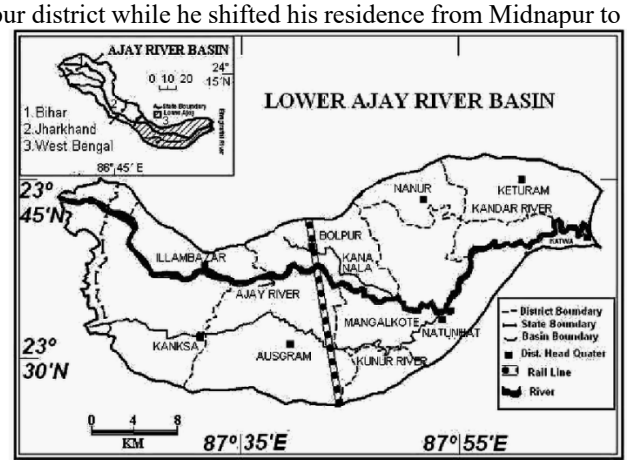

Figure 1: Map of Ajoy River Basin, West Bengal (Source: Department of Irrigation and Waterways, Govt. of West Bengal, 2010)

The commercial shipping traffic created opportunities for the local handloom weavers to weave a thick canvas cloth used as sails for the boats and vessels. The demand of extremely good quality of the cloth led to maintain a fair livelihood of about 1000 handloom weaver families.

On the other hand, the availability of lacquer from Illambazar forest and good quality of clay from the surrounding areas also helped to develop craft products by the traditional artisans/craftsmen, and potters.

In the year 1850, the construction of Railway track from Khana Jn. to Sainthia Jn. started which ceases the arrival and departure of large boats in this region. The transportation was completely stopped from 1859 when the railway bridge (with 32 holes) on the river Ajoy was put into function (September 1) for railway transportation through the newly built railway track. The natural flow of water was disturbed and the importance of Supur lost its importance as a port. The railway transportation came to replace the water transportation.

Later with the advent of Debendranath Tagore (1863) and then by Rabindranath (1901), Rathindranath and his wife Pratima Devi, the crafts products received another dimension with the touch of beauty & aesthetics. Besides Agricultural activities of the villagers there was a section of village people who were having their traditional skills of doing work of their own. As for example there were potters, basket makers, lacquer makers, carpenters, weavers etc. in and around Santiniketan. Gurudev wanted to make those craftsmen self-reliant, this might have rooted in his mind probably while he was in present Bangladesh when he came in close contact with village people. He also wanted to revive the moribund crafts of adjacent areas thereby giving an alternative source of income generation besides agriculture. In the year 1930 Rathindranath and his wife Pratima devi

went to Europe where they got interested in Leather work and on their return to the Ashrama many students used to come to learn this interesting work and making quite a fancy article from leather that became a fashion. After coming back from Java, Indonesia, Pratima Devi also introduced Batik Work in Santiniketan.

Silpa-Sadana had taken a leadership role in reviving and revitalizing the rural industries and craft sector for sustainable economic regeneration of the villages. It has been able to revitalize the decadent cottage industries by those artistic and creative impulses which underline the principle of 'Functional beauty', the foundation of all indigenous hand-crafted articles. It had reoriented and reengineered this sector by introducing innovation in technique, technology, aesthetics & design through better craftsmanship, new skill, new design, new trade, better techniques & upgrading methods of production and infusing design elements from other culture. Artistic leather crafts, batik work, embroidery work, wooden work, book binding, block prints etc. were introduced in Sriniketan under the patronage of Rathindranath Tagore. Silpa-Sadana in Sriniketan played the role of real mentor to nurture several crafts, design development, dissemination of technical know-how, knowledge, and providing a source of income generation to the rural people. The *Santiniketani* style of design has become the trend setter in the market.

Products were exhibited and sold in Colombo, Madras and Bombay in 1934. Exhibition was also held in Lucknow in 1936. In the same year the leather, batik and wooden products received a whelmed response in the exhibition held in London. All the products exhausted with a very short time. In 1938, a sales counter in the name of '***Sriniketan Silpa Bhandar***" was established at 210, Corn Walis Street, Kolkata to sell the crafts items. Netaji Subhas Chandra Bose the then President of Congress inaugurated the shop. In 1944, the sell value was Rs. 2 lakh 95 thousand at that time.

As the time passes, the demand of crafts items increases. As a place of tourism, a new market has evolved. The crafts products are no longer remained confined into the *Santiniketani* items only. Rather the other crafts like *Dokra*, Glass, Metal crafts, Cane & Bamboo work, and many other including mix-media are being experimented in *Santiniketani* styles boosting the rural economy. In contemporary times, with the availability of new materials, new techniques and exploiting several thematic expressions, the crafts are being constantly encouraged to meet the present needs. Designers are also being inspired from the paintings, sculptures of Santiniketan and even from Tagore's music and songs. Thus, creativity in mind bring about a real synergy between place, culture and economy in and around Santiniketan.

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[This paper has been presented as key note lecture in the National Conference on Creative Economic Geography of Artisanal Crafts Investigating the Synergy between Place, Culture, and Economy in India, held during March, 21-22, 2025]

Design Education In/For India: Towards A Model for Instructional Coherence Integrating Multiple Perspectives

Pasupuleti R. Rao* & Andrea Noronha

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Abstract:
This paper primarily examines teacher learning and practice domains through an integrated model for instructional coherence (Finlay, 2000) based on a theoretical framework for tertiary education in design learning concerning the major design schools in India. Through this, the authors aim to understand patterns in the underlying factors of the domains of design teacher learning and practices. While inspired design pedagogies dominated early Indian design schools, these have evolved in the newer schools, bringing about a parallel shift in design pedagogies. The authors also suggest that funding is a factor in how these curricula and pedagogies are shaped and eventually play out in the classroom. The authors propose a conceptual model for instructional coherence based on learning theories that helps understand the teaching and learning practices in the country's complex ecosystem of design education.

Keywords: Design Education, Design Pedagogy & Practice, Instructional Coherence, Instructional Models, Teacher Learning.

Article History: Article Received :29-06-2025, Revised: 25-07-2025, Accepted: 08-08-2025

1. Introduction – the historical perspective

1.1 Growth and Expansion of Design Education in India

The design education movement started in Germany in the 1930s with the establishment of the Bauhaus, followed by the Ulm School in the 1950s. These institutions and their pedagogy became the basis of many first-generation design schools, and they have also profoundly influenced the development of design education across nations, partly due to the closure of these institutions due to socio-political reasons. (Siebenbrodt, 2012). The teachers shifted their base and influenced the design pedagogy by starting new schools or joining existing schools with similar ecosystems. In India, establishing NID in Ahmedabad based on the recommendations of the India Report by Charles and Ray Eames in 1958 was a catalyst for the foundation of a new pedagogy for the growing nation (Eames, 1958). This was followed by the setting up of the Industrial Design Center at IIT, Bombay, which has benchmarked design education as part of reputed Institutions of National Importance. The NIFT model started in the 1980s under the Ministry of Textiles, provided momentum for the fashion and textile industry, and through expansion in various parts of the country (NIFT Act, 2006), 'Design' became very popularly associated with fashion and textiles.

The National Design Policy (DIPP, 2011) envisaged the setting up of four more National Institutes of Design in the States of Madhya Pradesh, Assam, Haryana, and Andhra Pradesh, out of which NID AP and NID Haryana started functioning from 2015 and 2016, respectively, followed by NID Assam and NID MP in 2019.

Today, design education is offered in diverse institutional systems that strongly influence the core educational components of *curriculum*[1], *pedagogy*[2], and *assessment*[3]. The following categories of institutional systems give an overview of the diverse educational setups.

- NID model of education that has evolved with Hands-On, Minds-On[4] Philosophy[5] on the lines of first-generation design schools like Ulm and Bauhaus. The first NID was set up in Ahmedabad in 1961 under the Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, GoI, as an autonomous institution set up for the design service, training, and research to support the diverse sectors of the economy. NID Ahmedabad has extension campuses in Bengaluru and Gandhinagar. As outlined above, new NIDs have been set up as part of the National Design Policy. NID Ahmedabad was declared an Institution of National Importance in 2014. Since then, all other NIDs have also been conferred the INI status.
- NIFT, under the Ministry of Textiles, serves the country's needs in the textiles, apparel, accessories, and craft industry through diversified campuses across the country. The NIFT model is one of the most successful design education expansion models, partly due to the advantage of having a single sector focus. NIFTs have been granted autonomous status through the NIFT Act. The Footwear Design and Development Institute, with multiple campuses under DPIIT, also has a sector-specific focus.
- Following the IDC School of Design, Many IITs, IISc, and IIITDM Jabalpur have started offering design programmes at B. Des, M. Des, and Ph. D. levels. The admission to these institutions is carried out based on a national-level CEED exam score.
- Schools with prominent programmes in planning and architecture have also begun to offer design programmes in interior architecture, interior design, and industrial design.
- The schools of art at some renowned Universities have a long history of offering programmes in the arts,

applied arts, and design areas. Some offer graduate and postgraduate level design programs and arts, crafts, and design programs.

- Among the state universities, one university based in Delhi was the first to position Design as a part of a liberal arts framework and offers an MA in Social Design, which is one of its kind in the country.
- Private participation in design education started with schools in Bangalore and Pune, both of which now offer graduate and postgraduate level programmes in design. Many new private universities are starting with Departments of Design to cater to the growing private demand in design education. Gujarat is leading in this area, with many qualified designers serving as design teachers to support the ever-expanding design education system within the private sector.
- Many states have initiated design institutes to support the regions with sector-specific design support. These institutions cater to the design needs of the state's priority sectors. The Indian Institute of Crafts and Design at Jaipur has been set up to support the vibrant crafts and livelihoods sector of Rajasthan. Similar initiatives are the Craft Development Institute at Srinagar, Kerala State Institute of Design, State Institute of Arts and Crafts, Orissa, UP Institute of Design, Lucknow, Craft Institute Jharkhand, etc. These institutions offer professional training courses in crafts, design, and technology and act as catalysts for the relevant sectors.

As briefly outlined above, design as a field of study finds its educational space in diverse institutional systems ranging from institutions of technology, multi-disciplinary design schools, schools of architecture, schools of arts, institutions of fashion technology and footwear design, institutions of craft and design, including departments in public and private universities. While one layer of curriculum, pedagogy, and assessment may be common to most schools, the host institution's learning culture, institutional systems, structures, processes, and resources greatly influence the learning system in each context. This diversity of institutional formats suggests the plurality of notions and conceptions of design (Margolin/ Buchanan, 1995) evolved over the twentieth century.

1.2 The Economic Dimension: Quality and Equity Concerns

The higher education sector is going through rapid transformation due to the influence of many factors worldwide. Out of the three key stages of education (primary/ secondary and tertiary/ higher), higher education qualifications give maximum economic benefits at the individual and economic levels. In the past, education was considered a public good (Samuelson, 1954) with larger social benefits; therefore, states have invested heavily in education for social and economic progress. It is no wonder that economically progressive nations also have some of the best education systems in the world. However, due to the increasing costs of higher education and the increasing economic returns to individuals, nations have slowly shifted their priorities to primary education, which has comparatively larger social benefits (Psacharopoulos, 1973 & 1980). Many states have constitutional provisions to provide mandatory/ compulsory primary education to their citizens, free of charge. Also, tight budgets/ prudence in public expenditure and taxpayer accountability-related factors have reduced public expenditure in higher education over the past 2 to 3 decades. India, as a vibrant, fast-growing economy, is no exception. Post-independence, while the overall expenditure in education has increased several times, the ratio of public expenditure in higher education to GDP has reduced substantially. As a result of this expansion in higher education, growth has happened due to the private sector participation in private aided colleges, self-financed colleges, and private universities (Agarwal, 2009).

In India, constitutionally, education was listed as a state subject. Although the 42nd constitutional amendment act brought education under the concurrent list, most states still bear the majority of public higher education investment. The central government's funding finances the few central education institutions, while most states fund their respective state public universities. With the increase in gross enrolment ratio, economic demands, and labor market returns in some professional sectors offering tremendous scope for social and economic mobility, the demand for higher education has increased exponentially. However, quality supply is constrained due to the limitations in investment and spiraling costs of higher education (Kapur & Crowley, 2008). The costs of input resources like land, building, and faculty salaries have become unaffordable, especially in urban areas.

The increased labor market returns to the talent pool, especially in specific professional disciplines, have led to increased expectations from the academic labor market. Internationally, the scenario is not very different. Except for a few countries, most of the higher education systems of advanced economies have become partly or substantially dependent on private sector participation, with increased tuition fees to support the education infrastructure. 'Cost sharing in higher education' as part of policy is widespread, with an increased proportion of higher education costs to be borne by the students/ households through their income or supported through education scholarships, grants, and loans (Johnstone, 2015). The main argument for this is whether taxpayers' money should subsidize a particular student's higher education costs, if he/ she can afford it? While this argument may hold for students who can afford it, this decision has negatively affected the participation of low-income students in higher education. The individual economic returns from the labor market depend on other factors like the perceived ability, fitness for the job, life skills, etc. The returns are also not guaranteed by enrollment in a particular program/ institution, making it difficult to make decisions regarding education loans/ borrowing.

The growth of private sector participation in India has happened in a policy vacuum regarding any systematic financial support systems for financing disadvantaged students. While the private sector has filled the supply side gap, there are concerns arising out of this growth related to equity and quality. Inclusivity in professional higher education is possible only

if the demand side finances are taken seriously and the policy design encourages participation from various disadvantaged groups. Several innovative schemes/mechanisms/ models like demand side vouchers (USA), Higher Education Contribution Scheme (HECS, Australia) based on income contingency, and Harambees Community Financing model of Kenya, etc, have evolved as a reaction to the challenges of student financing of higher education (Vossensteyn, 2013). In India, several private universities are offering merit-based scholarships, admissions, and discounted tuition fees based on merit, which works both ways. Diverse participation is crucial for a merit-based higher education system, and such a system's design is impossible without solid information based on student finances. While countries like Australia and the UK have conducted similar studies at the university/ system level, there is a dearth of information in this area in India.

1.3 The Effectiveness of Design Education in India

The Bauhaus was an experimental school that tried to provide a direction for design as a field of mediating discipline in the post-industrial revolution era by exploring forms and meanings of industrially produced objects. Later, Ulm, integrating science, technology, and other related topics, provided a clear direction for design as a profession. When NID in Ahmedabad was set up, it was on the lines that design should support the small and medium industry and provide services to the public sector. So, the foundations of design were rooted in practice; hence, in the initial years, the focus was on hands-on, minds-on experiential learning with a design training model that would serve the design practice needs of the country. This model made the institute's graduates a good fit to work for the needs of the Industry and related sectors. Unfortunately, the design awareness in the 1960s through 1990s was very low, and the industry and public sector sizes were small. Even the number of graduates coming out of institutions was very low to make any significant impact over several decades. The post-1991 liberalization era stimulated industrial and economic growth, creating a massive demand for designers. Design began to be recognized as a value-enhancing activity for organizations and users, and Industry houses and public sector organizations started employing professional design services. By the end of the century, design had gained recognition as an important profession that can improve the quality of life and standard of living through better design of products, services, and systems.

From the beginning of the 21st century, design education has been increasingly expanding in the above categories. Public investment through NIDs, IITs, and NIFTs, as well as the offering of design as a specialization in state and private universities on a self-financing basis, supported the growth. This expansion caters to the significant private demand from young aspirants for whom design has become a desirable career option for professional and personal reasons. However, the expansion has left many gaps on many fronts. When there is unregulated expansion, the first thing that is affected is the consistency of quality of graduates with varied levels of excellence. However, in Industry and other design input sectors, there is a limited market for graduates at varied levels. There is also a mismatch between what students aspire for (private demand) and what the Industry/ market is ready to pay for (market demand) design as a professional service. The third gap is that the variety of specializations that institutions offer does not represent the professional domains of expertise that the diverse sectors need, with varied talent among graduates. Fourth gap is that, essentially, design education formats have ignored the power of research-integrated design, which is slowly catching up with many of the institutions offering doctoral-level programmes in design and design research. The fifth and most significant gap is that the current design education formats have very little input on design pedagogy, both at the student level and at the teacher level, making the system week in supporting the teacher education needs of the country. There is a significant dearth of qualified full-time teachers who can support professional design education programmes.

1.4 The Unique Aspects of Design Pedagogy for Professional Education

A desirable way forward for institutional expansion in tertiary education in general and design education in particular is 'Excellence with Expansion and Equity'. Unlike the larger tertiary education sector, design education is expanding due to a mix of public and private demand for design education, supported by public and private investments in design education. However, the unique nature of design pedagogy poses serious challenges for qualitative expansion. The salient features of unique design education pedagogic principles have produced design excellence in some institutional systems.

- 'Hands-on, Minds-on' demonstrative learning: design education models evolved in response to manufactured products and systems' poor aesthetic and ergonomic qualities. So, the reaction had to be demonstrative in nature through hands-on, minds-on learning experiences through well-supported labs and facilities matching industrial production.
- Small group teaching: because of the demonstrative nature, the teacher/ trainer: student/ trainee ratio was minimal (initially 1:1 and now 1:15 in evolved pedagogic systems). This ratio is a massive challenge in the finance-deficient tertiary education scenario.
- Due to the demonstrative nature and specialist abilities, design education is highly resource and infrastructure-dependent, making it one of the least cost-effective professions, similar to the Medical and other professions.
- The notion of design has multiple connotations, and its interpretation varies contextually. Design evolved initially as a young interdisciplinary profession drawing on a knowledge base from diverse related fields of design. It is slowly moving towards an established profession with its disciplinary values, knowledge, and skill sets.
- Multiple interpretations and the interdisciplinary nature of design demand a diverse pool of faculty resources to engage with diverse talent pools of students through differentiated *instructional* [6] strategies and approaches. The

integration of diverse strategies in a systematic way is very critical to avoid confusion and wastage of intellectual and material efforts.

- Design education involves sensitization, awareness, value-centered thinking, problem-solving attitude, knowledge, and competence in design-related abilities. Strong competence-based abilities, attitude, and aesthetic sense demand understanding of ambiguity and subjectivity. This subjective judgment and related abilities are difficult to replicate in large numbers.
- Design education is strongly influenced by studio-based learning. Students with the support of practicing faculty are expected to work on real-life problems and projects supported by empirical research to empathize with human needs. Education has to align with the needs of the context of practice and usability.
- Prof Rittel of Ulm defines design problems as wicked problems that are ill-defined, incomplete, or contradictory requirements (Rittel, 1972), which are difficult to approach through a linear design process. People worldwide recognise that design requires complex, flexible, and adaptive structures and processes to address the systemic challenges of the contemporary world.
- Being hands-on and demonstrative, design learning relies on assignments based on creative design exercises. Some assignments have evolved over many years, with new exercises constantly experimented with by the design teachers.

1.5 The Need for Quality Teachers to Support the Expansion

Generations of committed teachers have nurtured design as a valuable profession by developing and sustaining an active, experiential learning pedagogy within specific Institutional systems (British Council et al., 2018). Design teaching demands qualitative attention and subjective professional judgment, which is not encouraged in mainstream professional disciplines, barring a few exceptions like health and life-critical disciplines. While the design profession expanded rapidly, due to its peculiar nature, the design teaching profession has not kept pace with the demands. Most design schools face a severe shortage of qualified, competent, experienced, and motivated design teachers. The reasons are many-fold

- Experience accumulates over a long period, and generally does not match the pace of demand for design teachers.
- Design education in many other tertiary education sectors is not very attractive for talented and competent young designers, as the industry labor market returns are higher than those of the academic labor market, barring a few exceptions.
- While the experienced design schools started with faculty development programs for their academic staff development, but the system does not match the teacher education institutions at the school level.
- Research programmes started very late in design globally and in India, with design being a very young profession. So, the teacher's entry through the design research stream is also minimal, with some not having the requisite professional design practice to complement research abilities.

Design is a practice-based profession, and successful education models have a mix of internal and visiting faculty. Design is not listed as one of the subjects under UGC NET, hence most systems follow diverse entry requirements for faculty induction based on the IDC IIT Model or NID Model (wherever the education happens outside the UGC system). Establishing the India Design Council as an organization to promote the design profession in India is a step in making design a professional field of study. As of now, design is offered as part of Architecture, Design, Fashion, Arts, Fine and Applied Arts with nomenclature B. Arch (Interior Design)/ M Arch (Interior Design)/ B. Des/ M. Des/ M. Des (Fashion)/ MA (Design/ Social Design)/ BFA/ MFA (Design and Applied Arts, etc. The following categories of resource people support the design education with a mix of external and internal contributions:

- Design teachers who studied design in some established institutions of repute. This profile is a prerequisite, with design being a relatively young profession. They understand design pedagogy's uniqueness and are the primary means through which design education sustains and maintains the existing pedagogic systems. Many of these learner teachers are also alumni of the same institutions, with a special affinity for the institutions and their educational philosophies. Faculty development programs also contribute to the development of the new designer-learner-teacher category.
- Designers as teachers: Practicing designers contribute in many ways and are respected as potential teachers in design schools. Aspiring design students get inspiration from the designer community to choose design as a career. Some open teaching and learning systems with a modular structure allow practicing designers to contribute as guest/ visiting faculty/ examiners. Practicing designers also have the opportunity to join learning systems as full-time faculty as a mid-career change of profession. Very few systems offer full-time internal faculty (designer-learner) opportunities to work on live projects and demonstrate their design abilities as design practitioners.
- Design Scholars: research programmes in design and related fields started very late, towards the end of the 20th century. Many aspirants from diverse fields pursued these research programmes. They became contributing faculty in subjects like science and liberal arts, ergonomics and human factors, engineering design, humanities and social sciences, textiles and clothing, fine and applied arts, etc. Design is now well recognized as a university subject and is part of mainstream, with many institutions part of the university structure offering

doctoral programmes for designers. The demand for research is also growing with the stakeholders' concerns regarding the certainty of design decisions.

- I teach; therefore, I am: Design curriculum is more than just design skills and abilities, supported by resource persons with a design background. Design as an interdisciplinary study borrows a knowledge base from the arts, humanities, technology, craftsmanship, management, and education. Teaching provides a constant and regular opportunity to learn design pedagogy through teaching practice and professional development in evolved systems. New pedagogies evolve through constant engagement in teaching activities, replacing outdated paradigms. With diverse backgrounds bringing in new perspectives rooted in their disciplinary pedagogies, integrating these diverse perspectives in an academic system becomes a challenge.

Any design learning system ideally needs teachers who have more than any of the above categories. We need design teachers who have learnt design through signature pedagogies (Shulman, 2005), with an inclination to apply design principles with research bent of mind and ready to share their living and learning experiences with young minds to motivate and transform them with their rhetorical, demonstrative, and personality attributes. While technology is transforming the way we educate future generations and design for future generations, it has not fully substituted the fundamental role of design teachers primarily due to the experiential, professional, and aesthetic dimensions. While high-end technology is a great tool in enhancing design and learning experiences, low tech is also very useful in creating meaningful learning experiences. How we learn design does not necessarily reflect how design is delivered as a professional service across various sectors of the economy. The quality of design teachers directly influences the quality of learning, as they are the integrating force for the various educational processes of curriculum, instruction, and assessment in an educational system. The earliest educational experiments of Ulm and Bauhaus had rooted pedagogic philosophies, and entire institutional systems were based on the central needs of the curriculum, instruction, and assessment supporting these philosophies. As we move towards the middle of the twenty-first century, there is an urgent need for an integrating pedagogical framework rooted in teacher expertise theories and practices. Can the new institutional models be based on an *integrated model* [7] of design pedagogy based on domains of teacher learning and practice? Or, should design teachers be taken for granted as just another economic input resource that institutions consider out of compulsion after the quality of learning is compromised?

An Integrative Model for Teacher Learning in Design Education

Research in design and design education is relatively new, with design being a very young profession. Very little information is available on the specific topic chosen for investigation. Various aspects of teacher knowledge (Shulman, 2004) are difficult to measure directly, and Shulman's model helps understand relationships among the factors underlying domains of knowledge and expertise. The *TPACK model* [8] (Koehler & Mishra, 2016) and similar models have well-established questionnaires and frameworks for data collection, analysis, and interpretation. However, there is a dearth of a specific conceptual framework that will address teacher learning challenges of design education.

Models are an abstract representation of reality, which helps us understand the world through concepts and derive meanings from them. Models can also be ideal standard design formats that can be the basis for the country's new institutional design of tertiary education. The most apparent approach to institutional building is through imitation or copying an ideal model, at the beginning or towards the end. Very few models try to be original and are based on core educational philosophies and values that characterize them with a distinct identity. An ideal model for a design school to start with must be coherent with the various theories of learning that work together to form an integrated approach to the core educational components of curriculum, instruction, and assessment, and put teachers at the center of attention and importance (Fernandez, 2014). There is a need for a conceptual framework that integrates and combines several aspects of teacher learning and practice. An interactive model is proposed for teacher learning and practice integrated through four quadrants of learning. The model does not claim to be exhaustive or comprehensive, but it has significant aspects of experiential learning embedded in it.

Design education started with a hands-on, minds-on philosophy falling between the '*Rational* [9]' and '*Empirical* [10]' axes. Design practice involves empathy with the users, feeling their needs, and realizing designs through engaging with materials and media to make things happen professionally. The other two domains cover design learning and design research as a knowledge-generating activity with ethnographic and experimental research methods. The four quadrants form the four dimensions of pedagogical, philosophical, professional, and psychological foundations of design education, with key components of curriculum, instruction, assessment, and preparation constantly influenced by the Pedagogyynamic interaction of the domains of expertise.

There is a need to synthesize and align relevant models of scholarship on teacher learning, addressing the critical components of curriculum, instruction, and assessment. Lee Shulman stressed the importance of pedagogical content knowledge (Shulman, 1986) as an intersection between pedagogical knowledge and content knowledge. This same model has been expanded later to include the emerging dimension of technology by Koehler and Mishra (Koehler & Mishra, 2016). In the model, the central circle is denoted by the technology dimension interacting with the pedagogical and content knowledge dimensions. Cochran, DeRuiter, and King proposed a four-component model based on the knowledge of pedagogy, students, subject matter, and knowledge of the contexts of the class and school (Cochran, DeRuiter, and King, 1993). Based on extensive research covering many institutions, Ernest Boyer's model of scholarship made the four dimensions of scholarship of teaching, discovery, application, and integration as legitimate domains of teacher learning (Boyer, 1996).

Eugene Rice relates the broader conception of Boyer's scholarship model with the four axes of the experiential learning model of David Kolb, moving closer to an integrated model for teacher learning and scholarship (Rice, 1996). Sylviane Bachy proposed a TPDK (Technological, Pedagogical, Personal Epistemology and Disciplinary Knowledge), as a modified form of the TPACK model for a University setting (Bachy, 2014). This model too resembles the other four-quadrant-based models, except that there is a special mention of the importance of personal epistemology. Interestingly, the community of inquiry model adapted from Stenbom et al. (2016) has similar divisions with a fourth presence, emotional presence, added to the rest of the three divisions of social presence, cognitive presence, and teaching presence.

Education and Design are both personality-transforming and value-creating processes, but the nature of transformation would differ. Design is an act of transforming realities into preferred ones. Such a reflexive act is likely to transform the individual engaged in the act. Education, on the other hand, is an acquisition of skills, attitudes, and values through an institutional process. Through active engagement, design pedagogy involves sensitization of the learners to moral, ethical, professional, aesthetic, and economic values. Design must depend on valid knowledge through various epistemological methods to understand the phenomena and needs. However, designers deal more with an imagined reality, with existing reality forming the basis. Design's multiple realities and perspectives can be understood only through continuous learning and integration through professional development with a plurality of perspectives. Design as an applied discipline has a pragmatic dimension, with design practice dictating the direction for design education and research.

The interaction of four major domains relates to further pedagogical practices that are relevant in design education. These four methods of learning (popularly called PBL) are passion-based pedagogy, phenomena-based pedagogy (Sahlberg, 2015), project-based pedagogy (Bender, 2012), and problem-based pedagogy (Barell, 2006). The most popular understanding of design as a problem-solving activity parallels problem-based learning that has evolved from the medical profession. Hands-on learning in design is possible through working on active projects that aim to contribute to society. With Finland making a phenomenon-based learning basis for national-level school education, many nations are looking at this approach seriously, and passion-based learning is unique to art, design, and other creative professions, with scope for expression and aesthetics.

Integrated Model in the Classroom: Curriculum, Instruction, and Assessment

The design practice is action-based, which influences how the act of teaching is enacted in a classroom. The curriculum, hence, is not well defined through textbooks. However, it is often a negotiated space developed through discussions with teachers who reflect, modify, and infuse ideas based on prior teaching experiences and their further interactions with the students. A preparatory framework may be created to guide and anticipate what is to be enacted in the classroom. Further, a set of exercises may be developed around a learning intent. Depending on the learning to be achieved, this exercise may address this intent directly or indirectly through abstract methods to provoke the learner into a state of curious learning. The curriculum in this case is not based entirely on theory but is often pragmatically assembled from various sources to support the learning intent.

For example, an exercise aimed at understanding the potentials of a triangle in 2-dimensional and 3-dimensional geometries can include at first - drawing using a compass on paper, or with the aid of a string for construction of lines or circles, or employing the potentials of the human body to create arcs as a means to construct a triangle. Any of these methods, activating the mind and the body, may work well as a take-off point to discuss its properties as three points in space- triangulation, symmetries, stability, space-filling qualities, etc. However, when discussing the potential of triangles as shapes and solids and their behaviour in various applications, a learner may employ a self-driven inquiry by searching to connect the dots, using skills and attitudes that may have been implied in any initial exercises. The inquiry is now student-led and no longer limited to the education imparted through the teacher. It translates into a passion-based project, driven by the student's curiosity and often fueled by their prior experiences.

In the classroom, the teacher may then attempt to relate a number of these learning journeys taken by a student to demonstrate the potential of 'a triangle', as is the case in this exercise. It is often seen that the discussion of the work outcome in groups greatly benefits group learning, but also validates the efforts of the student and often encourages them to pursue their ideas further through developing an intrinsic motivation to proceed (Deci, 1975). As Ariely outlines, meaningful work, connection, and ownership profoundly fuel motivation (Ariely, 2016).

In this case, the learning by the student often exceeds the intended curricular frame to develop unique approaches to the problem at hand which is often required of action-based practices. Hence, different students may often interpret the planned pedagogy differently to bring about a plurality of learning (passion-based pedagogy through extending the classroom-initiated project-based one).

Assessment is an act of translating attributes of the learning experience and outcome into grades. Here, a particular challenge resides in assessing such an outcome, which is qualitative and can rely on a scaffolding to guide it. The NID system provides several qualitative factors to guide the teacher in focusing on a set of parameters related to the course. These assessments consider the starting point, process (in-betweens), and the student's performance outcome. Such a formative assessment would require a continuous engagement between the student and teacher, regardless of the degree to which the teacher may mediate. However, in the enactment of such a pedagogy, the design teacher may often intervene to offer references or suggestions to guide the student in altering the preparatory framework to suit the student's needs at this time. This studio-based framework requires smaller student-teacher ratios.

The end of a course often culminates in each student sharing their work through a presentation or an exhibition. At this point, the outcome may be viewed without evidence of the productive struggle that has led to the outcome. A summative assessment at this point could lead to a very different assessment outcome if not referenced through earlier interactions.

2. Questions that need further exploration

Based on the understanding from the above discussion, the authors propose several questions that may warrant further inquiry.

- What are the expertise domains of design teachers' learning and practice among the design schools? To what extent does an integrated model based on a theoretical framework fit reality? What are the patterns of relationships among the latent factors underlying the domains?
- Is there any evidence of pedagogical practices of exemplary design teachers contributing to instructional coherence? What are the contributing and deterring factors? What are the relationships between the components of educational processes for achieving instructional quality in design education?
- What are the design educator's perceptions of an integrated institutional design model based on teacher learning and practice? What is the role of teacher learning and development in new institutional design? Is it possible to evolve an integrated model for institutional design based on signature pedagogies of an established instructional system?

3. Conclusion

Instructional coherence with constructive alignment among the educational components of curriculum, pedagogy, and assessment, and coherence between what is planned, instructed, and learned, is rare in design education. This is primarily due to the fragmented input from a diverse group of teachers and an equally versatile group of students in a dynamic teaching learning scenario. The pedagogic practices that lead to coherence can best be studied as case studies with exceptional circumstances of the context supporting them. Cases help us to follow and emulate, and exemplary cases often become the basis for new experiments in instructional design.

Selecting educators' experiences with experiments in models of design education in new institutional contexts is very useful in understanding the practical implications of theoretical models. Certain personalities are entrusted with the leadership challenges of institution-building in any domain. Their perceptions of models of institutional design (Goodin, 1998), especially concerning the NID model of design education, may be explored through in-depth interactions with design educators who had firsthand experience of institutional building in design education.

Using a combination of research methods (Gorard, 2004) has severe limitations regarding the validity and reliability of the conclusions drawn from studies and related interpretations. However, it is hoped that the knowledge generated and questions raised will give a unique research direction for an emerging field of study.

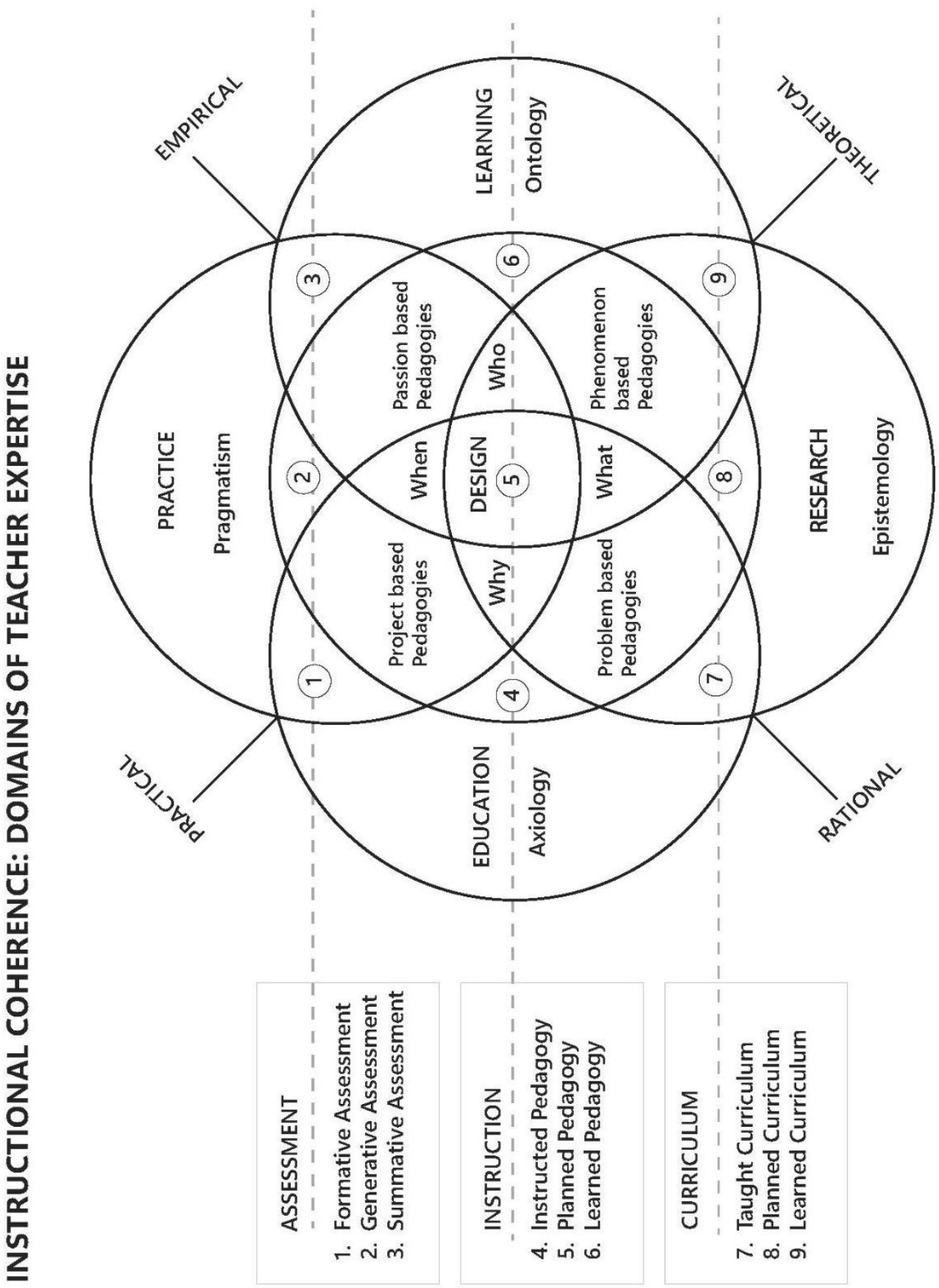
Instructional quality is governed by how the curriculum, instruction, and assessment triad is planned, taught, and learnt cohesively for achieving the institutional objectives (NRC, 2012). Talent, instruction, and learning have to be assessed as generative, formative, and summative evaluations to maintain educational quality standards (Marsh, 2004). The pedagogic methods planned must be implemented consistently for effective learning. There is also a need for a synchronous relation between the planned, taught, and learned curriculum. An ideal instructional system also aspires for a learning-teaching continuum intersecting vertically with the theory-practice continuum. The learning-teaching continuum provides opportunities for learners to transform into teachers and also provides opportunities for teachers as continuous learners. Design research should help designers understand design problems better, enabling them to develop professional services and solutions in an institutional context. Technology has great potential to act as an integrating force in instructional coherence and play a central role in methodological support to the educational processes. A pluralistic learner-centered design education with a strong institutional purpose rooted in values helps create new knowledge. This new knowledge, along with the values imbibed through the education system, can support the design profession in serving the societal objectives in a contextually relevant manner.

Notes:

1. Curriculum refers to subjects that comprise a course of study.
2. Pedagogy refers to a method or practice of teaching an academic subject or a theoretical concept. It shapes a teacher's actions, judgements, and strategies by taking into account the needs of the learner.
3. Assessment refers to the act of making judgements about something.
4. Hands-on, minds-on refers to the act of active learning where the learner is engaged in physical activities while also engaging in critical thinking about the concept at hand.
5. Philosophy refers to a theory or an attitude that acts as a guiding principle for behaviour.
6. Instructional refers to a defined direction, usually related to how something may be done or operated.
7. Integrated Model refers to a framework that combines different elements into a single cohesive structure.
8. TPACK Model refers to the Technological Pedagogical Content Knowledge, previously referred to as TPCK Model, that describes the intersections between technology, pedagogy, and content for the effective integration of

technology into teaching. (Koehler & Mishra, 2016) (Bachy, 2014). It has been argued that effective technological integration requires an understanding of the relationship between all three forms of knowledge in the teaching context. Contextual knowledge, however, includes information outside these three categories.

9. Rational reasoning refers to the process of using logic, reason, and evidence to form conclusions.
10. Empirical reasoning refers to a method of drawing conclusions based on observation and experience rather than on theory and logic alone.


INSTRUCTIONAL COHERENCE: DOMAINS OF TEACHER EXPERTISE
EMPIRICAL
THEORETICAL
PRACTICAL
RATIONAL
PRACTICE
Pragmatism
LEARNING
Ontology
RESEARCH
Epistemology
EDUCATION
Axiology
Passion based Pedagogies
Phenomenon based Pedagogies
Project based Pedagogies
Problem based Pedagogies
Who
When
What
Why
DESIGN
1
2
3
4
5
6
7
8
9
ASSESSMENT
1. Formative Assessment
2. Generative Assessment
3. Summative Assessment
INSTRUCTION
4. Instructed Pedagogy
5. Planned Pedagogy
6. Learned Pedagogy
CURRICULUM
7. Taught Curriculum
8. Planned Curriculum
9. Learned Curriculum

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Envisioning Sustainability-driven Artisan Entrepreneurship (SDAE) to expand Windows of Opportunity in a Reciprocal Macro-Micro Economy

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Abstract:
Scholars in the handicraft literature often address sustainability values, an entrepreneurial opportunity, or artisan entrepreneurship. However, these phenomena are typically examined separately or in paired. Rarely are they studied in an integrated framework. Recent discourse increasingly frames sustainability as a context for entrepreneurial opportunity. In response, the present deliberation introduces the concept of Sustainability-driven Artisan Entrepreneurship (SDAE), a framework designed to integrate and advance understanding of how artisan entrepreneurs engage with sustainability as an opportunity in the context of a reciprocal micro-macroeconomic perspective. SDAE highlights the interwoven dynamics of ecological responsibility, cultural continuity, market forces and value generation, and institutional-financial frameworks that shape artisan entrepreneurship at the micro level to best align with current ecological and social challenges in the macroeconomic landscape.

Keywords: Artisan entrepreneurship; Handicraft industry; Opportunity; Reciprocal micro and macro economy; Sustainability.

Article History: Article Received :08-07-2025, Revised: 29-07-2025, Accepted: 08-08-2025

1. Introduction

The domain of creative economy has emerged as a dynamic driver of economic growth, cultural innovation, and social transformation. It plays a critical role in shaping the cultural identity and reinforcing local economic resilience (UNCTAD, 2024). Moreover, within this broader landscape, cultural and creative industries (CCIs) encompass activities that rely on individual creativity and skill to generate economic value and foster cultural exchange, especially in developing countries (Peris-Ortiz et al., 2019). Combining artistic production with entrepreneurial practice, CCIs open new markets for cultural goods and services while safeguarding heritage (He, 2019). Consequently, Artisan Entrepreneurship (AE) represents a distinctive segment of CCIs within the handicraft industry. AE effectively connects traditional knowledge and craftsmanship at the microeconomic grounds with market-oriented innovation at the macroeconomic level (Ratten et al., 2019).

In general, handicrafts have been conceptualized as artisanal outputs grounded in place-based socio-cultural milieus. Further, it demonstrates a synergetic interrelationship of production, consumption, and heritage valuation that frames a deep cultural expression (Saha & Sen, 2023). Scholars have frequently examined handicrafts through anthropological, sociological, and cultural tourism perspectives. Recently, however, scholars have shifted toward a more integrated approach that reframes artisans as cultural bearers with an entrepreneurial mindset. Thus, the concept of "Artisan Entrepreneurship" (AE) has gained prominence and holds a distinctive position in both socio-cultural and economic systems worldwide in the mirroring of the two economies, micro and macro.

Moreover, it is observed that the conventional profit-centric model has often been inadequate in fostering the long-term viability of artisan entrepreneurial ecosystems. Industrial expansion and market liberalization often marginalize artisanal production. Also, the model frequently tends to overlook the intrinsic sustainability values inherent in craft-based production. To move forward, it is essential to reshape current approaches. Transitions toward sustainability must be treated as a central, unifying principle rather than a peripheral concern. Progress requires an integrated model that weaves together environmental conservation, cultural preservation, equity, and economic viability. These dimensions must reinforce each other to support long-term resilience. Therefore, the present paper has proposed Sustainability-driven Artisan Entrepreneurship (SDAE) as a framework that combines ecological responsibility at a macroeconomic level within the entrepreneurial practices of the microeconomy. Also, SDAE elucidates the dynamic interplay across cultural continuity, market and value creation processes, and institutional and financial conditions that reinforce artisan entrepreneurial ecosystems.

2. Research Dimensions

The section presents a synoptic review of the conceptual understanding of the three research dimensions. Specifically, Subsection 2.1 refers to a transformation in how societies perceive, value, and collective act upon the idea of sustainability. Moreover, Subsection 2.2 underscores the multi-faceted impact of artisan entrepreneurship in the handicraft industry. This impact includes cultural preservation, economic inclusion at both levels – micro and macro, and community resilience. In addition, Subsection 2.3 frames sustainability as an entrepreneurial opportunity that illustrates how ecological and social

imperatives can drive innovative business models.

2.1 Sustainability as a Socio-Cultural Shift

Sustainability values have increasingly emerged as central to contemporary development discourses. Global frameworks, notably the United Nations' Sustainable Development Goals (SDGs) — comprising 17 goals and 169 targets — have institutionalized sustainability as a global agenda (United Nations, 2015). Sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). These commitments articulate worldwide aspirations to eradicate poverty, safeguard ecosystems, and promote inclusive growth. However, translating these objectives into global to local practice often reveals conflicting priorities and entrenched structural constraints.

In response, a critical review of foundational literature identifies key domains in which sustainability-driven social and economic transformations emerge. To connect historical legacies with contemporary realities, these domains can be broadly classified into three interrelated areas as follows:

- Firstly, ***Knowledge and Cultural Systems*** encompass cultural heritage, education, and local knowledge that shape community capacities for developing values of ecological responsibility and participatory development. The Scottish urbanist and biologist Patrick Geddes (1854–1932) is widely recognized for introducing the analytical framework of "place, work, and folk," which structured his examination of modern urbanism. Furthermore, Geddes' vision of regional planning demonstrated that genuine social change depends on the organic integration of local knowledge systems with broader economic and institutional structures (C. & Geddes, 1916). Similarly, Rabindranath Tagore's initiatives aimed to cultivate community reliance and resource conservation in rural development. His work at Santiniketan and Sriniketan illustrates how global (macro) and local (micro) values can embed themselves in rural reconstruction by combining education, training, and cultural revival (Das Gupta, 2008).
- Secondly, ***Production and Economic Systems*** encompass the material and organizational structures that govern how local goods and services are created, distributed, and consumed. The practices of the Khadi movement and village industries, which Gandhi (2009) viewed as essential for achieving both well-being and moral purpose. This domain highlights the link between livelihoods and the ethical dimensions of production, which emphasizes localized, decentralized models in the microeconomic landscape over extractive and overriding industrial systems at the macroeconomic controls and communication.
- Finally, ***Institutional and Policy Systems*** refer to formal governance arrangements, regulatory frameworks, and social protection mechanisms designed to enhance adaptive capacities and social inclusion. Sen's (2013) capabilities approach emphasizes that development must expand individuals' substantive freedoms rather than limit itself to income measures. Likewise, Javed Burki & Ul Haq (1981) upheld that human development requires deliberate investment in social opportunities and institutional capacities, including education, health care, and social infrastructure are essential because they directly build individual capabilities and reinforce collective resilience. Most recent, Banerjee et al. (2022) said that to fight poverty, there is a need for sustainability of the programme period and a need for determining the ideal design for social protection programs, including microcredit, entrepreneurship training, cash transfers, and savings promotion.

Collectively, the insights suggest that sustainability values are shaped through the constant interplay between broad institutional agendas and everyday local actions, as illustrated in Figure 1[1]. For strategies to be truly effective, integrate cultural traditions, economic fairness, and inclusive governance in ways that enable mutual space between tradition and modernity, individual agency and collective well-being in the reciprocal micro-macro perspective. In this context, grassroots entrepreneurial innovation acts as a key mechanism for socio-cultural transformation by bridging global sustainability goals with the lived realities of local communities. Through these bottom-up innovations, new social norms and cultural meanings around sustainability are cultivated and develop deeper integration of ethical, economic, and ecological practices into daily life

2.2 Impact of Artisan Entrepreneurship in the Handicraft Industry

The handicraft sector forms a crucial microeconomic part of India's overall Micro, Small, and Medium Enterprises (MSME) ecosystem. Positioned at the intersection of cultural tradition and economic enterprise, these units primarily function within informal rural settings.

Despite their informal nature, handicraft enterprises fall mainly under the micro segment of MSMEs. Importantly, their contribution to rural employment and regional economies is significant, particularly in craft-intensive states such as Rajasthan, Uttar Pradesh, Odisha, West Bengal, and Gujarat.

Moreover, the sector holds substantial socio-economic value, employing approximately 7 million artisans, the majority of whom belong to marginalized communities, including women, scheduled castes, and tribes (Dasra, 2013). As of 2024, India's handicraft exports exceeded INR 32,758.80 crores (USD 3.95 billion), which reflects the sector's growing integration into global markets and its significance for sustainable rural livelihood (EPCH, 2024).

[1] *Developed by the authors*

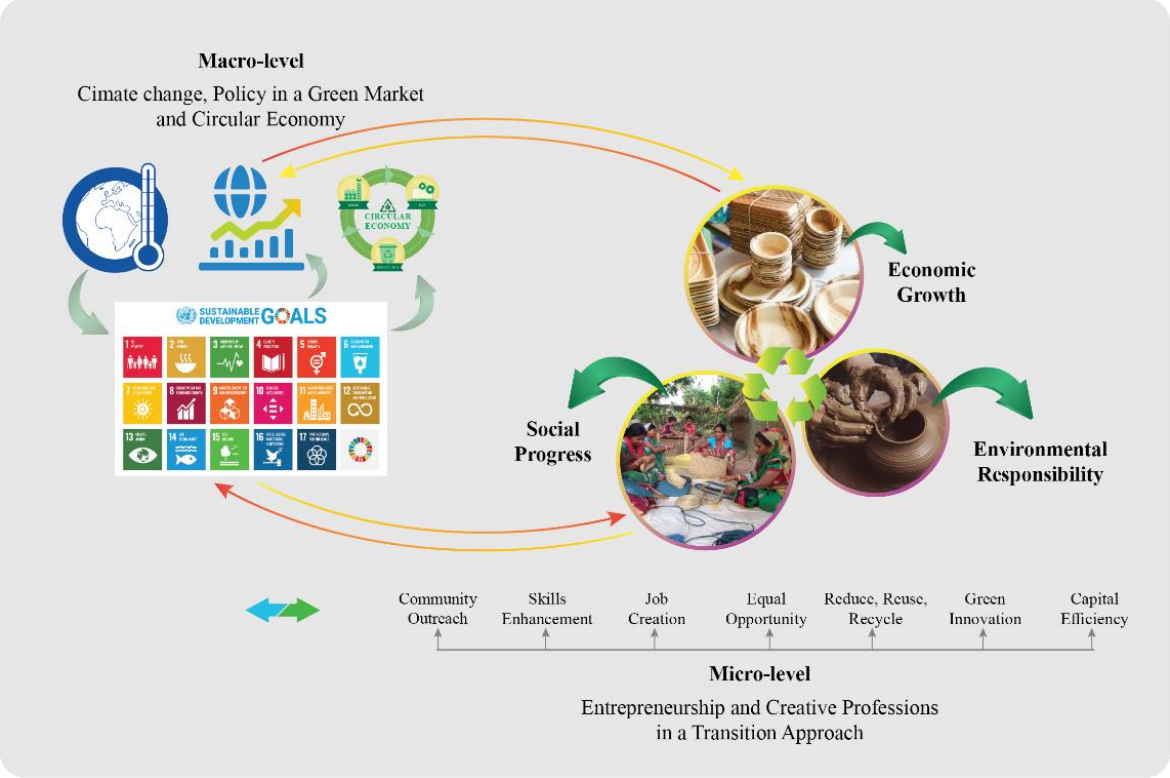

Figure 1: Macro-Micro level Interactions in Sustainability Discourse

Although still an emerging scholarly domain, Artisan Entrepreneurship (AE) refers to *producing and selling products or services with distinctive artistic values that merge artisanal skill with modern entrepreneurial intent rooted in traditional handicrafts* (Marques et al., 2019; Ramadani et al., 2019; Ratten et al., 2019; Solomon & Mathias, 2020). AE plays a crucial role in preserving traditional skills that face decline due to industrial standardization and mass production (Solomon & Mathias, 2020). Entrepreneurial artisans serve as upholders of cultural heritage. They transfer craftsmanship across generations while introducing traditional designs and materials to align with changing contemporary preferences. This dual orientation toward preservation and innovation enhances the resilience of handicraft systems (Mwila, 2024; Ratten et al., 2019). Also, it reinforces cultural relevance within global markets.

From an environmental standpoint, handicraft production is generally characterized by low energy consumption and reliance on renewable or locally sourced materials (Shafi et al., 2020). Socially, in many regions, particularly in the developing context, AE provides essential livelihood security and serves as a critical safety net for marginalized populations, including women and indigenous groups (Ramadani et al., 2019). Economically, the sector supports diversified local economies, stimulates rural employment, and enhances community resilience in regions where formal job opportunities remain scarce (Bakas et al., 2019). Moreover, the authenticity and cultural embeddedness of artisanal goods generate competitive advantages, particularly as consumers increasingly value ethical production and cultural uniqueness (Ferreira et al., 2019).

In this way, artisan entrepreneurship in the handicraft industry is deeply committed to ethical production, social connectedness, cultural preservation, and economic resilience that reflect core sustainability scholarship at the aggregate macroeconomic level. Specifically, such activities support Sustainable Development by promoting responsible consumption and production patterns (Chen, 2022).

2.3 Framing Sustainability as an Entrepreneurial Opportunity

Sustainability has increasingly been framed as a domain of entrepreneurial opportunity. This outlook addresses ecological and social challenges that become integral to value creation (Cohen & Winn, 2007). Diverges from profit-driven entrepreneurship views, it positions sustainability as a driver of innovation, competitiveness, and market development (Dean & McMullen, 2007). Entrepreneurs engaged in sustainability as agents of systemic change. In view of advanced innovative solutions to i) identifying and framing market imperfections related to environmental degradation and ii) integrating social aspects into products, processes, and organizational structures to strengthen the foundations of sustainable enterprise (Klewitz & Hansen, 2014; Schaltegger & Wagner, 2011).

Scholars argue that sustainable entrepreneurship arises where market failures and institutional voids intersect. Unmet social and environmental needs create signals of latent opportunity (Pacheco et al., 2010). For example, waste reduction, renewable energy, and circular economy models exemplify domains where entrepreneurial action can simultaneously deliver ecological benefits and financial returns. Further, the framing of sustainability as an opportunity has been influenced by rising societal expectations for responsible business conduct (Muñoz & Cohen, 2018). Also, the growth of ethical consumption expands

niches for products and services aligned with sustainable value creation (Holt, 2012; Werner et al., 2025).

Importantly, this perspective highlights the dynamic interplay between individual agency and structural change that actively contribute to the reconfiguration of socio-technical systems in pursuit of sustainability goals at the reciprocal micro-macroeconomic structure (Köhler et al., 2019). By doing so, they help redefine market norms, consumer expectations, and production practices, illustrating the transformative potential embedded in sustainability-oriented entrepreneurship (Planko & Cramer, 2021).

3. Envisioning Sustainability-driven Artisan Entrepreneurship (SDAE)

As discussed above, scholars widely recognize that artisan entrepreneurship (AE) in the handicraft sector holds distinctive potential to propel modern sustainability agendas. Extending this perspective, the present research introduces the idea of Sustainability-driven Artisan Entrepreneurship (SDAE) as a vital pathway for aligning traditional craftsmanship with contemporary sustainability imperatives. As a framework, SDAE seeks to reconfigure production and consumption practices in ways that address four dimensions found within artisan entrepreneurial practices.

Firstly, ***ecological responsibility*** at the microeconomic level that emphasizes raw material sourcing and environmentally regenerative production. Traditional crafts often depend on natural materials such as bamboo, clay, and plant-based dyes. The extraction and processing of these materials generally produce a lower environmental footprint than industrial alternatives. Further, many artisan practices slowly incorporate circular principles, including the reuse of byproducts and minimal waste generation. By maintaining locally adapted resource cycles and prioritizing biodegradable inputs, craft production supports reducing pollution. For instance, handloom textiles dyed with natural pigments avoid synthetic chemicals that contaminate water and soil (Surjit et al., 2023). Thus, ecological responsibility is embedded in raw material selection and the production process that aligns with natural ecosystem dynamics.

Secondly, ***cultural continuity*** highlights the critical role of intergenerational knowledge transfer in preserving cultural heritage in a macro perspective. Maintaining traditional practices requires active engagement with elders, community institutions, and educational initiatives. Intergenerational learning transmits technical skills and reinforces collective identity, shared values, and cultural narratives embedded in craft traditions. Community-based workshops, apprenticeships, and storytelling play a central role in this process. They enable younger generations to internalize both techniques and symbolic meanings (Boyd, 2020). Further, cultural continuity contributes to social cohesion by fostering a shared sense of belonging. Moreover, it generates cultural capital that differentiates artisan products in contemporary markets. Therefore, cultural continuity constitutes both a cultural imperative and an economic strategy for artisans seeking to access niche markets.

Thirdly, strengthening ***market and value systems*** requires multi-tiered strategies processed at the macroeconomic level. Building transparent value chains through certification mechanisms (e.g., fair trade, geographical indications) can help artisans secure recognition and the best prices for their work. Investments in digital literacy and e-commerce infrastructure enable producers to bypass exploitative intermediaries. Also, artisans engage directly with consumers in global markets (Yadav et al., 2024). Fostering consumer awareness of the social and environmental value of artisan products is equally important. This awareness can generate demand for ethically produced goods. Thus, transforming market and value systems extends beyond market access. It involves reshaping power relations and validating traditional knowledge and artisanal heritage as sources of economic value and social meaning.

Finally, ***institutional and financial systems*** are equally critical. Artisans frequently face institutional neglect and barriers to finance that limit their capacity for innovation and growth. Innovative financing mechanisms such as microcredit schemes, cooperative models, and incubation programs can help foster enabling environments for experimentation and long-term viability (Yadav et al., 2024). In parallel, the establishment of supportive institutional frameworks, including dedicated artisan boards, craft councils, and public–private partnerships, can strengthen governance structures and create more inclusive market systems. These interventions help mitigate structural constraints and enable artisans to integrate social and environmental considerations into their business models. Thus, institutional and financial innovations function as key levers to build resilience, reinforce legitimacy, and expand the transformative potential of artisan entrepreneurship as a confident microeconomic response to the macroeconomic landscape of industrialization-modernization paradigm.

4. Conclusion

The key dimensions explored in this paper are artisan entrepreneurship at the microeconomic grounding and sustainability as an entrepreneurial opportunity that trickles down from a reciprocal larger macroeconomic landscape. Although both concepts have been defined in varied ways across the literature, their intersection remains underexamined. To address this gap, the paper underscores a conceptual framework, i.e., Sustainability-driven Artisan Entrepreneurship (SDAE) which guarantees this reciprocity between the two ends.

The idea embeds four interventions: i) ecological responsibility at the micro ecosystem level, ii) cultural continuity between the micro and the macro systems, iii) market and value systems that bind the two, and finally, iv) inpouring of macroeconomic institutional and financial mechanisms into the microeconomic handicraft production that forwards the creative loop in the system, made evident in the Fig. 1. Collectively, these interventions offer a pathway to re-conceptualize microeconomic artisan entrepreneurship in response to contemporary sustainability imperatives descending from the

macroeconomic infrastructure planning, design and management. Consequently, SDAE extends the scope of artisan entrepreneurship research by illustrating how cultural heritage can align with current ecological and social demands integrating both ends – the micro and the macro. Hence, the approach positions innovative clustering of artisan entrepreneurship as a meso-level, the strategic accelerator of a good transition towards sustainability to create new opportunities for further scholarly investigation and subsequent policy engagement at a reciprocal and cyclic whole of understanding.

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Sustainable extraction and application of natural indigo dye from Assam rom [*Strobilanthes cusia* (Nees) Kuntze] on handloom silk and cotton fabrics

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Abstract:
Natural indigo dye has been successfully extracted from *Strobilanthes cusia* (Nees) Kuntze, commonly referred to as Rom or Assam indigo, a plant traditionally cultivated in Assam. Using an indigenous fermentation technique, the extraction yielded indigotin with a purity of 55.5%, thereby supporting environmentally responsible practices in textile processing. This research centres on optimising fermentation conditions, particularly the pH, to maximise indigotin yield while preserving fabric integrity and colour fastness. Dyeing trials conducted on eri silk, mulberry silk, and cotton fabrics exhibited excellent colour absorption, high ratings for light and wash fastness, and retention of yarn tensile strength, with only minor reductions noted in mechanical properties. The dyeing process, which utilises natural reducing agents such as molasses and alkaline substances like lime, is refined to ensure both ecological safety and effective dyeing performance. Post-dyeing assessments confirm the suitability of these natural indigo extracts for traditional handloom weaving, producing vivid, sharply defined patterns that do not compromise fabric quality or structural integrity. The integration of traditional knowledge with scientific refinement highlights the potential of natural indigo as a sustainable and culturally significant alternative to synthetic dyes, supporting both environmental conservation and the economic empowerment of rural artisan communities.

Keywords: Cotton, Handloom, Natural indigo, Rural entrepreneurship, Silk, Sustainable dyeing.

Article History: Article Received :30-06-2025, Revised: 28-07-2025, Accepted: 07-08-2025

1. Introduction

Natural dyes, particularly indigo, have played a significant role in global textile traditions due to their aesthetic, ecological, and cultural value. Indigo extracted from plants like *Indigofera tinctoria* and *Strobilanthes cusia* (commonly known as Rom or Assam Indigo) is especially valued for its biodegradability and low environmental impact compared to synthetic alternatives (Balaram, 2012). In Northeast India, traditional communities have long utilised *Strobilanthes cusia* to dye silk and cotton fabrics, employing fermentation-based extraction methods that are both cost-effective and environmentally friendly (Kar & Borthakur, 2008; Sarma et al., 2025).

In recent decades, natural dyes have regained interest due to environmental concerns and a shift toward sustainability in the textile industry (Mussak & Bechtold, 2009). Natural indigo, in particular, holds significant historical, cultural, and economic value. Unlike synthetic dyes, which are often environmentally harmful and resource-intensive (Yusuf, 2019), natural indigo offers a renewable and biodegradable alternative that aligns with the principles of green chemistry and the circular economy (Voukkali *et al.*, 2024). Although once prominent, the use of Assam Indigo declined with the rise of synthetic dyes. Today, growing demand for eco-friendly and ethical fashion is sparking renewed interest in traditional dyeing practices rooted in indigenous knowledge systems (UNESCO, 2021).

Despite this rich tradition, current research predominantly focuses on *Indigofera tinctoria*, with comparatively limited emphasis on *Strobilanthes cusia*, particularly regarding its potential for sustainable and eco-friendly dyeing practices on various fabric types such as eri silk, mulberry silk, and cotton (Das & Kalita, 2016). Studies have shown that natural indigo dyeing can achieve fastness properties comparable to those of synthetic dyes, thereby enhancing its commercial viability (Das *et al*., 2014). Moreover, the use of natural mordants and the optimisation of dyeing parameters have been shown to improve dye uptake and fastness, thereby supporting ecological sustainability (Banerjee *et al*., 2018). From an environmental perspective, natural indigo dyeing avoids the toxic effluents associated with synthetic dye production. Das et al. (2014) emphasised the advantages of simultaneous mordanting and dyeing techniques, which improve environmental compatibility and product durability. Research by Karmakar (1999) also highlights the potential for integrating traditional dyeing with modern processes, thereby fostering innovation and entrepreneurship in rural textile clusters.

However, critical gaps remain. Traditional extraction methods often rely on synthetic reducing agents such as sodium hydrosulfite, which pose significant health and environmental risks (Chavan, 2015). While recent efforts have introduced safer, bio-based alternatives such as indigenous fermentation techniques, natural reducing agents like molasses (locally known as *gur*), and alkaline substances like limestone, these methods still require further optimisation to ensure consistency, scalability, and compatibility with different fabrics (Senthilkumar & Murugesan, 2022). Moreover, research on the

application of *Strobilanthes cusia* to *eri* silk, an indigenous fibre with distinct qualities, remains limited, restricting the scope for revitalising traditional crafts and supporting rural livelihoods.

Moreover, the literature emphasises the importance of developing sustainable dyeing methods that align with indigenous knowledge systems, contributing to environmental objectives and cultural preservation (Periyasamy & Militky, 2020). While some studies have addressed dye fastness and environmental benefits, a notable need remains for a comprehensive, optimised protocol that integrates environmentally safe extraction processes, eco-friendly mordants, and fabric-specific dyeing parameters to ensure high-quality, fastness-resistant natural indigo dyeing suitable for the traditional handloom sector.

Despite the recognised potential of *Strobilanthes cusia* as a sustainable natural dye, present research is limited to basic extraction techniques, with minimal focus on its application across various natural fibres. There is a distinct lack of integrated studies combining indigenous fermentation methods with eco-friendly mordants suitable for eri silk, mulberry silk, and cotton. Furthermore, the optimisation of dye bath conditions, such as pH, reducing agents, and fibre-specific parameters, to enhance dye uptake and colour fastness remains insufficiently explored. The role of *Strobilanthes cusia* in promoting eco-sustainability and supporting livelihoods within the rural handloom industry of Northeast India remains underutilised. To address these gaps, this study aims to develop and evaluate sustainable natural indigo dyeing techniques specifically for eri silk, mulberry silk, and cotton yarns. The objectives include:

- Optimising the fermentation extraction process for Assam Indigo
- Find out suitable indigenous alternatives to caustic soda and sodium hydrosulfite
- Investigating dye bath parameters to maximise dye uptake and fastness
- Demonstrating dyeing on handloom fabric to support local entrepreneurship and preserve indigenous techniques.

This research directly supports local entrepreneurship by providing artisans with eco-friendly and cost-effective dyeing techniques rooted in indigenous knowledge, which can enhance the value of their products, improve access to regional and national markets, and promote the revival of traditional crafts. The adoption of sustainable dyeing practices not only preserves cultural heritage but also fosters economic empowerment within rural artisan communities.

2. Materials and Methods

2.1. Materials

Eri silk yarn (2/120 Nm), cotton yarn (2/80s), and mulberry silk yarn (20/22 denier) were purchased from NHDC Ltd., Guwahati.

2.2. Indigo Dye Extraction

Natural indigo was extracted from *Strobilanthes cusia* using an indigenous fermentation method, a traditional practice rooted in local ecological knowledge. Fresh plant materials (leaves, stems, and twigs) were soaked in water and allowed to ferment naturally at ambient temperature (~25°C). The fermentation lasted approximately 5 days, during which microbial activity converted indican into indigotin, producing a dye-rich extract. The process was monitored for pH, which was maintained between 9.5 and 10.5 through natural microbial processes, ensuring optimal conversion and dye stability. Gentle agitation was applied periodically to enhance microbial activity and uniform fermentation. The fermentation conditions were optimised based on indigenous knowledge and local environmental conditions to maximise indigo yield and dye purity. The fermented extract was then filtered and used for dyeing applications.

It is noteworthy that the reduction potential of indigenous fermentation-based agents, such as *gur* and lime, differs from that of conventional chemical reducers, like sodium hydrosulfite. Sodium hydrosulfite, a commonly used synthetic reducing agent, has a standard reduction potential at pH 7, allowing for the rapid and complete reduction of indigo to its soluble leuco form within minutes (Lohtander *et al*., 2021). In contrast, microbial reduction via *gur* relies on organic compounds produced during fermentation, which possess a lower and more variable reduction potential (Bulut & Çelik, 2020). The primary function of lime is to sustain an alkaline environment, facilitating enzymatic activity within microbes, rather than acting as a direct reductant. Due to these lower and more variable reduction potentials, the biological process is inherently slower, typically requiring hours or days to reach the reduction stability needed for effective dyeing (Božič & Kokol, 2008). Although this slower kinetics may seem less efficient compared to chemical reducers, microbial reduction offers significant environmental advantages by eliminating the use of toxic chemicals, reducing waste, and supporting sustainable dyeing practices aligned with ecological principles (Pranta & Rahaman, 2024). This makes it especially suitable for small-scale artisan applications and rural communities committed to greener practices in natural indigo dyeing (Saxena & Raja, 2014).

2.3. Dyeing Procedure

Dyeing involves three key parameters:

- *Indigo dye*: Prepared as a paste with castor oil and dissolved in hot water
- *Reducing agent*: *Gur* solution for eco-friendliness.
- *Alkali*: Replaced caustic soda with limestone (*chuna*) to maintain alkaline pH.

Cotton yarns were dyed at an alkaline pH of 11–12, leveraging the cotton's resistance to alkali. Silk yarns, being protein-based, were dyed at a pH of ~10, as higher pH levels lead to alkaline hydrolysis and fibre damage.

2.4. Evaluation of Colour Yield

The colour strength (K/S) value of dyed samples was evaluated using a spectrophotometer (Datacolor SF-650 Plus Colour Testing) with a 10° standard observer angle and D65 illuminant following the ISO standard. Five different places were tested, and the colour data were averaged. The K/S in the visible region of the spectrum was calculated based on the Kubelka-Munk equation: $K/S = (1-R)^2 / 2R$. Where Rλmax is the reflectance value of the dyed fabrics at the wavelengths of maximum absorbance, K is the absorption coefficient, and S is the scattering coefficient.

2.5. Evaluation of Fastness Properties

Evaluating colour fastness properties of the dyed fabric, standard methods were employed. Following colour fastness tests were performed using standard procedures: washing fastness (ISO 105-C 10:2006), rubbing fastness (ISO 105-X12:2001), and light fastness (AATCC TM 16-3:2014).

3. Results and Discussion

3.1. Indigo Extraction Yield and Purity

The natural indigo dye was successfully extracted from *Strobilanthes cusia* using an Indigenous fermentation method. The pH of the dye bath significantly influenced the indigotin yield. Moderate alkalinity yielded optimal results, whereas higher alkalinity levels led to pigment degradation and reduced dye stability.

As shown in Table 1, the highest indigotin yield (55.5%) was achieved at a pH of 10.5, indicating this as the optimum pH for fermentation-based extraction. Yields decreased both below and above this range because deviations from this pH impair the microbial fermentation process responsible for converting indican into indigotin. At pH levels below 10.5, microbial activity and enzymatic reactions become less efficient, resulting in reduced indigotin production. Conversely, at pH levels above 10.5, the pigment becomes unstable and prone to degradation due to alkaline instability, which further diminishes the indigotin yield.

Table 1. Effect of alkalinity on indigo yield

pH Level	Indigotin Yield (%)	Visual Assessment
9.5	42.8	Weak blue shade
10.5	55.5	Deep, vibrant blue
12.0	48.3	Pigment instability noted

3.2. Dyeing Application and Fibre Compatibility

Dyeing trials were conducted on eri silk, mulberry silk, and cotton yarns. Cotton, being cellulose-based, tolerated higher pH conditions (pH 11–12), whereas silk required a lower pH (~10) to prevent alkaline hydrolysis and fibre damage.

As illustrated in Figure 1, different yarns exhibit optimum dye uptake at different pH ranges, necessitating process customisation based on fibre type. Eco-friendly substitutes were used throughout: fermented *gur* replaced hydrosulfite as a reducing agent, while lime ($CaCO_3$) was used in place of caustic soda to maintain an alkaline pH. This ensured effective vatting and dye uptake with minimal environmental impact.

Cotton exhibited tolerance to higher alkalinity (pH 11.5), while silk required milder pH conditions (~10) to prevent hydrolytic degradation.

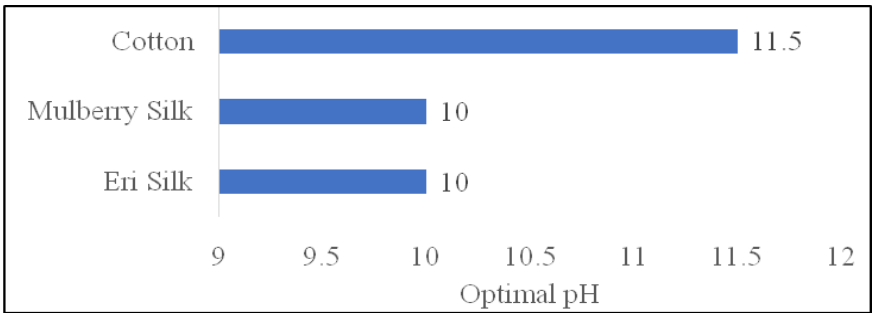

Figure 1. Optimal pH range for dyeing different yarns with Assam indigo

3.3. Colour Fastness Properties

Colour fastness is critical for the commercial viability of natural dyes. As evaluated according to ISI standards, the dyed fabrics exhibited excellent resistance to washing, rubbing, and light.

As shown in Table 2, fastness ratings ranged from 4 to 5 across all fibre types. Cotton showed the highest light fastness (4–5),

while silk samples also maintained satisfactory performance. These values confirm the technical comparability of Assam Indigo to synthetic indigo dyes.

The natural indigo dye extracted from Rom grown in Assam can produce fabrics with colour fastness properties comparable to synthetic indigo dyes. The optimised dyeing process, which involved precise control of parameters such as pH and eco-friendly mordants, contributed to the high fastness ratings observed (ratings between 4 and 5). Maintaining appropriate pH levels—around 10.5 for indigo extraction and fibre-specific adjustments—helped prevent fibre degradation while enhancing dye uptake and adhesion. These careful process controls ensure the durability and colour retention of the dyed fabrics, confirming the viability of sustainable natural indigo dyeing methods in producing high-quality textiles.

Table 2. Colour fastness ratings of Assam indigo-dyed fabrics

Fiber Type	Fastness Ratings			
	Washing	Rubbing		Light
		Dry	Wet	
Cotton	5	4	4	4–5
Mulberry Silk	4–5	4–5	4	4
Eri Silk	4–5	4–5	4-5	4

(*Scale: 1 = Poor, 5 = Excellent*)

3.4. Colour Depth and Strength (K/S Value)

Surface colour intensity was measured using the Kubelka-Munk (K/S) values, as depicted in Table 3. Cotton has the highest affinity for indigo, primarily due to its cellulose content, which results in higher dye uptake and deeper shades. The higher pH range (11–12) tolerated by cotton enhances dye fixation, contributing to its superior colour strength compared to silk, which requires milder conditions. This is reflected in the observation that cotton displayed the highest K/S values, followed by eri silk and mulberry silk.

Table 3. CIE colour coordinates and colour strength (K/S) values of dyed cotton and silk fabrics

Fiber Type	L*	a*	b*	K/S
Cotton	34.14	-1.1	-25.79	15
Mulberry Silk	33.31	-1.3	-22.97	12.4
Eri Silk	39.39	-2.75	-25.29	10

3.5. Weaving Integrity and Fabric Handling

Post-dyeing evaluations indicated that all tested yarns retained sufficient tensile strength and exhibited high suitability for handloom weaving. The approximate percentage loss in strength (tenacity) for each fibre type was as follows: eri silk showed an 8% reduction, mulberry silk exhibited a 7% reduction, and cotton experienced a 12% reduction. These results demonstrate that the dyeing process with natural indigo, optimised at specific pH levels and using eco-friendly mordants, effectively preserves the structural integrity of the yarns.

Regarding yarn orientation, the yarns were evaluated in both warp and weft directions during weaving trials. In all cases, the dyeing process did not adversely affect the yarns' ability to withstand the mechanical stresses involved in weaving in either direction, ensuring successful handloom operation without breakage or deterioration of fabric quality. Additionally, tie-dye experiments on silk yielded vivid, well-defined patterns, demonstrating both decorative and structural success. As summarised in Table 4, all fibre types exhibited high weaving suitability and retained desirable design outcomes after dyeing.

Table 4. Post-dyeing yarn strength and handloom suitability

Fiber type	Breakage observed	Handloom suitability	Design outcome (Tie-dye)
Cotton	None	Excellent	Deep, solid impressions
Mulberry silk	None	Excellent	High contrast designs
Eri silk	None	Excellent	Sharp, vibrant patterns

The results of this study confirm the technical feasibility and ecological relevance of using natural indigo extracted from *Strobilanthes cusia* for dyeing eri silk, mulberry silk, and cotton fabrics. The optimum indigotin yield was achieved at a pH of 10.5, and fibre-specific pH adjustments ensured effective dye uptake while preserving fabric integrity. The use of natural reducing and alkaline agents, such as *gur* and lime, has proven to be an effective and environmentally safe alternative to conventional chemicals. Colour fastness ratings of 4–5 across all tested fabrics, along with high K/S values, especially in cotton, demonstrate the dye's performance parity with synthetic indigo. Furthermore, the dyed yarns (Figure 2) retained their structural strength, validating their suitability for handloom weaving and decorative applications such as tie-dye. Collectively, these findings validate the ecological and technical feasibility of using Assam Indigo for sustainable textile dyeing. The use

of natural reducing and alkaline agents, combined with indigenous knowledge systems, supports the development of eco-friendly practices while empowering rural artisan communities in Northeast India.

(c) Cotton (b) Mulberry silk (a) Eri silk

Figure 2. Shades developed with Assam indigo

4. Conclusion

The research validates that high-quality natural indigo dye can be obtained sustainably from Rom plants cultivated in Assam's climate, with optimal dyeing achieved at a pH of 10.5. The application of natural reducing and alkaline agents, such as gur and lime, has proven to be an effective and environmentally friendly alternative to conventional chemicals, ensuring safe processing. The dyed fabrics—eri silk, mulberry silk, and cotton—demonstrated excellent fastness properties, with colour fastness ratings ranging from 4 to 5, comparable to those of synthetic indigo dyes. Post-dyeing evaluations revealed that the yarns retained their tensile strength and handloom suitability, with minimal strength reduction for each fibre type, and supported successful weaving and decorative techniques, such as tie-dye. Additionally, the process preserved the structural integrity of the yarns and yielded vivid, well-defined patterns, confirming both decorative and structural success. Collectively, these results affirm the ecological and technical viability of using Assam Indigo as a sustainable dyeing agent, promoting eco-friendly textile practices, empowering rural artisans, and supporting the revitalisation of traditional natural indigo dyeing methods in Northeast India.

Acknowledgements

The authors acknowledge NEDFI R&D Centre, Khetri (Assam), for enabling the extraction of indigo dye and Mr. Bharat Phukan, Scientific Officer, for his cooperation.

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Art of belonging: Preserving culture through traditional art in modern architecture

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Abstract:
Art and craft practices since ancient times have been an integral part of any civilization. These were not just a means of livelihood for the craftsmen but also symbols of the cultural development of their society. According to Aristotle, 'The activity of craftsmanship is a union of theory and making because neither of these aspects can be separated from the activity of craftsmanship.' Passed on from one generation to the next, these practices are in today's date important traditional knowledge systems, some of which are at the brink of extinction. Architecture has always been more than just shelter—it reflects who we are, where we come from, and what we value. In the modern era, characterized by rapid urbanization, globalization, and homogenized design aesthetics, the need to preserve and celebrate cultural identity has become increasingly urgent. This research investigates how traditional Indian art forms—such as Warli, Gond, Patachitra, Madhubani, and Kalamkari—are being integrated into contemporary architecture and interior design to create spaces that embody cultural memory and community identity. These are the traditional artforms from various States of India. From hand-painted murals and decorative tiles to handwoven upholstery and craft-inspired architectural features, these applications not only enhance aesthetic value but also promote sustainability and cultural continuity. We have seen these forms of art and crafts mostly implemented in Traditional textiles but by blending the past with the present, architects and designers are creating immersive spaces that celebrate heritage while meeting the demands of modern lifestyles instead of ending their creativity till fabrics. Traditional Indian art forms mainly Madhubani, Warli, and Gond are no longer confined to rural walls or ceremonial use; today, they are being reimagined in modern interior design and public spaces as powerful visual and cultural tools. Mughal architecture stands as a testament to the seamless integration of artistic expression and craftsmanship. The fusion of art and craft is vividly manifested in the intricate detailing of Mughal monuments. From ornate inlay work to detailed Jali screens, Mughal architecture showcases the harmony between form, function, and fine craftsmanship. This paper explores the evolving role of these folk arts in contemporary design contexts and Architecture where they serve both aesthetic and narrative functions.

Keywords: Architecture, Art & Craft, Craftsmen, Interiors, Sustainability and Traditional.

Article History: Article Received :14-07-2025, Revised: 06-08-2025, Accepted: 09-08-2025

1. Introduction

Architecture becomes truly compelling when traditional art forms are thoughtfully executed, enhancing its aesthetic dimension. The incorporation of art in architecture has profoundly contributed to its aesthetic excellence. It evokes a sense of heritage, culture, and innovation for onlookers in the global context. Recently Nita Mukesh Ambani inaugurated Art and Cultural Center in Mumbai, (NMACC) according to Mrs. Nita Ambani it is *"An ode to our nation, the Cultural Centre aims to preserve and promote Indian arts. I hope our spaces nurture and inspire talent, bringing together communities from across India and the globe."* The center preserves and promote Indian arts. The traditional artwork of Gond, Warli & Kantha has been depicted in the walls of NMACC. On the other hand, the amalgamation of Rajput and Mughal architecture represents a significant era in Indian history, where the fusion of these two styles (Rajput & Mughals) gave rise to some of the most iconic monuments. **(**Jain A., Ar. Anugya Sharan 2024**)**. In the modern era, the need to preserve and celebrate cultural identity has become increasingly urgent. One powerful way to foster this connection is through the integration of traditional art forms into contemporary architecture and interior design and wall paintings on the roadside of Kolkata streets. Most of the boundary walls on the roadsides, especially in Kolkata, have found their way towards artforms, particularly folk art. These hand painted artworks are done by the students of Fine Arts and Art & Architecture. The reason behind this is to reinvent and preserve our art and craftsmanship and the belongingness of our cultural heritage. These visual languages—developed over centuries through indigenous craftsmanship—carry deep spiritual, social, and ecological meanings, often rooted in community life and nature. The historical evolution of Indian architecture is deeply intertwined with its arts and crafts traditions, which have significantly shaped the aesthetic, structural, and symbolic aspects of built forms across different periods. These traditions were not mere embellishments but were integral to the architectural design, reflecting the cultural, religious, and social ethos of their time. (Jayachandra, 2022 (Dei, 1998**)** Science Behind Ancient Indian Temple Architecture – A Review2022. Infusing traditional art into modern architecture is a meaningful way to preserve cultural heritage and nurture a sense of belonging. Elements like murals, carvings, and motifs rooted in local customs and aesthetics help maintain continuity between past and present. This fusion not only enhances the visual character of contemporary structures but also anchors them in cultural identity, allowing built environments to tell enduring stories of community and tradition in an increasingly globalized world.

India's rich tapestry of traditional art, including Warli, Gond, Madhubani, Kalamkari, and Pattachitra, embodies stories, rituals, and values unique to its diverse regions. Historically applied on walls, textiles, and temple surfaces, these arts are now being

reimagined in modern design contexts—from muraled facades to patterned tiles, hand-painted ceilings, woven partitions, and artisanal furniture. This blending of the old with the new not only adds aesthetic and narrative depth to space but also encourages sustainable and culturally inclusive design practices. In doing so, it positions traditional art not as a nostalgic aesthetic, but as a living, evolving expression of heritage—one that actively shapes how we inhabit and relate to the spaces around us. This approach not only helps bridge traditional and modern art forms but also supports the economic sustainability of artisans by opening new market opportunities. In this research, the integration of traditional art into modern architectural practice is explored as a vital method of preserving cultural heritage, particularly aspects that go beyond physical structures to include stories, symbols, rituals, and values. These non-material expressions, often passed down through generations, are recognized as intangible heritage core component of a community's identity. By embedding traditional motifs, patterns, and artistic techniques into contemporary buildings, architecture becomes a medium of cultural reflection, mirroring the beliefs, customs, and aesthetic sensibilities of a people. This not only enhances the symbolic value of space but also helps protect and transmit cultural heritage in ways that resonate with both present and future generations. Thus, the paper justifies the use of these terms by positioning architecture as a dynamic tool that can preserve intangible legacies while reflecting the evolving yet rooted cultural identity of a society.

Figure 1: Wall painting with folk-art

Objectives

- To explore how traditional art forms contribute to a sense of identity and cultural continuity in contemporary architectural spaces.
- To examine the integration of indigenous crafts and motifs in modern architecture as a means of preserving intangible cultural heritage.
- To assess the role of artisans and craft communities in co-creating architectural spaces that reflect local culture and belonging.
- To identify the challenges and opportunities in fusing modern architectural practices with traditional artistic expressions.
- To promote sustainable design strategies that value local materials, craftsmanship, and vernacular aesthetics in urban and rural contexts.
- To inspire culturally responsive design approaches that strengthen community identity and intergenerational knowledge transfer.
- To explore how cultural heritage can be preserved through the architectural integration of traditional art forms.

2. Materials and Methods

This research adopts a qualitative, interdisciplinary approach combining architectural analysis, cultural studies, and craft documentation to explore how traditional art forms are integrated into contemporary architectural practice to preserve cultural identity. The research also investigates how traditional arts and crafts are being reinterpreted or retained in modern architecture and identifies best practices and challenges. Visiting architectural projects (e.g., resorts, cultural centers, public buildings) where traditional art has been integrated. Documenting techniques, materials, and through photography, sketches, and notes. Scholarly articles on cultural preservation, vernacular architecture, and craft-based design. Books/documentaries on Indian folk art and its evolution has been studied. Field visits are done to areas to glance the mesmerizing artistic art and craft executed by the traditional artisans.

Figure 2: Traditional Handpainted Flower Vase

Materials Used in Architectural Contexts

A variety of materials were identified in the selected studies, including:

- **Natural and Organic Media:** Cow dung, rice paste, stone pigments, earth colors for wall art
- **Textiles:** Handwoven cotton and silk fabrics used in soft furnishings and screens
- **Sculptural Materials:** Terracotta, bamboo, sandstone, wood carvings, and oxidized metals
- **Modern Adaptations:** Digitally printed motifs on tiles, CNC-carved wall panels, and laser-cut *jali* designs inspired by traditional patterns

2.1 Indigenous Art and Craft: Preservation Through Innovation

The preservation of indigenous art and craft traditions is no longer confined to museums or academic documentation—it is increasingly finding new life through innovation in architecture and design. This research demonstrates that modern applications of traditional art forms in spatial design offer a powerful pathway for cultural sustainability. By incorporating indigenous motifs, techniques, and narratives into built environments, architects and designers are fostering a sense of place, memory, and identity in contemporary spaces. Crucially, this revival is not about replicating the past but reinterpreting it meaningfully. Through collaborative design processes, traditional artisans and modern creatives co-develop solutions that maintain cultural authenticity while responding to modern needs, materials, and aesthetics. Such partnerships empower craft communities economically and socially, giving relevance to their knowledge systems in today's world. However, the process must be rooted in ethical engagement—ensuring that artisans are active contributors, not sidelined decorators. When done respectfully, innovation becomes a tool not of erasure, but of continuity allowing indigenous art and craft to evolve while retaining their cultural core. From Warli murals in urban cafes and co-working spaces to Madhubani-inspired tilework in boutique hotels and Gond motifs in community centers, these adaptations bring regional identity and storytelling into the fabric of modern interiors. The integration of handprinted wall panels, textiles, and craft-based installations not only enhances spatial character but also fosters cultural continuity and awareness. By bridging the gap between tradition and innovation, such applications demonstrate how indigenous art can inform meaningful, localized design in today's-built environments. The handicraft industry has always been the primary source of employment generation in India. It also helps to preserve Indian art, culture, and heritage. The artisans portray these beautiful emotions in different forms of art, craft, designs, etc. The design depicts the vibration of the creator and peculiarities of any civilization; hence handicraft industry helps to open the treasure of any culture or community. (VD Sharan, A Priya, MK Shrivastava *et al*., 2020). According to (Bhaskar, L. N. (2021), the narrative of traditional Indian craft and traditional textile is woven tightly with sub-continent's culture. These indigenous crafts and traditional textiles in India are clustered in small weaver communities or tucked away in rural artisan pockets far from the urban settlements.

2.2 Architecture as Cultural Reflection and Expression

Architecture is not merely about constructing physical space; it is a mirror of culture and a medium of expression. Every structural form, spatial layout, and decorative element carries embedded meanings that reflect the beliefs, values, and histories of a community. From temples adorned with sacred symbols to homes painted with folk art. In the integration of indigenous art and craft, architecture becomes a dynamic platform for cultural reflection. Traditional motifs, materials, and techniques, when thoughtfully incorporated into contemporary buildings, do more than enhance aesthetics—they preserve intangible heritage and give voice to local identities. For instance, the use of tribal murals, handwoven textiles, or carved wooden panels can evoke ancestral knowledge and establish continuity between generations. Moreover, architecture as cultural expression is a form of resistance against homogenization. In an era of global design trends, it helps retain the uniqueness of place and reasserts the value of regional narratives. When communities see their traditions represented in public buildings, schools, or urban spaces, it fosters pride, ownership, and emotional connection. Thus, architecture becomes both a reflection of cultural memory and an expression of evolving identity. It allows tradition to live not in isolation, but as part of a vibrant, innovative, and inclusive design language that honors the past while shaping the future. The integration of arts and crafts into Indian architecture offers a multifaceted narrative that connects historical legacy, contemporary innovation, and sustainable practices. Historical structures such as the temples of Khajuraho, the Ajanta and Ellora caves, and Mughal monuments like the Taj Mahal demonstrate how craftsmanship was pivotal in shaping not just aesthetics but also the cultural identity of architecture. (Inam, 2024)

2.3. Role of Arts and Crafts in Sustainable Architecture where tradition meets Sustainability.

The integration of arts and crafts into architecture plays a vital role in advancing sustainability not only in environmental terms but also in cultural and social dimensions. Craft in India is as old as the civilization itself and contributes to preserving art, culture, identity and storytelling (Dayinee and Priya 2020). By reconnecting design with traditional wisdom, local materials, and community engagement, crafts become a powerful tool for creating holistic, meaningful, and enduring spaces**.** Traditional crafts often emphasize natural materials such as clay, wood, bamboo, stone, lime, and natural dyes—resources that are biodegradable, locally sourced, and require minimal energy for processing. When these are used in architecture, they:

- Reduce the carbon footprint of construction.
- Promote passive design solutions (e.g., terracotta jalis for ventilation, mud walls for insulation).
- Encourage low-waste building practices rooted in circular use and hand-based techniques.

2.4 Cultural Sustainability

Arts and crafts are living expressions of local heritage. Integrating them into architectural design helps preserve.

- Traditional knowledge systems of making and building.
- Symbolic and ritualistic meanings in built forms (e.g., kolam patterns, sacred geometry, folk storytelling).
- A sense of place and identity, especially in urbanized or globalized environments where local culture risks erasure.

This contributes to cultural resilience, keeping indigenous traditions alive through adaptive reuse in modern spaces.

2.5 Economic and Social Sustainability

Incorporating handcrafted elements into buildings creates livelihoods for local artisans and craft communities, who often face economic challenges due to industrialized production. Sustainable architecture that supports traditional craftsmanship:

- Empowers marginalized communities through fair wages and recognition.
- Revives declining crafts by giving them new contexts and visibility.
- Fosters community participation in the design and making process, leading to deeper connections between people and the spaces they inhabit.

3. Modern Applications of Traditional Art Forms

Traditional art forms ranging from folk paintings and indigenous crafts to age-old textile practices carry the cultural, historical, and spiritual legacies of communities. In recent years, these traditional expressions have found renewed relevance in modern contexts with their integration into contemporary design, architecture, fashion, and product design. This fusion not only preserves cultural heritage but also encourages sustainable practices, community engagement, and creative innovation. The modern application of traditional art forms serves as a bridge between the past and the future. It not only safeguards intangible heritage but also infuses contemporary life with richness, meaning, and aesthetic depth. As global interest in authenticity and sustainability grows, traditional art forms will continue to evolve as dynamic agents of cultural and creative innovation. Beyond utility, crafts bring texture, warmth, and meaning to architectural spaces. Handcrafted features like painted ceilings, carved screens, or woven panels—imbue buildings with aesthetic richness and emotional resonance. They foster a tactile and visual dialogue between the user and the built environment, enhancing the overall experience of space.

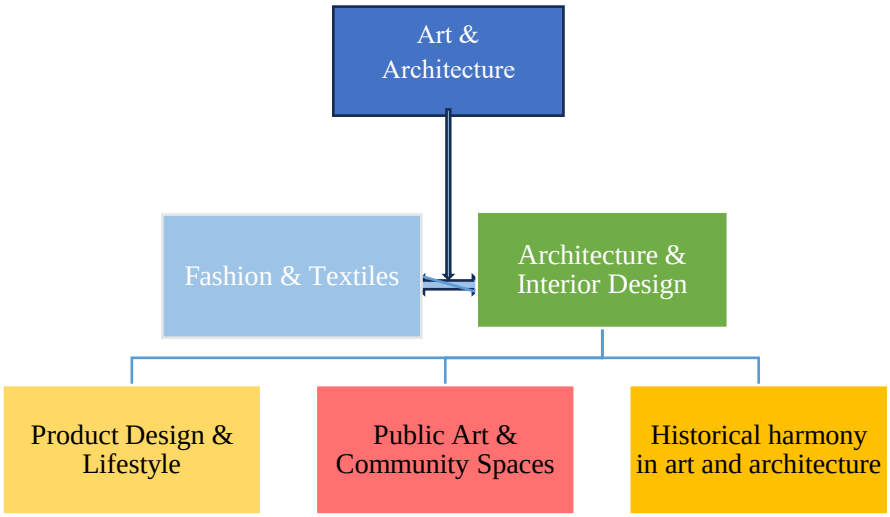

Figure 2: Key areas of Applications for Traditional Art forms

3.1 Architecture & Interior Design:

- Use of tribal and folk art (**e.g., Warli, Madhubani, Gond)** in wall murals, tiles, and decorative facades.
- Handcrafted elements like jharokhas, wooden carvings, and traditional motifs in modern buildings.

Traditional Indian art forms such as Madhubani, Warli, and Gond have moved beyond their conventional settings of rural homes and ceremonial use. Today, they are being creatively reinterpreted in contemporary interior design and public spaces, serving as both visual statements and carriers of cultural meaning. Warli murals now animate urban cafes and co-working spaces; Madhubani-inspired tilework adds a distinctive flair to boutique hotels; and Gond motifs enliven community centres with vibrant storytelling. The incorporation of hand-painted wall panels, artisanal textiles, and craft-based installations not only enriches the spatial experience but also reinforces cultural heritage and continuity. These design interventions bridge tradition and innovation, illustrating how indigenous art can meaningfully shape localized, identity-rich environments in today's architectural and interior landscapes.

Figure 3: Artwork painted on one of the walls of Bolpur

3.2 Implementation of Warli Art in Architecture & Monuments

Warli art, a tribal art form originating from the Warli tribe of Maharashtra, is traditionally characterized by its minimalistic style, using geometric shapes to depict human figures, animals, nature, and everyday rural life. Historically painted on the walls of village homes using rice paste on mud surfaces, Warli art carries deep symbolic meaning and reflects a harmonious relationship with nature. Today, its integration into architecture and monuments represents both a cultural revival and a sustainable design approach. According to author Dr. K. Mrutyunjaya Rao the originality of the Warli art must be preserved and promoted. It should be preserved through documentation like slides, short movies, artists, and artisans should work together and exhibitions in museums and private art galleries (Rao, M. 2022). The integration of Warli art into architecture and monuments not only preserves a centuries-old tradition but also introduces a narrative-driven and sustainable aesthetic in contemporary design. Through walls, facades, public spaces, and participatory design processes, Warli art enriches built environments with cultural continuity, ecological consciousness, and artistic expression. Warli motifs are increasingly used on building exteriors and interiors both in urban and rural contexts. These murals narrate traditional stories or celebrate community life, adding visual interest and cultural depth. Warli-inspired carvings or engravings are incorporated into columns, doorways, and lintels of cultural buildings. They act as symbolic thresholds into spaces representing collective memory and identity. Warli designs are used in the design of memorial walls and panels that reflect indigenous stories and rituals. In community spaces like Amphitheaters, open-air pavilions, and public gathering spaces often use Warli patterns to reflect local context. These spaces foster a sense of belonging and celebrate indigenous identity through art. The design patterns are applied to decorative panels, ceilings, and room dividers in museums, resorts, and boutique hotels. Terracotta tiles and floorings inspired by Warli motifs combine aesthetic beauty with cultural storytelling. Architects collaborate with local Warli artists, promoting community involvement and knowledge preservation. Natural materials like mud, lime plaster, and organic dyes are used to remain faithful to Warli's sustainable roots.

Figure 4: Execution of Warli artwork in contemporary style, focusing on the staircase

Figure 5: Art forms painted on the corridor walls

Example: Tribal Museum in Pune incorporates Warli murals painted by tribal artists themselves, Gondwana Art Project, Maharashtra includes Warli wall art in visitor spaces, Mumbai Metro stations – Use Warli art to depict local narratives and cultural ethos, Warli Art installations at Bharat Bhavan, Bhopal blending art with monument architecture are some of the examples of implementation of Warli art in architecture. In 1966 during severe drought, the All-India Handicrafts Board has sent artist Bhaskar Kulakarni to Mithla to encourage women to paint the same motifs on paper that they painted on walls and floors previously thus enabling them to sell their artwork to increase augments their family income (Singh and Poovaih, 2012).

3.3 The Architectural Revival of Madhubani Art

Madhubani art, also known as Mithila painting, is a centuries-old folk-art form originating from the Mithila region of Bihar, India. Traditionally created by women on the walls and floors of their homes during rituals and festivals, Madhubani art is characterized by intricate linework, vibrant natural colors, and symbolic motifs of flora, fauna, mythology, and cosmology. Madhubani paintings, one of the most celebrated works of art from Bihar are accomplished by generations of skilled artists. (Rani *et al*., 2022). The research paper by Rani and Agarwal (2019), Tribes in India: Their Social and Economic development through Art.

Figure 6: Madhubani Hand Painted cushions and artwork

In recent years, this traditional art has found new life in modern architecture and interior design, serving as both a decorative and cultural medium. Madhubani art, with its expressive lines and symbolic richness, serves as a powerful cultural tool in contemporary architecture and interior design. Whether through murals, tiles, textiles, or architectural elements, this folk tradition bridges the gap between heritage and modern living—revitalizing spaces with meaning, artistry, and a sense of place. Madhubani motifs are used on building facades to reflect regional identity and cultural heritage. Institutions, museums, and cultural centers in Bihar and elsewhere integrate Madhubani-inspired exterior to promote visual storytelling. Entry gates, archways, and supporting columns in public buildings and resorts often feature Madhubani patterns through carvings or painted surfaces. Feature walls in homes, hotels, or offices use hand-painted or printed Madhubani murals to create visual impact. Arts and crafts define the cultural layers of a particular place and community. Every corner of India reflects definite specialties and uniqueness, showing the character of the area and its people (Bhandari,2017). Madhubani paintings in interiors have improved their significance in the present-day context. Accessories made by using Madhubani motifs have indeed helped in preserving the richness of Indian handicrafts and enriched the modern interiors. (HIND INSTITUTE OF SCIENCE AND TECHNOLOGY. (2010). Example: Madhubani Railway Station is adorned entirely colorful Madhubani murals, transforming the station into a cultural landmark.

3.4 Gond Art and painting

Gond painting, also known as Gondi art, is a vibrant and deeply symbolic tribal art form that originates from the Gond community of central India, particularly Madhya Pradesh. Renowned for its use of bold colors, intricate detailing, and motifs drawn from nature, Gond art reflects the community's close spiritual and ecological connection to their environment. Common themes include animals, trees, folklore, and mythological tales, rendered through patterns that create a sense of movement and rhythm. The modern recognition of Gond art owes much to Jangarh Singh Shyam, a pioneering artist often hailed as the father of contemporary Gond painting. Gond art is one of the purest folk art and Patangarh of Dindori district is a village of artists which owes its artistic legacy to the great Gond artist Jangarh Singh Shyam & other famous Gond artists. Born into a Pardhan Gond family in rural Madhya Pradesh. Traditionally, Gond artists used natural pigments and tools like bamboo brushes, creating artwork on walls during festivals and rituals. Today, while many artists continue to honor these roots, contemporary Gond art also explores modern themes and techniques, blending tradition with innovation. This fusion has contributed to its growing popularity among art collectors, galleries, and cultural institutions around the world.

Figure 7: Traditional and Contemporary Gond Art depicted on walls. (Exterior & Interior)

The study affirms the importance of documenting and preserving these artistic traditions as a means of safeguarding cultural identity. (Tamrakar & Banerjee, 2019, pp.47-52)

3.5 Gond Art and Painting in Contemporary Architecture

Gond art has transitioned beautifully from rural walls to urban architecture and luxury interiors. Whether in boutique hotels, tribal museums, eco-resorts, or high-end homes, its presence adds a layer of authenticity, nature symbolism, and cultural richness. Architects and designers are increasingly using Gond art to bridge tradition and modernity, while also supporting tribal artists and preserving indigenous storytelling. Gond art, with its rich visual language and deep connection to nature, is increasingly being integrated into contemporary architecture as a medium of cultural expression and aesthetic enrichment. Originating from the Gond tribal community of central India, this vibrant art form—characterized by intricate patterns, rhythmic lines, and nature-inspired motifs—offers architects and designers a way to embed indigenous identity into modern built environments. Gond art is incorporated into interiors through painted panels, room dividers, ceiling motifs, and custom furniture, lending a unique, handcrafted aesthetic to modern spaces. Its organic forms and symbolic motifs add warmth and cultural depth to otherwise minimalist interiors. The traditional knowledge and craftsmanship, passed down through generations underscore of the Gonds intricate connection to their environment and their innovative approach to utilizing natural resources (Ete, Vol.l2, Issue-8, 2014, p.36). In contemporary architectural contexts, Gond painting is being used in diverse and innovative ways. Importantly, the integration of Gond art into architecture not only enhances visual appeal but also promotes cultural sustainability. It empowers tribal communities by creating livelihood opportunities and ensuring the transmission of artistic knowledge. Architects and designers who engage with Gond art contribute to a broader movement of inclusive and identity-conscious design, where traditional art forms are not merely decorative but deeply embedded in spatial narratives. This art can be seen in public buildings and government spaces in states like Madhya Pradesh, Chhattisgarh, and Odisha feature Gond murals on facades, entrance walls, and lobbies. Railway stations (e.g., Habibganj in Bhopal) have been adorned with Gond murals as part of beautification and cultural heritage projects. Museums such as the Indira Gandhi Rashtriya Manav Sangrahalaya (Bhopal) and Tribal Museum (Raipur) integrate Gond art in architectural displays, walls, and decorative installations. Apart from Warli, Madubani and Gond there are multiple of other traditional Indigenous art forms which are also implemented in architecture and design.

4. Historical Synergy Between Indian Arts, Crafts, and Architecture

Indian architecture is deeply intertwined with its rich heritage of arts and crafts, reflecting the cultural, spiritual, and material life of the subcontinent over centuries. From ancient temples to Mughal palaces and vernacular homes, art and craft have played a central role in shaping India's built environment, not merely as decoration but as integral expressions of identity, symbolism, and function. The historical influence of arts and crafts on Indian architecture continues to resonate in modern times. The blending of aesthetics and functionality, the use of indigenous materials, and the emphasis on cultural expression have laid a strong foundation for sustainable and context-sensitive architectural practices. These traditions not only preserved cultural narratives but also established a legacy of integrating art with architecture, which remains a defining characteristic of India's built heritage. (Inam, A. 2024). The contemporary renewal of the museum cultures relies on an infusion of these national viewpoints with post-colonial perspectives that reflect twenty-first century Indian society (Mathur and Singh 2017; Saradana 2020). The collaboration of art and craft is prominently visible in Mughal architecture, where monuments like the Taj Mahal, Humayun's Tomb, and Fatehpur Sikri exemplify the harmonious blend of intricate craftsmanship and aesthetic vision. From detailed marble inlay work (pietra dura) and finely carved jali screens to calligraphy and floral motifs, these structures showcase the synthesis of Persian, Indian, and Central Asian artistic traditions. Architectural studies by Frampton (1995) emphasize the necessity of cultural continuity through regional expression and vernacular aesthetics. These expressions are often embedded in art forms that symbolize cultural heritage and are reflected in materials, ornamentation, and spatial design. Research in cultural studies and urban anthropology further illustrates how built spaces become sites of cultural reflection, communicating histories, identities, and shared values. This review positions the present study within a framework that acknowledges architecture as a living archive of both tangible and intangible cultural assets.

4.1 Ancient and Temple Architecture:

In ancient India, especially during the Maurya, Gupta, and Chola periods, architecture was inseparable from sculpture and craft. Stone carving, woodwork, and metalwork were employed extensively in temple complexes. Temples in Khajuraho, Ellora, and Hampi are prime examples where architectural form and intricate stone carvings narrate mythological stories, social life, and spiritual concepts. The Ellora Caves are known for monumental rock-cut

Figure 8: Stone Carving sculptures of Ellora, admired in the modern living rooms

architecture and intricately carved sculptures, particularly in Cave 16 (Kailasa Temple), a single monolithic structure dedicated to Lord Shiva. Together, the caves represent the pinnacle of ancient Indian craftsmanship, embodying spiritual devotion, technical mastery, and cultural richness. These works not only influenced later Indian art but also serve as a timeless testament to India's heritage of integrated art and architecture. Ancient and temple architecture in India is a profound demonstration of how architecture was not merely functional, but an artistic and spiritual pursuit. Every element from the smallest carving to the grandest tower was crafted with intention, devotion, and incredible skill. These temples continue to be living museums of India's rich craft heritage, showcasing the timeless interplay of structure, art, and soul. The Nagara and Dravidian style are the two primary temple architectural styles that best demonstrate the brilliance of Indian temple construction (Coomaraswamy, 1985).

- **Stone Carving**: Exquisite relief sculptures, friezes, and statues were chiseled into granite, sandstone, or marble. Temples at Khajuraho, Ellora, and Mahabalipuram are prime examples of masterful stonework.
- **Metalwork**: Bronze and copper idols, particularly in South India (e.g., Chola bronzes), displayed high technical and artistic refinement.
- **Woodcraft**: In regions like Kerala and Himachal Pradesh, temples used intricately carved wooden facades, ceilings, and brackets.
- **Terracotta and Stucco**: Bengal temples, especially during the medieval period, were adorned with terracotta panels showing social life and mythology.

Every culture and era have a distinctive building style that is unique to it and reflects the philosophy, technological development, artistic expression, and architectural style of that particular era or civilization. (Kaur, J., Verma, N., & Reddy, T. B. C. 2024).

4.2. Vernacular Traditions:

Crafts were embedded in vernacular architecture through locally available materials and artisan techniques. Mud walls adorned with mirror work or frescoes (like in Kutch or Shekhawati), carved wooden brackets in Himachal or Kerala homes, and terracotta motifs in Bengal are testimonies of this symbiosis. These reflected both ecological sustainability and regional identity. Vernacular architecture in India reflects a deep-rooted relationship between people, place, material, and craft. Developed organically over centuries, these structures were not designed by architects in the modern sense but by local artisans and communities using indigenous materials and traditional craft techniques. Each region evolved a distinct architectural style shaped by climate, geography, cultural practices, and available resources. Vernacular architecture served as a canvas for local identity. Festivals, rituals, and social hierarchies were embedded in the spatial organization and décor like Warli and Madhubani paintings adorning walls, or the use of symbolic thresholds and courtyards. Vernacular buildings demonstrate environmental harmony and low-carbon principles long before modern sustainability discourse. They used locally sourced materials, minimized waste, and involved collective craftsmanship, strengthening community bonds and knowledge transfer. In vernacular traditions, art and craft were not ornamental afterthoughts they were woven into the very structure and function of homes, temples, and community spaces.

- **Mud and lime plasters** were often hand-decorated with natural pigments and mirror work (e.g., Bhungas of Kutch).
- **Carved wooden brackets**, doors, and columns were common in Gujarati havelis, Kerala Theravadas, and Himachal homes.
- **Handwoven textiles,** bamboo, thatch, and cane were used creatively for shading, insulation, and aesthetics in homes across the Northeast and coastal India.

4.3. Islamic and Mughal Architecture:

With the advent of Islamic rule, especially during the Mughal era, Indian architecture absorbed Persian and Central Asian craft influences. Jaali (latticed screens), pietra dura (inlay work), calligraphy, and tilework became defining features of Indo-Islamic architecture. The Taj Mahal stands as an iconic fusion of architecture and ornamental craftsmanship. Islamic and Mughal architecture emphasized symmetry, geometry, and ornate detailing. This era witnessed the flourishing of several intricate craft traditions:

- **Jaali work**: Delicate stone lattice screens that combined function (ventilation, privacy) with intricate geometric and floral patterns.
- **Calligraphy**: Arabic and Persian scripts were used to adorn mosques and tombs with verses from the Quran, often crafted in marble inlay or stucco.
- **Parchin kari**: A refined inlay technique using semi-precious stones embedded in marble, famously seen in the **Taj Mahal**.
- **Muqarnas and domes**: Complex architectural ornamentation inside domes and arches showcasing advanced mathematical and artistic precision.
- **Tilework and frescoes**: Use of colorful glazed tiles, especially in provincial Islamic architecture, and floral wall paintings in Mughal palaces.

Mughal floral art is often characterized by detailed illustrations of branches, leaves, blossoms, and buds, arranged in various patterns that represented the principles of naturalistic art and its aesthetics. The backgrounds are simple, with a sense of perspective defining the horizontal lines. Mughal artists frequently include birds, butterflies, and other insects flying over the flowers to create rhythm of movement and creates compositional aspects. (Matloob, M. 2024).

Figure 9: Artistry work at Taj Mahal, Agra

A huge diversity of buildings was constructed during the reign of the Mughals. Mughal sovereigns became the reason for the most glorious and spectacular construction in the Indian subcontinent. The massive structures with various varieties, built in that period were gates, forts, gardens, mausoleums, mosques, palaces, public buildings, and tombs, etc. (Mughal, R. B. & University of the Punjab. (2023).

4.4 Colonial Era and the Arts and Crafts Revival:

The colonial period in India (18th to mid-20th century) brought significant changes to architectural practices, with British styles like Gothic, Indo-Saracenic, and Neoclassical influencing urban landscapes. However, this era also sparked a revival of traditional Indian arts and crafts, both as a reaction to colonial dominance and to preserve indigenous identity. British colonial rule introduced new architectural styles but also led to a reactionary revival of Indian crafts through movements like the Swadeshi movement and the efforts of visionaries like Rabindranath Tagore and Gandhiji. Architects such as Laurie Baker and later Charles Correa integrated craft knowledge into modern design, blending colonial techniques with indigenous artistry. The contemporary renewal of the museum cultures relies on an infusion of national viewpoints with post-colonial perspectives that reflect twenty-first century Indian society (Mathur and Singh 2017; Saradana 2020). India is known for its diverse forms of arts and crafts and unique cultural heritage. Creativity is central to all such sociocultural expressions (Mascarenhas, A., & Tiwari, J. 2024, February)

4.5. Guilds and Artisan Communities:

Historically, architecture thrived through guilds of artisans, such as *sthapatis* (temple architects), *silpis* (sculptors), and *vastu shilpis*. These communities passed down knowledge orally or through *shilpa shastras*, ensuring the continuity of craftsmanship in architectural practice. Guilds and artisan communities were not just builders of monuments they were custodians of tradition, technology, and cultural expression. Over time, many artisan roles became hereditary, and entire communities specialized in certain crafts.

5. Artisans and Architects, their Challenges and Collaborative Futures in Cultural Design

Challenges

- **Loss of Traditional Knowledge and Skills**
  - Many traditional art and craft techniques are endangered due to declining intergenerational transmission.
  - Young artisans often shift to other professions due to lack of recognition, market access, and financial stability.
  - Ancient treatises like the *Shilpa Shastras* are no longer widely studied or applied.
- **Disconnection between Architects and Artisans**
  - In modern practice, there's a disconnect between formal architectural education and craft traditions.
  - Artisans are often treated as laborers rather than collaborators, leading to underutilization of their creative potential.
- **Commercialization and Dilution of Authenticity**
  - Traditional crafts are sometimes used superficially, stripped of their cultural meaning to fit design trends.
  - Imitations and factory-made "craft-like" elements threaten the authenticity and value of handcrafted work.
- **Lack of Policy Support and Integration**
  - Government policies often focus on heritage conservation but not on integration of crafts in new architecture.
  - Urban planning and infrastructure projects rarely allocate budget or space for crafts-based interventions.
- **Material and Technological Constraints**

- Traditional materials and techniques may not always align with modern construction timelines or standards.
- A lack of R&D to adapt traditional crafts to contemporary sustainability and safety codes hinders innovation.

Future Directions

- **Craft-Architect Collaborations and Co-Creation Models**
- Encourage partnerships between architects and artisans from the concept stage to execution.
- Promote models like design-build studios, residency programs, and participatory workshops to bridge gaps.
- **Craft-Inclusive Design Education**
- Integrate vernacular design, traditional materials, and craft history into architecture curricula.
- Encourage site-based learning and documentation of local craft traditions by architecture students.
- **Digital Documentation and Revitalization**
- Use digital tools (3D scanning, AR/VR, GIS mapping) to document endangered crafts and make them accessible for design use.
- Platforms showcasing regional artisans and crafts can help architects source authentic elements.
- **Sustainable Architecture through Local Crafts**
- Promote local materials and hand-made construction as low-carbon, culturally rooted alternatives to industrial building methods.
- Traditional knowledge systems offer resilience in the face of climate change and ecological crises.
- **Policy, Incentives, and Urban Craft Integration**
- Government incentives for craft-based construction in public buildings and tourism infrastructure.
- Mandating craft elements in urban design—like murals, tiles, and screens in metro stations, airports, or schools.
- **Craft as a Medium of Social Empowerment**
- Revival of craft-based architecture can generate employment and preserve cultural identity for marginalized communities.
- Encourage women artisans, tribal groups, and rural youth to participate in architectural projects through training programs.

5. Results and Discussions

The research revealed a significant resurgence in the use of traditional Indian art forms particularly Warli, Gond, Madhubani, and Kalamkari in modern architectural projects across India. This integration is not limited to decorative purposes but functions as a medium of storytelling, cultural symbolism, and regional identity. The study found growing instances of co-creation between artisans and architects, especially in public institutions and cultural centers. Contrary to the assumption that traditional art is purely decorative, many case studies showcased functional integration, such as, terracotta jalis for passive cooling, handloom curtains used for thermal and visual comfort, natural pigment murals that reduce the use of synthetic paints etc.

Discussion Summary is furnished in Table 1.

Table 1: Discussion Summary

Theme	Key Insight
Cultural Belonging	Traditional art evokes regional identity.
Sustainability	Natural, handcrafted materials promote ecological design.
Collaboration	Co-design with artisans leads to authentic and grounded outcomes.
Modern Adaptation	Digital tools help expand reach, but risk oversimplifying cultural symbols.
Public Space Transformation	Traditional art democratizes and humanizes urban environments.

6. Conclusion

The fusion of art, craft, and architecture holds transformative potential not only for design innovation but also for cultural sustainability, community empowerment, and environmental stewardship. Addressing current challenges and embracing inclusive, forward-thinking strategies will ensure that traditional knowledge systems continue to shape the built environment meaningfully in the future. Traditional art forms, when thoughtfully integrated into modern architecture, go beyond beautification and they become carriers of cultural memory, community voice, and sustainable practice. This study has shown that the integration of traditional Indian art forms into modern architecture plays a vital role in preserving cultural heritage while shaping spaces that evoke a deep sense of belonging and identity. The research highlights that successful integration requires intentional collaboration between architects, designers, and artisans. Projects that engage traditional craftspeople early in the design process tend to be more authentic, meaningful, and socially impactful. Furthermore, the revival of traditional materials and techniques such as natural dyes, and handloom fabrics supports not only cultural sustainability but also environmentally conscious architecture. Digital technologies have expanded the accessibility of these art forms, allowing them to be adapted in new contexts. However, the study cautions against over-commercialization or aesthetic appropriation that can strip these traditions of their depth and significance. Ultimately, embedding traditional art into architecture fosters a living

dialogue between the past and the present, helping communities recognize, reclaim, and celebrate their heritage. As cities grow and modernize, such cultural continuity becomes essential not just for visual identity, but for social cohesion, place-making, and long-term sustainability. To uphold the vision of *"Art of Belonging: Preserving Culture Through Traditional Art in Modern Architecture"*, it is essential to address pressing issues that hinder sustainability, community participation, and empowerment within the built environment. Active participation of local artists, craftspeople, and community members in the architectural design process is important. Incorporating working studios within libraries, community centers, or museums offers artists a space to create while also engaging directly with the community. These spaces serve as hubs for cultural exchange and strengthen the transmission of artistic knowledge. Integrating indigenous art forms like **Madhubani**, **Gond**, **Warli**, and others into the architecture of these spaces celebrates local heritage and makes it accessible in daily life. Such an approach ensures that heritage is not only remembered but continuously lived, experienced, and celebrated.

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- Sahapedia – Virtual field visits and artisan interviews.

Creativity and Design Thinking: Reflections and New Paradigms

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Abstract:
Creativity gives birth to original ideas, and design embodies those ideas through the creative process. Design thinking is instrumental in embodying the content of creation through a specific plan and its function, informed by reasoning. Something creative in a true sense necessarily undergoes a certain structural procedure from the time of conceiving an idea to the final product. And the essence of that structural procedure comes out of design thinking. The term "creative" refers to a person (creative person), process (creative process) and product (a creative product which could be an idea, performance or an artifact). This paper aims to identify and examine the formal relation between the two by reflecting upon their inter-sectional and intra-sectional paradigms. The question is how creativity as a phenomenon persists into the phenomenon of design thinking within its phenomenal purview, or the other way round. Where are the points of their entry and exit in materializing a body of thought? What are the formal features of their intra-sectional and inter-sectional association? Creativity and design thinking, as two parallel phenomena, re-create the horizon of our existence, experience, memory, and imagination by transcending and transforming an original idea into a physical being. How does this transformation happen?

I propose four steps to address the above-mentioned queries. They are – (1) to identify the structural formations of design thinking in the phenomenon of creativity (2) existential, experiential and imaginary horizon of re-creation, (3) to analyze the formal association and creative occurrences in the embodiment of an idea, and (4) to examine sense-perception in relation with a formal outcome of re-creation.
The significance of the work lies on three fundamental grounds. Firstly, it enables us to reach out to the importance of visualizing an act of creativity in association with design thinking. Secondly, it directs us on how the rational approach of design accommodates creative potentials for the growth of a creative mind. Thirdly, it justifies that every creative process essentially invokes a design in it.

Keywords: Creativity, Design, Formal Association, Mind, Paradigm, Reflection.

Article History: Article Received :10-07-2025, Revised: 05-08-2025, Accepted: 10-08-2025

1. Introduction

To think or to create something requires an effort which leads to both mental and physical actions. The act of thinking and the act of creating walk side by side and are inseparable from each other. Creativity is a playful act. And the act of playfulness happens when the mind connects to the matter and responds instantaneously to its sense perception. Then the coordination happens between sense perception and motor action for the execution of a creative thought or an idea. Every creative action essentially requires a free mind. It is the free mind which embraces a playful act of creation. Most of the time, the act of playfulness in a creative process is either mistaken or misunderstood in society. It's often articulated as an unruly, unstructured phenomenon of art practice which may occur without any reason. This may be further associated with the disassociation between theory and practice in the arts, characterized as an irrational phenomenon, which leads to certain expressions.

On the other hand, design is very well defined as a method to conceive something formal, structured and necessarily with a purpose. Generally, we neither tend to see nor inquire about the playfulness involved in the structural quality to bring out the rhythm of a design. Overall, it is important to analyze and understand the formal correspondence between mind and matter. How does a mental action correspond to the motor organs, and how do motor organs respond to the signal of the mind? Therefore, it is the understanding of design which helps in experiencing, articulating, and expressing the phenomenon called creativity rationally. As light and darkness, positive and negative, existence and non-existence, pleasure and pain, good and bad appear in a cycle according to their designs; similarly, no living or non-living being exists in the universe without design.

Creativity stands nowhere without a design instinct. However, a design may or may not be creative but purposive. A design must serve the purpose of both mental and physical actions. A creator is also a spectator and knower at the same time. A creator becomes a knower by experiencing the process of creation. It can also be seen as "man the maker" and "man the knower" (Arendt, 1981). A creator can be seen as a designer as well. A creator or designer performs in reality in terms of existence, experience and imagination. Reality is discrete or contiguous by nature (Singh, 2003). It is multi-dimensional and has many nooks and corners. To unfold any portion of this reality requires a multi-faceted approach towards its multi-dimensional nature of existence.

The story of the birth of an image or painting is beautifully narrated in the Ćitralakṣaṇa of Nagnajit (Nagnajit, 5th C. CE/1987). There was a king called Bhayjit, and the kingdom was running without any disturbance and well protected in every aspect. Bhayjit is the person who conquers all kinds of fear and becomes fearless. But all of a sudden, a young boy died in the kingdom. Everyone who lived in that kingdom was shattered by the fact. The devastated father of that boy came to the king and wanted to know the reason behind the sudden demise of his son and why the kingdom had to go through this misfortune. The father

wanted his son back with him. Helpless Bhayjit did not have an answer for him. Bhayjit then went to the God of death and asked him whether it is possible to make a dead person alive or how to deal with the situation. The God of death replied that everyone dies based on his or her deed. So, it is not possible to make a dead body alive. But it is possible to re-create the persona of that boy by making his image from memory. And the reply seemed to be feasible to Bhayjit. He followed the instructions and re-created the persona of that boy in the form of a painting and gifted it to his father. The father became happy after receiving the image and went back home with joy. Thus, Bhayjit conquered over nudity and became Nagnajit.

Let us try to understand how design played an important role in the process of re-creating the persona of a person. The king Bhayjit played the role of creator, designer, spectator and knower during this entire episode of narration. An image of a person can be re-created by experiencing the gross body or subtle body. The gross body is the matter made of blood and flesh, and dies after some time. But the subtle body remains immortal. It carries all kinds of lived experiences. Understanding of design helped the creator to identify an impetus in the persona of that boy, which he kept in his memory after experiencing it. And the impetus led to imagination based on the previous experience, and then into the action of re-creation by re-experiencing the experienced. There are reality removals in the action of imagination and memory removals in the action of re-creation. Because experiencing a real space is different from experiencing the memory of that actual or factual reality. And it is different every time we revisit and experience the actual or imaginary space. Hence, every time we re-create something, a new layer of the perceptual reality gets unveiled to us.

An inquiry or a discourse often propounds re-creation. The creator goes through an aesthetic experience and judgment in the process of re-creating an image (Gnoli, 1968; Zangwill, 2003). Design helps to envision this image by unfolding an aesthetic experience or sense-perception. It makes the inside of a persona visible to the spectator. And the spectator brings the inside out in the best possible way to know the fact from being to becoming.
The phenomenon of bringing an inside out in a creative process consciously or unconsciously beholds certain art forms for expression. And every conscious act in this phenomenon revisits its potential space of expression repetitively to build a house of memory. Design gives an ontological foundation to the phenomenon called creativity, which further propagates philosophical inquiries (Allison, 2001; Atalay, 2007).

2. The Four Identified Layers to Analyze the Co-Existence between Creativity and Design Thinking

2.1. Structural Formations of Design Thinking in the Phenomenon of Creativity

There are multiple ways of understanding the term "design". The universe has its own design by which creatures are born. They also have their own designs of re-creation, and the process continues. Design is a process which gives identity to every existence, irrespective of living or non-living beings. Design doesn't reflect itself. It gets reflected in the forms of expression, communication, relation, production and so on. It is instrumental in inquiring and identifying the existence of the non-existent, too (Pinker & Foster, 1997).

Design thinking is a process which digs deep into the sequential or episodic phenomenon of creativity. A creative person is a thinker. And thinking becomes possible when there is a sense of design. A creative phenomenon entails two fundamental components – (a) original idea and (b) sense of design. But every design may not be creative by nature. How do they correspond to each other?

Let us take a structure or structural image (Figure 1), for instance. When we refer to a structure, an indication goes into its design as we see it and also how it came into its physical being. So, design plays an important role at the ideational level of an object, which is non-physical and also at the level of its physical being. At the next level, we experience the physical object. The object experienced then stays in our memory depending on the gravity of the experience. We may want to re-create that object from our memory. It thus goes like a cycle with its own structural formation. Each step of the cycle has its own design interlinked to the other. A design becomes thoughtful when this structural formation breaks its stereotypes and becomes uniquely spontaneous. Figure 2 shows how different directions and movements produce different structures or structural formations. Each structure is very precise and doesn't go beyond its structural boundaries. However, Figure 1 shows a kind of structure which is more fluid by nature. It brings reflectivity in a spontaneous expression. And this spontaneity brings dimension into the expression.

The phenomenon of creativity happens at the level of transcendental reality. Trans is a state of human affairs of mind where the experience of reality goes beyond its factual reality (Kant, 1908; Kim, 2007). To be creative, a person has to go beyond physical reality. One has to be sensible to go beyond the realm of physicality. Sensibility contributes to the forms of space and time as a pure intuition (a priori). It helps to cognize a sensible world. But that's limited to providing a form. A sensible person with pure understanding can get into the process of formation and the nature of its in-formation. Thus, it constructs cognition of a sensible world (Rohlf, 2010).

Figure 1: Spontaneity, Flow
Dry Pastel on Paper, 4" x 6", 2025

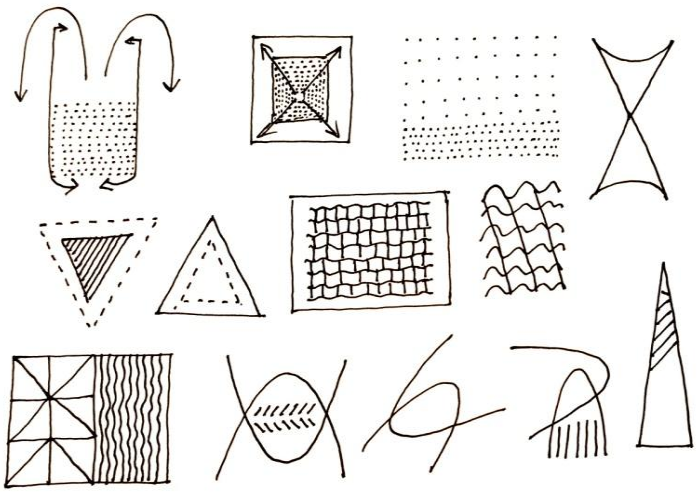


Figure 2: Direction, Movement, and Structure
Drawing on Paper, 6" x 4", 2025

2.2. Existential, Experiential and Imaginary Horizon of Re-creation

Re-creating something is to revisit our memory repetitively. The act of re-creation is repetitive by nature. It requires certain skills of seeing, hearing, smelling, testing, touching, and knowing to have a better understanding of the world we live in. Acquiring the skills provides direction towards the purpose or reason of re-creation. The qualitative features of the product of re-creation depend on the aesthetic experience with creative cognition. Righteousness in a creative act of cognition depends upon the design that prevails in it (Coomaraswamy, 1909).

Figure 3: Drawing on Paper, 6" x 4", 2025

Figure 4: Ceramic Pot, 4" x 4" x 4.5",
Personal Collection

Figure 3 shows multiple ways of depicting an idea called "pot". Figure 4 shows an image of an actual pot. But potness is present in all the images. Potness is an abstraction of the idea or concept of a pot. Pots drawn here are the byproduct of understanding an idea called "pot". Varieties of shapes could originate and be expressed from a single idea, but the essence remains the same in all shapes. The essence resides in the abstraction of its idea, concept or form. So, potness is universal and exists in all kinds of pots in the world. And this universal quality makes the idea of a pot different from the idea of a chair. A pot is a utilitarian object, and the basic objective of its making serves the purpose of its utility. But it cannot be limited to its use only. A sense of aesthetic comes in here. A pot which serves its purpose and is also aesthetically beautiful, we call it a well-designed pot. That means it satisfies both mind and matter. So, the word "pot", image of a pot and the actual pot inhabit the space of our horizon in multiple layers, and design helps us identify those layers in the process of re-creation (Pippin, 1982).

The meaning of an object changes depending on its use by an individual or a community in the horizon of existence, experience and imagination. There are various meanings, like denotative or token meaning, metaphorical meaning, poetic meaning, moral or purposive meaning, structured occurrences of meaning, cognitive meaning, iconic meaning, and judgmental meaning that

an artist can experience and deal with to unveil the vastness and dimension of an imaginary horizon (Merleau-Ponty, 2012; Dryden, D., 2004).

2.3. Formal Association and Creative Occurrences in the Embodiment of an Idea

Design punctuates each existence in reality from reality in general. For instance, the reality of A is different from B and B from C. Though they live in the same physical world, they experience the same world differently. *Akṣara* is the term used to refer to form in Indian philosophical tradition (Jagadānanda, 1980). "*A"* refers to "not" and "*kṣara"* refers to "melt away or perish". So, form is something intangible, imperishable and atomic by nature. The notion of syllable derives from it. It is a non-geometric point or a region. For Plato, a form is an idea. Aristotle articulates form in respect of a relation.

Creativity nurtures original ideas, which are expressed by a specific plan and its function with reasoning. It may or may not be possible to give a rational explanation of a creative expression always, but that doesn't demark it as irrational either (Paul, 2023). Designing itself is the rational way of embodying an idea or thought. That means, an original idea in the phenomenon of creativity comes into its physical being with the precision of design thinking. Cohabitation of creativity and design thinking elevates the originality of creation and does not limit it to the physicality of time and space.

Figure 5: Acrylic on Paper, Untitled, 12"x 6", 2020

Figure 6: Acrylic on Paper, Untitled, 12"x 6", 2020

Figures 5 and 6 depict two different ways of expressing a state of being. The expressions are very direct, spontaneous and abstract. They do not portray any specific idea or object. They are pure expressions. A question may arise in terms of the role of design in delivering pure expressions. Design in terms of a pure expression serves the functions of the mind.

2.4. Examination of Sense-Perception in Relation with a Formal Outcome of Re-creation

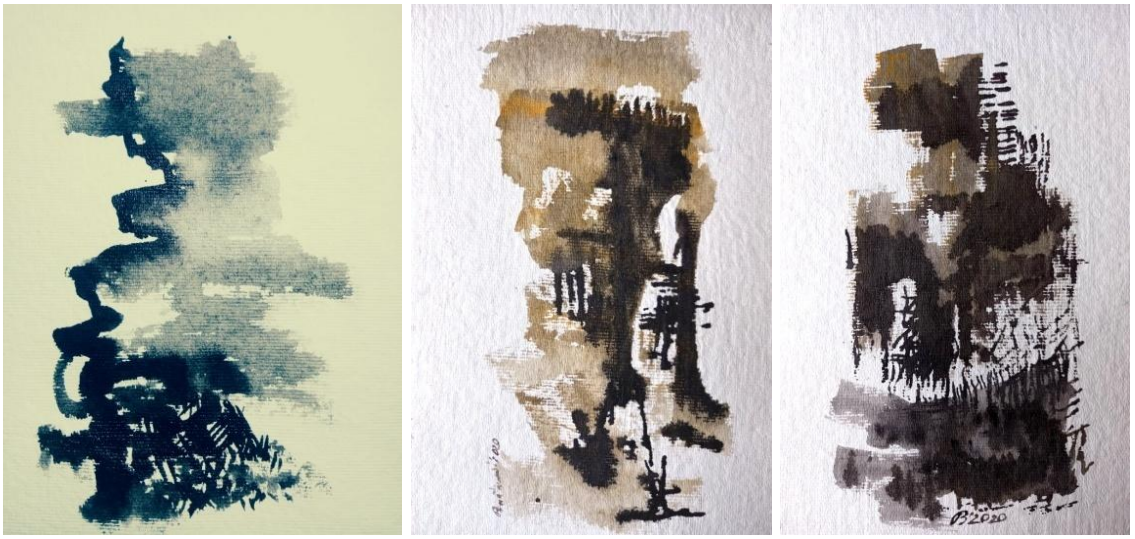
The universe is made of five elements known as air, water, fire, space, and earth. And we have five sense organs used for the five senses called touch, taste, sight, hearing and smell. Amongst the five senses, touch is associated with air, taste with water, sight with fire, hearing or sound with space and smell with the earth. Apart from the five senses, there is a concept of sixth sense called *antahkaraṇa* in Indian philosophical tradition. *Antah* means "inner" and *karaṇa* means "instrument"/ "organ"/ "cause". So together it is known as an "inner instrument" or "internal organ". It can also be understood as an inner sound, conscience or a perennial voice which is instrumental in reflecting our mind in totality. It's the subtle body of our existence. Mind, intellect, ego and consciousness are the four basic elements of this subtle body. The mind is instrumental in cognitive functions such as perception, thinking and memory (Ryle, 1949; Dryden, 2004). Our conscience functions upon its instinct and undergoes modifications in the process of knowing an object of knowledge. The instinct is different in every individual.

Therefore, the same reality appears differently to different individuals.
Form, taste, smell, touch and sound are the five essential predicates of human sensations. A conscious state of affairs in the human mind reclaims its past under the shadows of the present and the future. It embraces the perceptive sensibilities to cognize a form of expression. The concept of "body image" becomes meaningful in that case. It is neither mental nor physical and doesn't separate body from mind. This image can be experienced in all human actions and engagements (Allison, 2001; Merleau-Ponty, 2013).

3. Results and Discussion

The empirical studies involved in this research help us to develop a rational foundation for creative thinking. It enriches our vision in creation in terms of its originality and sensibility to understand – (1) the profundity of creativity and design thinking as parallel phenomena in relation with the philosophical and empirical inquiries, (2) the role of design thinking to understand direct and indirect knowledge in the process of creation, (3) elemental qualities of expressional and functional designs, (4) originality as an inherent quality of a creative act, (5) how creativity and design thinking complement each other, and (6) the function of our conscience as an "inner instrument" for a creative refinement. Therefore, it enables us to have a more delicate

articulation of aesthetic experience and aesthetic judgment pertains to the creative process.



(a) (b) (c)

Figure 7: Acrylic & Water Color on Handmade Paper; Untitled, 7"x 14" (each), 2020

Figures 7 (a), (b) and (c) are the examples where the tactile sensation of sound and vision got materialized in different ways.

4. Conclusion

To perceive as well as to conceive an original idea requires a design instinct. A creative mode of inquiry confirms the presence of this instinct in every sphere of imagination to materialize the idea. Perception requires a method to adhere to that idea by internalizing it. And our conscience plays an important role in this method to activate the process of internalization. There are various forms of art, including painting, sculpture, dance, drama, poetry, music, cinema, and many more. Though they are formally unique, they live in association conceptually. A thoughtful design carries the capacity to transcend the individual or formal distinctions of all art forms. An idea needs a body for its expression. If we imagine an art form as a body or vessel by which an idea gets expressed, that demands a certain method of its entailment. And a close examination of that method identifies an instinct of its origin. It constructs a new paradigm of re-creation.

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Ink through living culture: A journey of Indigenous expression to Digital era

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Abstract:
This paper traces the rich and varied history of ink, from ancient times to the present day. Ink has served as a vital medium for communication, art, and cultural expression across civilizations, reflecting the technological and social advancements of each era. The study explores the origins of ink in early societies, examining its composition—ranging from natural materials like soot and plant extracts to modern synthetic formulas—and the innovative techniques developed for its application in writing, printing, and visual arts.

By investigating the cultural significance of ink, this paper highlights how different societies have utilized this medium to document history, convey ideas, and express individual identities. It also addresses the impact of technological innovations, such as the printing press and digital media, on the production and use of ink, as well as current trends towards sustainability in ink manufacturing. Through this comprehensive exploration, the project not only emphasizes the historical significance of ink but also reflects on its ongoing role in shaping communication and artistic expression in our rapidly evolving world. Ultimately, this research seeks to document and preserve the knowledge surrounding ink-related practices and artifacts, fostering a deeper appreciation for its enduring relevance in contemporary society.

Keywords: Artistic ink-pot, Digital ink, Eco- friendly ink, History of ink, Ink culture, Swadeshi and Sulekha.

Article History: Article Received :01-07-2025, Revised: 06-08-2025, Accepted: 10-08-2025.

1. Introduction

"Ink through living culture" describes how cultural legacy is explored and preserved using ink, a medium frequently employed in calligraphy, tattoos, and other traditional and modern art forms. This concept demonstrates how the essence of cultural identity, ideas, and customs can be captured and conveyed through the adaptable and timeless medium of ink. By acting as a link between the past and the present, ink permits the ongoing expression and development of cultural narratives. Understanding "ink via living culture" helps one grasp how societies utilize it to preserve a sense of continuity in a constantly changing environment, record history, and express uniqueness.

Ink, which is made up of pigments or dyes suspended in a liquid, is used to create text and images on a variety of surfaces, including skin, fabric, and parchment paper. The invention and application of ink have been essential to human communication, making it possible to record and share information, express oneself artistically, and preserve cultural traditions. While inks were typically made from natural substances, their formulation evolved to incorporate more complex chemical compounds, improving durability, colour, and ease of use.

In calligraphy and writing, ink has been indispensable for the production of manuscripts, books, and documents that have shaped the transmission and preservation of knowledge. In the arts, ink is prized for its adaptability and capacity to create a variety of effects, ranging from delicate brushwork to strong, expressive strokes. Ink has also found a special place in tattooing, where it becomes an indelible part of the skin and functions as a potent means of cultural and personal expression.
Today's inks continue to develop as a result of technological advancements, with the creation of inks for digital printing, specific artistic applications, and even environmentally friendly formulations. Despite these developments, the essential role of ink as a medium for expression and communication remains unchanged, highlighting its everlasting significance in human history and society.

2. Objectives

The primary objective is to explore the evolution of ink as a medium, examining its cultural, technological, and artistic significance throughout different periods and societies. Specific goals include:

- Tracing the historical timeline of ink production, from ancient civilizations to modern innovations, highlighting key developments and discoveries.
- Learning how ink has influenced communication and expression in many cultures, paying particular attention to its use in tattooing, writing, and art.
- Exploring the ingredients utilized in ink formulations from various historical periods, such as contemporary synthetic chemicals, natural pigments, and dyes, to understand the effects these materials have on application and quality.
- Understanding how ink manufacturing and consumption have been affected by technical innovations like the printing press and digital printing.
- Examining current ink production trends, such as environmentally friendly inks and novel uses in digital media, while considering ink's future in a rapidly changing world.

- Contributing to the documentation and preservation of ink-related artifacts, practices, and knowledge, fostering an appreciation for this vital medium in both historical and contemporary contexts.

As a whole, this research aims to provide a comprehensive understanding of the significance of ink throughout history, highlighting its role in shaping culture, art, and communication.

3. Methodology

This methodology aims to be both collaborative and respectful, integrating research and community involvement in studying living culture through ink-based traditions. Understanding the historical applications of ink in diverse cultures and eras, ranging from prehistoric times to the present. examining the evolution of ink's use in writing, art, and communication. comparing the chemical characteristics of antique and contemporary inks. Paying attention to the components and how chemistry advancements influenced the creation of ink. investigating the ways in which ink was valued in communities and eras beyond its practical applications. In religious writings, ink is used as a sacred medium. In official documents, it represents authority. examining the symbolic meaning of ink in prehistoric and indigenous cultures. Examining the ways in which ink symbolized authority, creativity, and knowledge. exploring the function of ink in networks of trade, especially between ancient civilizations. How ink was made, traded, and valued in various places; how various cultures impacted one another's methods of producing ink; and how the trade routes that conveyed these goods and information were influenced. examining the transition from conventional to contemporary ink technology, covering the creation of synthetic and inkjet printing inks, among other developments, and how industrialization and technology changed the manufacture, usage, and distribution of ink in contemporary society.

Movements that caused the birth of indigenous ink – "Sulekha", studying the historical conditions that led to the emergence of the indigenous ink movement "Sulekha". Look into the socio-political, economic, and cultural movements that sparked this revival. Analysing whether "Sulekha" was a part of a broader indigenous practice reclamation or resistance movement in reaction to colonial or international forces. contrasting the evolution of native ink traditions such as "Sulekha" with those imposed by colonialism or industrialization. What cultural connotations and principles set them apart.

4. Literature review

This section synthesizes key scholarly works that inform our understanding of ink's historical, cultural, and technological significance. It highlights how various researchers have explored ink's role across different civilizations and artistic practices. Ink has been crucial to the visual arts, especially to Japanese sumi-e painting and Chinese calligraphy. In 'Ten Thousand Things: Module and Mass Production in Chinese Art', Ledderose (2000) examines how the flexibility of ink enabled artists to convey both philosophical concepts and intimate feelings. Ink was essential for the dissemination of revolutionary ideas through newspapers and pamphlets during the Enlightenment and the ensuing revolutions in Europe and America.

'The Literary Underground of the Old Regime' by Darnton (1982) explores the role ink had in the dissemination of rebellious ideas. The spread of Enlightenment ideas and the revolutionary goals of the French and American revolutions was aided by the employment of ink in the printing of pamphlets, books, and newspapers in 18th-century Europe (Darnton, 1982). Ideas of liberty, democracy, and individual rights were disseminated via ink, which helped to organize people against repressive governments. Newspapers and pamphlets that spurred the American Revolution were printed in ink by revolutionary intellectuals like Benjamin Franklin.

The indigenous Sulekha ink movement in colonial India evolved into a symbol of opposition to British rule. Ink manufacture was closely linked to local identity and anti-colonial feeling, as discussed in Kumar's (2017) Print, Folklore, and Nationalism in Colonial South India.

The way ink was used and viewed was completely changed in the fifteenth century with the introduction of the printing press. Ink became a commodity with the mass production of books and newspapers, which was essential to the democratization of information. The Scientific Revolution, the Reformation, and the Renaissance were all greatly influenced by the Gutenberg press and the widespread use of ink-based printing, according to Eisenstein (1979). The introduction of synthetic inks increased printing and artistic expression options. The development of colour inks and inkjet technology, according to Raymond (2002), transformed fields including publishing, advertising, and the arts by making it possible to produce brilliant, multi-coloured images in large quantities.

5. Origin of Ink and Ushering of a New Era

History is intrinsically linked with ink. For more than a millennium, ink has been used to preserve human history in everything from Palaeolithic cave drawings to parchment scrolls and printed books (Blair, 2006) (Melody, 2021). Communication, facilitated by all types of inks, represents the earliest and most enduring form of information technology. Because every variety of ink is the outcome of choices about purpose, cost, usefulness, and accessibility, inks are inextricably linked to their respective periods, places, and utilities (Melody, 2021) (Pyne, 2018).

The necessity to write and draw led several ancient societies all over the world to independently discover and create inks (Willingham, 2022). The methods and formulas used to produce ink are either from written texts or from examinations of archaeological remains. It is thought that lampblack, a kind of soot that is easily gathered as a byproduct of fire, was used to

make the first inks used by all civilizations. A black liquid that might be used to trace pictures and signs was created by combining carbon, the solid by product of combustion, with water (Tifa, 2016).

Figure 1: Application of ink on leaf (left) and rock (right) in ancient times; Ink pallet found by archaeologist (middle) (Source: thesciencebreaker.org/ worldhistory.org)

Ancient Egypt and China employed writing inks, which date back to around 2500 BC. They were made of lampblack ground mixed with gum or adhesive, shaped into sticks, and then left to cure (Willingham, 2022) (Darnton, 1985) (Company, Jun, 30). The carbon obtained from burning oil lamps which burned tar combined with vegetable oil was used to make the colours (Kumar, 2017) (Schwenter, 2021). Gum was used with this carbon to guarantee its adhesion to the surface. It was combined, then sun dried into the form of sticks (Pyne, 2018) (Pines, 1931) (Schwenter, 2021). After dipping these sticks into water, they were prepared to write on papyrus.

Egyptian scribes developed their craft on objects like stones and bits of wood before they started writing on these scrolls. The scribe was given the opportunity to write hymns, spiritual and religious writings, love poems, and literary works once they had mastered the art (Huntington, 2004) (Kahn, May 5, 2016) (History of the inkwell, 2019). The way the ink colours were applied was also very important; for example, red ink, which may have come from the earth pigment iron oxide, was used to indicate the start of a new paragraph and to indicate titles and other rubrics (Formichella, 2023) (Kahn, May 5, 2016). Most of the time, black ink was utilized to write hieroglyphic characters. In one instance, the scribe would dilute the paint into ink using water by using cakes of black and red paint (Strains, 2021).

Figure 2: Scribe's Inkwell, Faience, Place Made: Egypt Dates: 664 B.C.E.-395 C.E. (Left), Chinese ink pot, archaic floral decoration terracotta base ground with blue inked artwork (Middle), Bonhams: A tortoise-shaped pottery ink-stone and cover Han Dynasty (right) (Source: bing,com, pinimg.com)

The discovery of ink pots in ancient times provides valuable insights into the early use of ink and writing tools across various civilizations.

- In ancient Egypt, Ink pots have been discovered at tombs and archaeological sites; they are often made of stone or earthenware. Ink pots were found in Tutankhamun's tomb, emphasizing the value of writing in official and sacred contexts (Melody, 2021) (ASI, 1920-21) (Formichella, 2023).
- In ancient India, Evidence of the use of ink has been discovered in the Indus Valley Civilization (c. 3300–1300 BCE) and Harappan Civilization, including ink pots and inscription seals, though not as much as in Egypt or China. Later periods are represented by artifacts such as manuscripts made of birch bark and ink pots used for writing on palm leaves, from the Gupta Empire (320–550 CE) (Formichella, 2023) (ASI, 1920-21) (Gell, 1993).
- In ancient Greece and Rome, many ink pots have been found in Greek and Roman archaeological sites. These ink pots were used to write on ostraca, or pottery shards, and papyri. Ink pots are among the numerous objects that were saved from the 79 CE eruption of Mount Vesuvius, offering a glimpse into Roman daily life and writing customs (Boone, 2000) (Maldonado, 17 August 2018).

6. Exploring the diversity of Ink

All kinds of inks have been created and reimagined, with each ink being a creation of its own distinct environment. Inks are made up of two basic materials: colour and a means of adhering to the surface, such as paper, parchment, or papyrus, on which the colour is intended to be applied. However, the combinations of those elements and the materials that go into making them allow for a wide range of possibilities, making ink one of the most intriguing and intricate things in human history (Blair, 2006) (Boone, 2000) (Davids, 1894).

6.1 Maya Blue

Maya Blue is a vivid azure hue that may be seen across the ancient Mesoamerican environment on pottery, structures, and written documents. Originally produced about 300 AD, Maya Blue is an ink that has been preserved in the archaeological record for centuries (Davids, 1894) (Science India Bureau, 2024). It is made by melting indigo from the nearby *Añil* plant and the clay mineral palygorskite. The ink was ceremoniously created by heating indigo and palygorskite in incense burners. It represented the rain god, *Chaak,* and was connected to other deities, making it more than just a writing instrument and a vital component of ancient Maya religion and ritual. From 4,500 years ago until the Spanish conquest of Mexico in the 16th century, the Maya people lived in Mesoamerica (Company, Jun, 30) (Daumas, 1970) (Agarwala, Sharma, & Negi, 2016).
Although they left their mark on architecture and ceramics, the Maya primarily recorded their history in codices, which are

Figure 3: Application of Maya blue on ancient texts, fresco work and over terracotta woman doll

folding books with continuously folded pages that resemble accordions. Religious scribes wrote these codices using a variety of inks, including Maya Blue.

6.2 Chinese ink

Chinese ink, so named because it originated in Neolithic China, is a glossy, dark black, long-lasting carbon-based ink that has been used by authors and painters throughout Asia for 5,000 years (Kahn, May 5, 2016) (Schwenter, 2021). (Chinese ink,

Figure 4: Chinese calligraphy ink (left), application on Chinese landscape painting ink on silk (middle), ancient curved ink stone(right)

sometimes referred to as India ink, is still quite popular among modern authors and artists.) Chinese ink has been employed in traditional Chinese calligraphy as well as on Buddhist and Jaina scrolls from China, Korea, India, and Southeast Asia (Science India Bureau, 2024) (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Davids, 1894).

Unlike many other inks used throughout history, conventional Chinese ink was designed to be kept in a solid state and only melted into ink when needed. Water, carbon black, and anima l glue are the usual ingredients of Chinese ink. Soot or another black mineral, such as graphite, which was mostly obtained by burning oils, bones, or pine trees, was the source of the carbon pigment (Willingham, 2022) (Gell, 1993) (Strains, 2021). The binding agents were egg whites or fish- or ox-based glues. Artists had access to more hues than only black thanks to the addition of incense and other ingredients by some traditional Chinese ink makers to their ink formulations (Science India Bureau, 2024) (Melody, 2021) (Pines, 1931). The pigment and glue were combined, allowed to dry, and the result was a portable, rock-like inkstick that could be re-liquefied as needed. The stick was ground into a fine dust, and water was added to create ink. The manufacturer may manage the viscosity and thickness of each batch, allowing each stroke of ink to reflect intent or express a certain cultural cachet (Team, 2024) (Schwenter, 2021).

The inkstick was one of the primary instruments used in traditional Chinese calligraphy and painting, together with a brush, paper, and an inkstone for grinding. The Chinese artist, poet, and calligrapher Mi Fu gave an especially creative interpretation of the ink in his poem "Poem Written in a Boat on the Wu River" from the 11th century (Blair, 2006) (Boone, 2000) (Davids, 1894). The calligraphed characters in this poem are more than just drawings; they have aesthetic value (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Clemens, 2007) (Schwenter, 2021).

6.3 Iron Gall ink

Iron gall ink was one of the most widely produced and used inks in Europe from the Middle Ages until the 19th century; in fact, it was so widespread that it was referred to as "common ink". Up until the 18th century, it was manually prepared in small amounts before being produced on a commercial basis (Agarwala, Sharma, & Negi, 2016) (Boone, 2000) (Clemens, 2007). One of the most identifiable inks in the world is iron gall, because of the rusty brown colours (and paper deterioration) that are commonly found in texts written in it.

Iron gall ink's most basic formula, which dates back to Pliny, calls for four ingredients: gall nuts, water, gum Arabic, and iron sulphate. Oak trees produce gall nuts, which are the source of the tannins in the ink, which are biomolecules used to dye textiles and tan leather, as a defence against the irritants of hatching insects (Davids, 1894) (Clemens, 2007) (Blair, 2006). The iron sulphate was obtained either directly from iron mine or as a by-product of making alum. As the binding agent, the gum Arabic increased the viscosity of the ink, ensured that the pigment particles were correctly suspended in the water, and bound the ink to the desired writing surface. Various recipes for iron gall require extra components, such as plasticizing agents like sugar or honey, tannins from pomegranate rinds, colour-enhancing dyes or pigments, and preservatives like vinegar or alcohol to extend the ink's shelf life (Schwenter, 2021) (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Agarwala, Sharma, & Negi, 2016).

6.4 Printing ink

In the 1440s, Johannes Gutenberg popularized mass printing in Europe; his innovation went beyond a simple, movable type press made of metal. Additionally, a new type of ink needed to be created. Water-based inks were used to write books and codices in longhand centuries before Gutenberg's invention of the printing machine (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Clemens, 2007) (Melody, 2021) (Tifa, 2016). Korean printing presses employed the water-based Chinese ink in their woodblock presses, which was invented a century or two before Gutenberg's.Water-based inks just poured off the metal of Gutenberg's movable typeface, but they work well for writing on vellum, parchment, or even printing with wooden blocks (Science India Bureau, 2024) (Strains, 2021) (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Westtek, 2021) (Kahn, May 5, 2016).

As a result, a different kind of ink would be needed for the new metal presses in order to give the liquid a thick, viscous consistency that would adhere to the typeface. Using oils like to those used by modern painters, Gutenberg created an oil-based substitute, giving the ink more in common with paint or varnish than with the water-based inks used by scribes. Gutenberg finished printing about 180 copies of the Bible in 1455 (Science India Bureau, 2024) (Science India Bureau, 2024) (Davids, 1894) (Strains, 2021). Together with high concentrations of copper, lead, titanium, and sulphur, the smooth, even black ink linked to Gutenberg's Bibles also contains minute reflecting graphite grains and carbon, which combine to give the ink both an intense, even hue and a reflected sheen (Agarwala, Sharma, & Negi, 2016) (Kumar, 2017) (Strains, 2021) (Melody, 2021). In early printed editions, Gutenberg tried printing in multiple colours and experimenting with using red for the start and finish of specific verses (Blair, 2006) (Westtek, 2021). But in the end, the efficiency that printing in only black provided won out over the benefits of polychrome printing (Adkins, 2017) (Boone, 2000) (Clemens, 2007).

6.5 Japan's Nara ink

According to legends, the production techniques for Japanese ink, or sumi, were brought to Japan around 610 AD by a Korean monk by the name of Damjing (donchō in Japanese) (Blair, 2006) (Davids, 1894) (Clemens, 2007). With the shift of the capital to Nara at the start of the 700s, ink production—which is necessary for writing characters and recording text—moved to the city and has been there for roughly 1,300 years (Darnton, 1985) (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Clemens, 2007).

Pine Soot Ink (Shōen Zumi)

Many Buddhist temples could be found in Nara, which maintained its religious prominence even after the capital relocated to the Kyoto region in 794. For jobs like sutra transcribing, a lot of ink was required, and the basic material for the ink, carbon

soot, could be obtained from the neighbouring forests in abundance (Melody, 2021) (Science India Bureau, 2024). As a result, Nara continued to produce high-quality ink. For Nara ink, shōen, or pine soot with a high resin content, was the chosen raw material during the Nara, Heian, and Kamakura periods. Pine wood was chopped into small pieces and burned in a stove to obtain this (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Davids, 1894).

Glue (Nikawa)

Animal-based glue (nikawa) is another element used in traditional Japanese ink, in addition to carbon soot. The process involves boiling the dermis, which is the layer of skin beneath the epidermis, from an animal, like a deer or cow. Since niki wada is so sticky, it is commonly employed as a bonding ingredient in traditional art forms (Science India Bureau, 2024) (Tifa, 2016). By combining the soot with this adhesive and letting it dry, ink sticks are created. Furthermore, fragrant materials like borneol, musk, or Japanese apricot blossom essence are added to the glue to mask its disagreeable odor. When the ink stick is wiped down, this produces a fresh scent (Boone, 2000) (Adkins, 2017).

Lamp Soot Ink (Yūen Zumi)

For those in charge of administration and culture, ink is essential. Because of this, ink was manufactured across ancient Japan. But things changed, and there's a reason why Nara rose to fame as a producer of ink (Tifa, 2016) (Davids, 1894) (Agarwala, Sharma, & Negi, 2016). This is due to an attempt made by a monk at Kofuku-ji Temple to create ink from soot from votive oil lamps placed in front of the Buddha statues around the start of the Muromachi period. As a result, soot from these lamps was used to create lamp soot ink, or yūen zumi (Strains, 2021) (Adkins, 2017) (Blair, 2006). Because yūen zumi produced a strong black colour, it became the most widely used ink. Nara established a reputation for producing high-quality ink by adopting lamp soot ink production early on, and this reputation has stuck until this day (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Melody, 2021).

6.6. Miscellaneous inks

Except the popular ink created, processed based on different cultural backgrounds, geographical location and varied materials, there are major digression of Ink production based on growing needs of human civilization, specifically during post-industrial era. The following types of ink has emerged out of socio-political necessity and technological development.

6.6.1. Invisible Inks

This kind of ink is known as sympathetic, or secret, ink and is used for espionage and deceit. Common food items can be used to make it; for example, during the Indian Mutiny in 1857, the British manufactured Invisible ink from rice starch (Science India Bureau, 2024) (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Clemens, 2007). The most popular kind of sympathetic ink is cobalt chloride-based; when diluted before writing, it dries to a very light pink colour; but when heated, it turns into a vivid blue. The ink doesn't become visible once phenolphthalein is introduced until it comes into contact with ammonia fumes. Lemon, orange, or onion juice were among the first edible inks; as these juices are undigested and change back to their original colour when heated, they needed to be burnt in order to become visible (Schwenter, 2021).

6.6.2. Typewriter ribbon inks

Castor oil is typically used as the foundation for typewriter ink due to its delayed drying time. Ground colouring additives are then added to the oleic acid mixture. It takes skill to get the ink onto the ribbons. A predetermined spacing between rollers is used to pass the ribbon through. The majority of typewriter ribbons come in two colours; however, each section is simultaneously inked from two different colour reservoirs. To keep the two inks from combining, there needs to be a barrier at the rollers (Westtek, 2021) (Tifa, 2016) (Adkins, 2017). Nevertheless, if the viscosities of the two inks are not the same, the colours will mix. The final ribbon has a line in the middle that represents the partition's width. The ink on a typewriter fade after repeated use because the subsequent words are not as firmly pressed onto the paper. This is a result of the ink being used; if the user leaves the ribbon alone for an hour, the ink will re-enter it (Science India Bureau, 2024) (Schwenter, 2021) (Blair, 2006) (Aydemir, Yenidoğan, & Kandirmaz, 2018).

7. Critical Discussion: The Cultural, Technological, and Material Trajectory of Ink

The present section deals with the comparative analysis of the inks. The comparative table reveals the rich cultural, technological, and material diversity of inks across time and geography. Inks like Maya Blue and Nara Ink reflect deep spiritual and ritual significance, with Maya Blue's exceptional durability and ceremonial use, and Nara Ink's perfumed, refined formulation for Buddhist sutras. Chinese Ink and India Ink, both carbon-based and derived from soot, exemplify traditional sustainability and aesthetic finesse, maintaining relevance for millennia. In contrast, Iron Gall Ink, widely used in Europe, highlights the shift towards chemically complex inks that offered improved flow and permanence, though at the cost of long-term degradation. Printing Ink, born from the Gutenberg revolution, introduced oil-based viscous compositions for mass communication, marking a significant leap in media technology and information accessibility.

Table 1: A concise presentation of variety of inks to understand the chronological evolution, technology, purpose, and sustainability of the same

Type of Ink	Timeline	Geographical Origin	Key Components	Technology	Purpose/Usage	Durability	Sustainability	Inference
Maya Blue	c. 300 CE	Meso-America	Indigo (Añil), Palygorskite clay	Heated ceremonially in incense burners	Rituals, frescoes, codices	Very High	Natural, low-tech	Sacred ink; strong ritual and cultural resonance
Chinese Ink	c. 3000 BCE – Present	China	Carbon (soot), water, animal glue	Solid inkstick ground on inkstone	Calligraphy, scrolls, Buddhist/Jaina texts	High	Sustainable (with minimal animal use)	Highly refined and adaptable across centuries
Iron Gall Ink	1st c. CE – 19th c.	Europe	Gall nuts, iron sulfate, gum Arabic, water	Handmade → Industrial	Manuscripts, records	Medium–High (can corrode)	Moderate (tannin/iron extraction involved)	Long-used but chemically unstable for preservation
Printing Ink	1440s onwards	Germany (Gutenberg)	Soot, oil, varnish, lead, copper	Oil-based for metal movable type	Mass book production	High (vivid, long-lasting)	Low (heavy metals, non-renewable oils)	Pivotal for printing revolution, but unsustainable by modern standards
Nara Ink (Japan)	From 610 CE	Japan (Nara)	Pine/lamp soot, animal glue, perfumes	Boiled glue + soot; molded into sticks	Sutras, calligraphy	High (esp. Yūen Zumi)	High (locally sourced, traditional)	High craftsmanship, spiritual, and artistic symbolism
Invisible Ink	Antiquity – 19th c. espionage	Global (esp. India, Britain)	Organic acids, cobalt chloride, phenolphthalein	Chemically or heat-activated	Espionage, secret messaging	Low (invisible until triggered)	Variable (some food-safe, some toxic)	Functional innovation for covert communication
Typewriter Ribbon Ink	Late 19th – 20th c.	USA / Europe	Castor oil, dyes, oleic acid	Roller-based ink transfer on fabric ribbons	Mechanical typing	Medium (fades with use)	Low (industrial, chemical-heavy)	Pragmatic ink use; transient but impactful during early office culture
India Ink	From 3rd millennium BCE; Europe 17th c.	China → India → Europe	Pine soot, animal glue, water	Solid inkstick ground on inkstone	Art, manuscripts, engraving	High (deep black, archival)	High if traditional; varies in modern forms	Culturally cross-pollinated ink with long-standing global usage

Inks of the modern and industrial periods, such as typewriter ribbon ink and invisible ink, reflect shifts in functionality—from bureaucratic efficiency to covert communication. While invisible ink offered strategic utility during espionage, typewriter ink represents the mechanization of writing. These innovations, however, lacked the durability and eco-viability of traditional inks. The table also emphasizes the growing concern for sustainability, where naturally derived inks like those from China and Japan fare better than industrial formulations. Despite ongoing technological changes—including digital inks and synthetic variants—ink remains a vital medium for cultural expression, archival memory, and identity across eras.

8. India ink: Introduction and its journey to Europe

India ink, sometimes referred to as China ink or Indian ink, is a durable and adaptable black ink that has been used for thousands of years in many writing and artistic traditions. India ink's history begins in ancient China, when it was first created around the third millennium BCE (Adkins, 2017) (Boone, 2000). Animal glue and soot from pine smoke were combined to generate the ink, which was subsequently moulded into solid ink sticks. An inkstone wet with water might be used to grind these sticks into a smooth, rich black ink (Aydemir, Yenidoğan, & Kandirmaz, 2018). The technique and formulation were eventually transmitted to India, where it gained its name. Since ancient times, Indian scribes have written many of their Buddhist and Jain scripts using a needle and pen (Adkins, 2017) (Blair, 2006) (Schwenter, 2021) (Agarwala, Sharma, & Negi, 2016) (Schwenter, 2021). In India, black ink was referred to as "masi" which was made of various ashes, water and animal glue. The term "Indian ink" did not originate until Europe started importing ink from India in the middle of the 17th century (Adkins, 2017) (Agarwala, Sharma, & Negi, 2016).

The spread of India ink to Europe was facilitated by several key trade routes and cultural exchanges:

- A major factor in the spread of products, concepts, and technology was the Silk Road, a network of trade routes that linked the East and the West. Along with other breakthroughs in culture and technology, India ink travelled from Asia to the Middle East and ultimately to Europe along this route.
- India ink was first brought to the Mediterranean region by Arab traders. They served as go-betweens, bringing paper, other technologies, and ink from the East to Europe.
- Additionally, the Crusades (11th–13th century) made it easier for products and information to be traded between the East and the West. The Islamic world, which had previously adopted methods and materials from China and India, was using sophisticated art and writing materials when European crusaders arrived.

Though its use was first restricted, India ink gained recognition in Europe by the 13th century (Blair, 2006) (Aydemir, Yenidoğan, & Kandirmaz, 2018). The persistence and rich black colour of the ink were valued by European artists and scribes. But Europe did not start using India ink more extensively until the Renaissance. European intellectuals and artists endeavoured to resurrect and imitate the classical knowledge and skills of antiquity, particularly Eastern ones, during the Renaissance. India ink was used by artists such as Albrecht Dürer and Leonardo da Vinci to create intricate drawings and technical representations. India ink was used by scribes and illuminators to create the elaborate decorations on manuscripts (Clemens, 2007). India ink was utilized in the creation of printmaking techniques including woodcuts and engravings due to its consistency and clarity (Aydemir, Yenidoğan, & Kandirmaz, 2018) (Adkins, 2017).

9. The Advancements of the Industrial Revolution

The Industrial Revolution, which unfolded in the late 18th and early 19th centuries, brought about ground breaking changes in the ink industry, fundamentally altering how ink was made, distributed, and used around the world. Prior to this era, inks were meticulously crafted in small batches from natural materials like iron gall, charcoal, and plant-based dyes (Bureau, 2024). However, with the rise of mechanization, ink production transitioned to large-scale operations that introduced standardized methods, improved reliability, and significantly lowered costs. Innovations in chemical engineering allowed manufacturers to swap out natural pigments for synthetic dyes—most notably aniline dyes derived from coal tar—leading to inks that were not only more vibrant and longer-lasting but also versatile enough to meet various printing and artistic demands (Agarwala, 2016; Boone, 2000; Huntington, 2004; Aydemir, 2018; Maldonado, 2018).

The introduction of steam-powered printing presses, especially Friedrich Koenig's press in 1814, transformed the publishing landscape. These presses dramatically sped up the production of newspapers, books, and pamphlets, creating an unprecedented demand for ink (Bureau, 2024; Aydemir, 2018). In response, specialized ink formulations were crafted to cater to different types of presses—like rotary, offset, and lithographic—signifying a crucial turning point in print technology (Blair, 2006). This advancement played a direct role in the rise of mass literacy, as more affordable and plentiful printed materials became available to broader segments of society. Ink, along with budget-friendly pens and paper, became essential in education, administration, and personal communication, nurturing a more literate and engaged public (Amsel-Arieli, 2021; Wood, 2019).

However, early industrial inks often contained toxic substances like mercury and lead, posing health and environmental risks until regulatory reforms prompted safer, cleaner practices (Boone, 2000; Clemens, 2007; Aydemir, 2018). Expanded rail and steamship networks further enabled the global distribution of ink, making it a truly widespread and industrialized commodity (Amsel-Arieli, 2021).

10. Case Study: Sulekha Ink – Indigenous Resistance in a Bottle

When the Swadeshi movement reached its zenith in the 1930s—"Swa" meaning "own" and "deshi" meaning "country" its creator, Mahatma Gandhi, was desperately searching for a locally produced ink with which to pen letters and petitions (Kumar, 2017) (Adkins, 2017) (Schwenter, 2021). He told West Bengali liberation fighter Satish Chandra Das Gupta about this. Gupta is credited with creating Krishnadhara, the country's first Swadeshi ink, and he gave the Maitra brothers, Nanigopal and Sankaracharya, access to his formula (Maldonado, 17 August 2018) (Agarwala, Sharma, & Negi, 2016).

The brothers, who were from Rajshahi (now in Bangladesh), had recently been let out of prison and seized the chance to oppose the British once more. Later, at a public demonstration, they ran into Gandhi and accepted his blessings (Daumas, 1970) (Pines, 1931) (Kumar, 2017). Because of the strong sense of national identity, Nanigopal even quit his position as a professor at Rajshahi University after being told to wear a suit instead of the customary dhoti (Karelia, 2021) (Adkins, 2017) (Singh, April 19, 2024) (Sarkar, 2023). Thus, he relocated to Kolkata (now Calcutta) and began to market the ink. Sales multiplied many times over, and the ink became well-known as Professor Maitra's (Davids, 1894). It was only when store owners inquired about the name of the ink that the moniker Sulekha (Su = nice and lekha = writing) evolved. Rabindranath Tagore, India's cultural envoy, is said to have suggested the name. The Maitra family has decided to stick with this version of events, even if the company lacks evidence to support it (Karelia, 2021) (Sarkar, 2023) (Pyne, 2018).

As soon as notable people like Gandhi, former West Bengal chief minister Dr. Bidhan Chadra Roy, former prime minister Morarji Desai, and renowned filmmaker Satyajit Ray wrote with pens imbued with Sulekha's ink, the upstart pen producers quickly became well-known (Adkins, 2017) (Shuanghao Zheng, December 2021) (Kumar, 2017). Ray's Feluda novels and films also had references to the ink and its bottle. In the ensuing forty years, the corporation experienced exponential growth. It peaked between 1970 and 1980, selling one million bottles every month.

While Sulekha Ink has experienced a resurgence, its market penetration appears limited. Jafar, the owner of a stationery store in New Market, reports that sales are primarily confined to affluent consumers and those driven by nostalgia. Historically, Sulekha held a significant market share; however, the contemporary market is dominated by various high-quality international inks from brands such as Dollar, Pilot, Montblanc, and Diamine (Kumar, 2017; Knight, 2018). Despite this competition, Mizanur, the sole importer of Sulekha into Bangladesh, expresses optimism regarding the brand's future, noting a renewed appreciation for fountain pens (Kumar, 2017; Knight, 2018; Sarkar, 2023). This trend suggests that new consumers entering

the market for inks may consequently gain a deeper understanding of the historical significance of pens in the struggle against British rule, thereby connecting with Bengal's revolutionary past.

10.1 Sulekha: India's first indigenous ink

The journey of Sulekha Ink encapsulates the essence of "living culture" through an indigenous material that has both reflected and shaped socio-political consciousness in modern India. Emerging in the crucible of the Swadeshi Movement—a powerful wave of economic nationalism and anti-colonial sentiment in early 20th-century Bengal—Sulekha Ink was not merely a utilitarian product but a symbol of intellectual defiance and self-reliance. It embodied a cultural and economic response to colonial domination, standing in opposition to imported British inks that were then monopolizing Indian markets (Mukherjee, 2009).

Founded in 1934 by Satyacharan and Nanigopal Mazumdar in Rajshahi (now in Bangladesh), Sulekha's inception was spurred by a direct need: to replace the British ink brands dominating schools, offices, and publishing houses across the subcontinent. Its name — "Sulekha," meaning "beautiful writing"—was not merely metaphorical but ideological, reinforcing the idea of reclaiming literacy and authorship as a sovereign act. As Chatterjee (2012) notes, the act of writing itself became a nationalist gesture, and Sulekha provided the ink that enabled this act of defiance. The product thus operated at the intersection of industrial enterprise and ideological empowerment, creating a distinct space where material culture supported decolonial intellectualism.

What makes Sulekha a compelling example of "living culture" is its persistent adaptation while maintaining its ideological roots. Initially crafted using natural ingredients and traditional methods—borrowing from indigenous ink-making practices including soot-based formulations and local dye extraction—Sulekha evolved its chemical compositions with technological shifts but never abandoned its Swadeshi legacy (Sen, 2017). Its packaging too, marked by austere brown glass bottles and Bengali calligraphy, contributed to a vernacular aesthetic that positioned ink as both a tool of resistance and of cultural pride.

In the post-independence decades, as India embraced industrialisation and modern printing technologies, Sulekha expanded its product line to include fountain pen inks, stamp pad inks, and eventually, printing inks. However, it never transitioned fully into synthetic formulations like Western counterparts. This tension—between technological relevance and cultural rootedness—positions Sulekha as a unique artifact within the landscape of Indian manufacturing. Even in the digital age, where writing is increasingly virtual, Sulekha retains its presence in academic institutions and among nostalgic users, embodying a continued respect for handwriting, permanence, and cultural memory.

Moreover, Sulekha's legacy opens up a dialogue on sustainability and localism in today's context. In contrast to disposable plastic cartridges and chemically toxic industrial inks, Sulekha's emphasis on refillable containers and biodegradable ink compositions resonates with current ecological concerns (Roy & Ghosh, 2020). Its production practices, rooted in community-scale industry and low-waste processes, suggest models for eco-conscious manufacturing that draw from tradition rather than bypass it.

Sulekha Ink's story—spanning from colonial resistance to contemporary reinvention—mirrors the broader arc of Indian design history, where material culture mediates between ideological assertion, artisanal continuity, and technological innovation. Within the framework of Ink through Living Culture, Sulekha emerges not only as a physical medium but also as a carrier of resistance, memory, and continuity, bridging past and future through the enduring act of writing.

10.2 Sulekha and the impact of Industrial Revolution and sustainability

The Industrial Revolution profoundly transformed the ink industry through mass production, chemical innovation, and mechanized printing technologies (Bureau, 2024; CO., 1894; Boone, 2000). These advancements not only made ink more affordable and widely available but also influenced writing cultures and literacy rates globally (Amsel-Arieli, 2021). By the early 20th century, this industrial momentum had reached colonial India, where imported inks dominated the market. It was against this backdrop that Sulekha Ink emerged in 1934 as a Swadeshi response to imperial dependence, aiming to indigenize ink production using locally sourced materials and knowledge systems (Karelia, 2021; Sarkar, 2023). While Sulekha initially adopted industrial-era technologies to compete in a globalizing market, its founders consciously rooted the brand in nationalist and ethical production values. In doing so, Sulekha bridged the industrial advancements of the West with the moral imperatives of self-reliance and sustainability that were central to India's freedom struggle. Today, this legacy continues as the company adapts post-industrial sustainability goals—such as biodegradable formulations and eco-friendly packaging—thereby echoing the evolutionary path of ink from industrial scale to ethical scale (Cem Aydemir, 2018).

11. Critical Review: Sustainability and Feasibility Goals of Ink in the Digital Era

Sulekha's journey from a Swadeshi-era symbol of indigenous resilience to a modern ink manufacturer reflects an evolving commitment to sustainable practices. Rooted in nationalist ideals of self-reliance (Karelia, 2021; Sarkar, 2023), the brand today aligns itself with eco-conscious production—emphasizing water-based, low-VOC inks and recyclable packaging that reduce environmental impact (Bureau, 2024; Cem Aydemir, 2018). The company's recent innovations, such as their biodegradable and archival-grade inks, not only preserve quality but also support broader ecological goals, bridging legacy with responsible technological progress.

In today's digital world, the push for sustainability in ink production has shifted from a nice-to-have to an absolute must. Traditional inks made from petroleum, packed with VOCs and heavy metals, are gradually being swapped out for more eco-friendly options like soy, vegetable-based, and water-based inks, which significantly reduce environmental impact (Cem Aydemir, 2018; Bureau, 2024). These modern inks are not only biodegradable but also low in toxicity, making them safer for both users and the planet. Sulekha Ink, which originated during the Swadeshi movement as a symbol of local resistance, has found new relevance by adopting biodegradable packaging and exploring eco-friendly formulations in its latest products. This blend of cultural heritage and modern ecological responsibility shows how traditional brands can align with the sustainability goals of the 21st century. Moreover, the industry's commitment to cutting down carbon footprints through renewable energy, recyclable materials, and de-inkable formulations is paving the way for a circular economy (Daumas, 1970; CO., 1894). As demonstrated by legacy brands like Sulekha, sustainability today is more than just a technical issue—it is a cultural story that builds trust and encourages responsible innovation.

On the practical side, advancements in digital printing technologies have revolutionized the economics and use of sustainable inks. The transition from offset to digital printing allows for precise printing, minimizes waste, and supports on-demand production (Zheng, 2021). However, achieving cost parity between petroleum-based and eco-friendly inks remains a hurdle. Brands like Sulekha are working to tackle this challenge by offering competitively priced ink solutions without compromising on quality. Today's inks need to work well on a variety of substrates—from paper to plastics—and deliver vibrant, long-lasting results. UV-curable and waterless inks are stepping up to meet these needs, providing quick-drying, low-emission options that are perfect for packaging and industrial applications (Anuja Agarwala, 2016). Importantly, the scalability of sustainable ink production is now tethered not only to industrial efficiency but also to consumer acceptability. Heritage brands, once symbols of nationalism, like Sulekha, now act as mediators between ecological sensibility and digital utility—offering culturally rooted, technically feasible models of ink innovation. As the digital era continues to expand, sustainable inks—whether for 3D printing, conductive applications, or archival usage—must balance eco-performance with accessibility, making brands like Sulekha not relics, but relevant players in a greener, tech-integrated future.

12. Conclusion

An essential component of recording human history has been ink. Its growth has been aided by ancient civilizations, ranging from Egypt to China, and as such, it is an essential instrument for art, record-keeping, and communication. Its chemical progression from basic mineral and plant-based inks to contemporary synthetic variants demonstrates the advances in science that have improved its functioning, colour range, and durability. This development is consistent with broader societal advances in technology. It serves as a medium for societies to convey their most profound ideas, identities, and challenges in addition to being a tool for writing. Whether in indigenous tattoos, revolutionary pamphlets, or sacred texts, ink has symbolic value as a means of expressing, documenting, and maintaining cultural identity.

Through the lens of Sulekha Ink, the narrative of ink intersects with India's Swadeshi movement, showcasing how indigenous knowledge and production challenged colonial economic structures and gave rise to self-reliant industrial practices The case study on Sulekha exemplifies how ink production became intertwined with local culture and trade, reflecting the socio-economic impact of this material on indigenous communities. Sulekha’s evolution from a freedom-era brand to a modern enterprise embracing eco-conscious packaging and biodegradable ink solutions illustrates how traditional industry can adapt to global sustainability goals while retaining cultural resonance.

The evolution of ink and its global trade reflect the changing power dynamics, intellectual exchanges, and creative fashions of many historical periods. In the digital era, ink continues to evolve—from printed electronics to 3D printable materials—demonstrating its enduring relevance and adaptability. Its role as a conduit of memory, protest, design, and innovation positions it not as a relic of the past but as a dynamic force bridging indigenous traditions and digital futures.

Thus, the story of ink, particularly in the Indian context through Sulekha, embodies the convergence of material science, cultural politics, and sustainable design. Ink remains a potent symbol of how indigenous expression survives, adapts, and thrives—even as the medium itself is constantly reinvented to meet the ethical and ecological demands of a changing world.

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Maheshwari Handicraft: A Supply Chain Perspective On Crafting And Preserving A Timeless Traditional Weaving Craftsmanship In A Modern Industry Ecosystem

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Abstract:

Handlooms are the most labor-intensive, export-focused, and employment-generating industry in India, particularly in rural and semi-urban areas. Using 106 weavers from Maheshwar city in the Khargone region of Madhya Pradesh as a sample, this study attempts to investigate the effects of several government welfare programs on the weavers employed in the handloom industry. A novel supply chain model is put out in this study for the unorganized Maheshwari Silk Weaving Cluster in India. In order to boost livelihoods, increase efficiency, and encourage sustainable development, the concept combines design, technology, and market access. The concept intends to improve quality control, decrease lead times, and increase revenue potential by clustering weavers, setting up design and training centers, and putting in place a digital platform. With its potential to revolutionize the Maheshwari Weaving Cluster, the suggested approach might foster social progress, economic expansion, and cultural preservation.

***Keywords*:** Handloom, Ethical Supply Chain, Ethical Craftsmanship, Maheshwar, Maheshwari Silk Fabric, Sustainability in Production, Social Responsibility.

Article History: Article Received :11-07-2025, Revised: 15-08-2025, Accepted: 20-08-2025

1. Introduction

Symbolizing the majesty and dignity of the holy city of Maheshwar, the Maheshwari Silk Saree is a classic piece of Indian textile heritage. A tribute to the city's rich cultural heritage, Maheshwari Silk is renowned for its gorgeous gold and silver brocade, fine silk, and superb craftsmanship. Because of its elaborate patterns, gold accents, small and intricate pattern weaving, Maheshwari Silk has come to represent elegance and luxury. Traditional themes and techniques have been passed down through the generations by Maheshwar's talented weavers, who have been honing the craft of producing Maheshwari Silk fabrics for decades. Every Maheshwari Silk Saree expresses India's rich cultural diversity through its elaborate motifs and floral patterns. Maheshwari Silk's timeless appeal is demonstrated by the fact that it is still a sought-after item for all Indian women, spanning generations and time.

The Maheshwari Silk business, which is well known for its fine handcrafted goods, has particular supply chain issues that affect its ability to compete on the international market. The industry's intricate distribution networks, geographic concentration of production, and reliance on traditional weaving processes all contribute to bottlenecks that make supply chain management ineffective. By examining the complexities of the Maheshwari Silk supply chain, this paper highlights important obstacles and areas for development.

This study seeks to shed light on alternative solutions that could improve the productivity, efficiency, and competitiveness of the Maheshwari Silk business by thoroughly examining its supply chain. This study aims to help the Maheshwari Weaving Cluster create more sustainable and efficient supply chain strategies by investigating the connections between traditional craftsmanship, geographical limitations, and contemporary supply chain management concepts.

2. Origin and Significance of Maheshwari Weaving

2.1 Location & Geography

Maheshwar is a town in the central Indian state of Madhya Pradesh, located on the north bank of the Narmada River in the Khargone district. It is situated 91 kilometers from Indore, the state's commercial center, and 13 kilometers east of National expressway 3 (the Agra-Mumbai expressway). Maheshwar is a market hub for agriculture. The town is also well known for its locally made brass cutlery and hand-loomed sarees.

Maheshwar is a Nagar Panchayat city in Madhya Pradesh's West Nimar district. Elections are held every five years for the 15 wards that make up the city of Maheshwar. Of the 24,411 residents of the Maheshwar Nagar Panchayat, 12,447 are men and 11,964 are women. The Caste Factors are as Schedule Caste (SC) constitutes 11.73 % while Schedule Tribe (ST) were 11.20 % of total population in Maheshwar. Maheshwar City has an 81.21% higher literacy rate than the state average of 69.32%. As to

the 2011 Census India data, Maheshwar's female literacy rate is 73.78% and its male literacy rate is approximately 88.40%. (Chandra S, 2016), (www.gatha.org)

2.2 Historical Significance of Maheshwar

Queen Ahilyabai Holkar established Maheshwar as her capital city in 1767 while ruling Malwa. This small town located along the Narmada River underwent significant transformation during her reign, becoming a vibrant hub for trade and industry. One of her initiatives to promote this growth was the introduction of the Maheshwari Saree. She invited skilled weavers from various princely states, including Hyderabad, Mandava, and Gujarat, to settle in Maheshwar. Prior to their arrival, only grey cotton fabric was produced locally. The influx of these weavers led to the emergence of new designs and styles. The Queen encouraged them to draw inspiration from the local architecture and the motifs found on the walls of her fort, which uniquely connected the fabric to Maheshwar (www.gatha.org)

Maheshwar, also known as Choli-Maheshwar, is a town in southwestern Madhya Pradesh, India, situated on the northern bank of the Narmada River, approximately 40 miles (64 km) southwest of Indore. It is located on the historic site of Maheshvari, which served as the capital around 200 BCE for Kartavirya Arjuna, a Haihaya king referenced in the ancient Sanskrit epics, the Ramayana and the Mahabharata. The town features broad ghats—stepped bathing areas that rise from the river to the fort, temples, and the palace of Ahalya Bai, who chose Maheshwar as her capital in 1767. A 16th-century mosque in the area also holds historical significance. Across the Narmada River lies the early site of Navratil, where excavations have uncovered painted pottery and other artifacts. (www.issuu.com)

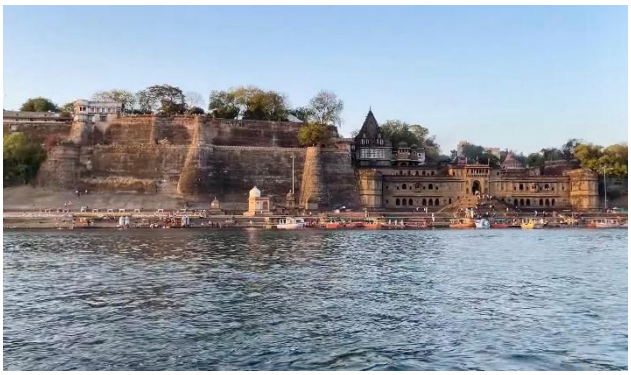

Figure 1: Maheshwar Ghat from river Narmada

Figure 2: Maheshwar Ghat & Maheshwar Fort

2.3 Historical Background of Maheshwari Handicraft

The weavers evolved from simply creating fabrics to producing sarees, turbans, and other clothing for the local community, gradually fostering economic self-sufficiency. A 5-yard saree was referred to as "dandiya," while a 9-yard one was simply called a saree. They utilized natural dyes to create colored textiles, and over time, they began to produce checked patterns and other decorative designs. The Queen initially supported these weavers by purchasing many of their products, which she wore in public and generously gifted to dignitaries, helping to spread the recognition of this craft. Under the Queen's guidance and the combined skills of various weavers, a unique aesthetic emerged, establishing a distinct cultural identity for Maheshwar's handloom industry, which continues to thrive today (Mahapatra S. *et al*, 2019).

The craft faced its first major challenge during World War I when the availability of colors and dyes significantly decreased. This led to the use of inferior dyes, harming the fabric's reputation and causing weavers to become complacent and seek other jobs, resulting in a decline in the population of craftsmen. This issue was addressed around 1910 when royal descendant Naresh Thukojirao Holker and several organizations took steps to revitalize the craft. Weavers were brought together again, and it was decided to set up dyeing and spinning centers. After navigating various socio-political challenges, the craft eventually prospered.

In 1921, King Shreeman Holkarji Rao established a weaving and dyeing demonstration factory aimed at educating weavers about modern techniques. This factory now serves as a handicraft training center in Maheshwar. Following its establishment, new weaving methods were introduced, such as using Dobby for border designs and replacing throw-shuttle looms with fly-shuttles, which boosted production in the area. These tools were sourced from Nagpur, and weavers received training in their use, with many receiving supports to set up pit-looms in their workshops. In 1978, Richard and Sally Holkar, members of the former ruling family, founded the Rehwa Society, which has played a crucial role in the industry's growth and development. (Rai A K, 2018)

The Maheshwari handloom sector, despite having received Geographical Indication (GI) status, is facing challenges due to a lack of understanding of GI among weavers, intermediaries hindering communication between consumers and producers, and ineffective government policy implementation. To rejuvenate the industry, it is crucial to enhance awareness among both producers and consumers, enforce strict regulations against misrepresentation of GI, and encourage public-private partnerships.

Furthermore, embracing new technologies, diversifying the product range, and establishing price regulation mechanisms can boost efficiency, lower costs, and increase demand for Maheshwari brocade and sarees, ultimately benefiting the weavers and the industry overall (Rai K. A. *et al*, 2015).

To enhance the Maheshwari Weaving Cluster, various marketing strategies and interventions are suggested. These include leveraging relationships with designers, forming strategic partnerships, setting maximum retail prices (MRP), and providing training for sales personnel. The industry could also gain from forward integration, optimizing point-of-purchase strategies, creating service infrastructure, and implementing regulatory measures to manage seller conduct. Additional recommendations involve focusing on exports, tackling supply chain management challenges, and enhancing skills through training programs to improve sales, communication, and overall industry efficiency (Mahapatra S et al, 2019).

Another study examined the supply chain dynamics of the handloom industry, concentrating on the motivations, challenges, and opportunities faced by weavers, retailers, and government stakeholders. The findings underscore the necessity for social responsibility and alignment within the supply chain to foster welfare and efficiency. The study categorizes three types of organizational systems and suggests enhancements to bolster weavers' resources and capabilities, including technological advancements, demand forecasting, infrastructure improvements, and brand development. It highlights the significance of collaboration among government, private, and cooperative entities to unlock the innovative and productive potential of weavers and recommends exploring ways to align customer preferences with the needs and aspirations of weavers to encourage growth without conflict (Chandra S, 2016).

2.4 Significance of Maheshwari Handicraft

Devi Ahilyabai Holkar brought professional artisans from Varanasi, Hyderabad, and Surat to weave traditional, one-of-a-kind, and ethnic Maheshwari sarees. These weavers follow the motifs etched on the walls of Ahilya Fort. Surprisingly, handloom operations that have been in place since the 18th century continue to use natural fibers forming lightweight fabric, intricate motifs and Pallu designs with zari, reversible border design techniques and use of natural dyes. Even now, similar designs can be found on the Maheshwari handicraft materials (www.issuu.com) (www.recykal.com).

Maheshwar Cluster employs around 4500 weavers who have been manufacturing traditional handicraft items for generations. The handloom industry in Maheshwar employs people from diverse castes and religions, such as Kshatriyas, Bharuds, Muslims, Kumhars, and Kahars. This cluster focuses on versatile handloom products such as sarees, stoles, dress materials, shirts, home décor products like curtains and cushion covers. Maheshwari handicrafts have gained international recognition, contributing to India’s handloom exports and promoting sustainable craft traditions abroad (Kaur U, 2024) (Pant R, 2024)

3. Production Process of Maheshwari Textiles

The creation of Maheshwari Silk sarees and textiles involves multiple steps, starting with sourcing high-quality silk yarn from trusted suppliers. The yarn undergoes processes such as degumming, dyeing, and treatment before being separated into warp and weft threads. The warp threads are arranged lengthwise, rolled onto a wooden log, and then moved to the warp roll.

Figure 3: Weavers at Maheshwar producing Maheshwari Sarees

Maheshwari sarees are known for their refined simplicity. Many of their patterns maintain traditional styles, while some have evolved over time. The borders serve as a distinguishing feature, featuring designs inspired by the engravings of the Maheshwar fort and specially the reversible weave in Border and Pallu. Sarees are categorized based on their borders or patterns, including Maheshwar Bugdi Kinar, Zari Patti, Rui Phool Kinar, Phool Kinar, Chatai Kinar, V Kinar, Kahar Kinar, Laheriya Kinar, Bajuband Kinar, Luddoo Kinar, Pankha Kinar, Heera, Baila Ankhi, Chameli ka Phool, among others. They are also classified by texture, which depends on the proportion of cotton or silk used. Categories include 100% Cotton Saree, Warm Silk Saree, Silk Saree, Neem Silk Saree, Katan Saree, 75% Cotton Saree, Tissue Saree, Mercerized Path Design Saree, and Mercerized Checks Design Saree. The saree features a reversible border that can be worn on either side, adorned with intricate zari work. The body is typically plain or features stripes or checks. The raw materials include un-degummed mulberry silk yarn of 18/20 - 20/22 D for the warp and 2/80's – 2/100's cotton yarn for the weft. Gold and silver zari are used for additional warp designs in the border and for extra weft buta and stripes in the pallav. The saree is woven on a lightweight metal frame fly shuttle loom

and showcases a unique pallav with five alternating stripes, two plain white and three coloured. The borders are decorated with geometric patterns rather than floral designs, often abstractly representing local elements like rivers and architecture. With fine cotton yarns in the weft and silk in the warp, the fabric is light and breathable for summer while maintaining a subtle silk sheen.

The designs of the sarees are created on graph paper using pixel calculations, and cards are punched for the jacquard machine to weave the design into the fabric. These cards can be made by hand or machine, with simple weavings taking about 5-6 hours and more complex designs requiring 1-2 weeks. The jacquard machine is a specialized loom that weaves intricate designs by controlling one thread at a time.

The weaving process entails interlacing the warp and weft threads with the use of a pit loom, demanding significant effort and patience from the weaver. Once completed, the fabric is rolled onto a patti, and the duration to weave a saree varies based on the intricacy of the design, taking anywhere from 15 days to 6 months. After weaving, additional steps such as washing, cutting, mending, and polishing are carried out to create the final Maheshwari textile products.

Figure 4: Maheshwari Sarees

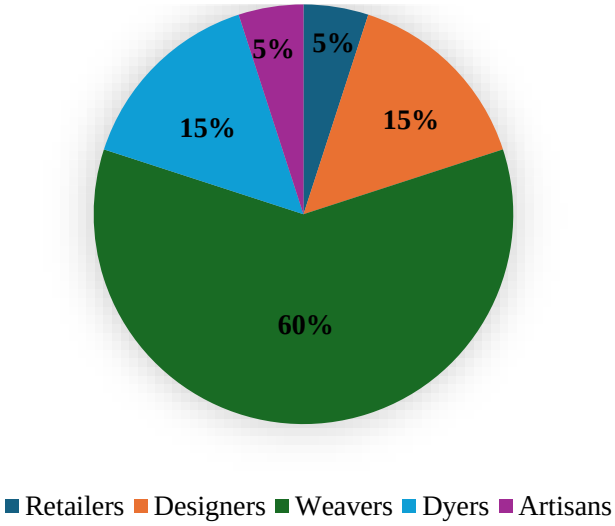

Figure 5: Producers Contribution to Maheshwari Textile Creation

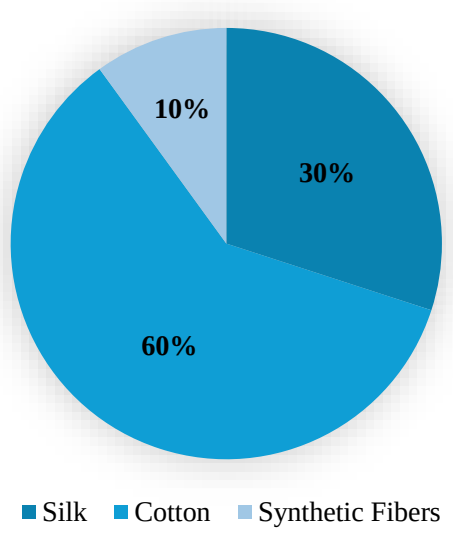

Figure 6: Raw materials for Maheshwari Textile Creation

4. Structure of the Maheshwari Textile Industry

The Maheshwari textile cluster features a complicated web of participants, including weavers, traders, and merchants. It is mainly family-operated, utilizing both handlooms and power looms for Saree production. Each type of loom yields different varieties of Sarees, distinguished by their unique yarns, designs, and production methods (Chakravartty A, 2016).

Weavers in this cluster can be divided into three primary categories: individual weavers, master weavers, and cooperative society weavers. Individual weavers face the most exploitation, as they are solely responsible for sourcing raw materials, designing, and marketing their products. In contrast, master weavers supply materials, design, and color guidelines to the weavers while overseeing the production. Cooperative society weavers work together, pooling resources and knowledge (www.scribd.com).

The trading sector is crucial to the industry, with around 300 traders controlling the market. These traders, mostly Hindus, have

significant power over the predominantly Muslim weaving community. Weavers often find themselves isolated from the market, depending on traders for design guidance and distribution.
Exploitation is rampant in the industry, with weavers receiving very low compensation for their work. Their vulnerability is worsened by limited access to raw materials and retail markets. Additionally, the payment system, which frequently involves post-dated checks and commission agents, further burdens the weavers financially.

5. Supply Chain of Maheshwari Silk

In today's competitive market, effective supply chain management is essential for businesses to thrive, necessitating investment and focusing on their supply chains. A supply chain consists of a network of suppliers, manufacturers, distributors, and customers collaborating to create and deliver products or services. For Maheshwari Cotton-Silk Sarees, this supply chain includes various participants such as gaddidar, shopkeepers, intermediaries, master weavers, and weavers (Basu B, 2011) (Croxton, Keely L. et al. 2001).

The production process for Maheshwari Silk Sarees is intricate, with manufacturers operating on a work-order basis or based on anticipated market demand. Wholesale clients place orders with gaddidar and shopkeepers, who then relay these orders to intermediaries or master weavers, who assign tasks to weavers at a set wage per piece or day. The completed sarees are sold to a range of retail and wholesale customers through stores and exhibitions. (Rai K A, 2018) (www.scribd.com)
In the Indian handloom sector, strong supply chain management is vital for maintaining global competitiveness. The industry encounters issues like low productivity, silk contamination, insufficient spinning, and a lack of raw materials. To tackle these problems, cost optimization is necessary at every level of the supply chain. Furthermore, improved coordination between the industry and relevant trade organizations is needed to enhance supply chain efficiency. By optimizing their supply chains, businesses in the Indian handloom sector can boost their competitiveness and provide high-quality products to their customers (www.scribd.com) (Pant R, 2024)

6. Main Issues Faced by Maheshwari Silk Cluster

The Maheshwari Silk cluster, which was once a flourishing handloom weaving sector, is now experiencing a downturn. Weavers in this area are facing numerous supply chain management challenges that affect their efficiency and competitiveness. Many struggling weavers cannot afford silk due to increasing prices, which forces them to resort to cheaper, lower-quality synthetic fibers. This shift has led to the use of inferior raw materials, resulting in a decrease in the quality of the final products. Traders often use weaving defects as an excuse for their actions, further complicating the difficulties faced by the weavers. This situation underscores the urgent need for support and protection for Maheshwari Silk weavers to help preserve this traditional craft. (Chandra S, 2016) (Rai K A, 2018)

6.1. Key Challenges in Yarn Procurement

Inconsistent yarn quality - Copper-coated nylon has taken the place of pure gold wires in zari, and synthetic dyes have supplanted the limited range of natural colors. Only a few weavers still create the traditional striped designs of the Saree, which are characteristic of Marathi style and remain popular in Maharashtra.

Delayed yarn availability - Due to high demand and tight deadlines, dyers must prepare a warp of silk in just one hour, which leaves little opportunity for the revival of traditional slow natural dyeing methods.

Difficulty in sourcing yarn of desired quality - Artisans dye silk yarn at their home. While only acid dyes should be used for silk, many weavers opt for cheaper alternatives, resulting in numerous complaints about color bleeding.

These challenges are worsened by the geographical spread of weavers, which causes transportation delays and complicates access to financial assistance.

6.2. Additional Challenges

Weavers encounter several additional challenges during the production process, such as:

Limited access to advanced looms - Innovation and productivity in the handloom industry are hampered by Maheshwar's limited access to sophisticated looms. Artists are unable to scale up or experiment with contemporary designs due to this technological divide (Chandra S, 2016) (Rai K A, 2018).

Insufficient knowledge of creative patterns and market trends - Although the younger generation has recently transformed the craft, nearly 60% of weavers are still falling behind due to inadequate marketing. Designing a Saree is an art form, and not all craftsmen possess the skills to analyze current trends and plan their creations accordingly. While they are talented, not everyone has the foresight to assess the current landscape and adapt to their work (Chandra S, 2016) (Rai K A, 2018).

Difficulty in adjusting designs and patterns to meet evolving market demands - Master weavers, who are vital to the community, find it hard to position themselves as viable and sustainable in the market. Their struggle to innovate and respond to design changes and market trends leads to products that fail to capture customer interest, ultimately impacting the livelihoods of the weavers in the community (Chandra S, 2016) (Rai K A, 2018).

6.3. Impact of Globalization on the Maheshwari Weaving Industry

Globalization has significantly influenced the Maheshwari Weaving Cluster, integrating it into the global marketplace. Although more than 80% of the surveyed population recognizes Maheshwari handcrafts, the industry faces challenges in embracing the digital era. Even with the rise of e-commerce, 88% of Maheshwari customers still prefer in-person shopping due to concerns about authenticity and variety (Chandra S, 2016).

The effects of globalization on Maheshwari Silk weavers have been particularly pronounced. The introduction of power looms and mills has resulted in the production of fake fabrics that are often sold as genuine, leading to a loss of income for many skilled weavers. Additionally, the growing workforce in the sector has created an oversupply of labor, which has driven down wages and prices. Fluctuating silk prices and artificial shortages imposed by suppliers have further placed weavers in vulnerable positions (Rai K A, 2018).

7. Market Research

In recent years, consumer purchasing habits have changed, especially in tier 1 and tier 2 cities, with more customers opting to shop at organized retail chains. However, high-net-worth individuals and younger consumers are not sufficiently familiar with the latest styles and varieties of Maheshwari Silk, leading to lost opportunities for the industry (Prabha. Jaya, 2018) (Mamidipudi A, 2016).

To better understand the Maheshwari Silk market, we conducted research in Varanasi, focusing on wholesalers and retailers. Our findings offer important insights into market dynamics and consumer behavior. One of the wholesalers we spoke with was Sona Sarees, a family-owned business with over 40 years of experience in selling Maheshwari sarees.

Many manufacturers and resellers obtain sarees from weavers in Maheshwar and distribute them through various channels, including online platforms such as retail websites, WhatsApp, and their own sites. They also maintain a retail presence across India and internationally in cities like London, Canada, and Dubai. Notably, they briefly sold on Amazon but stopped due to the platform's commission fees, illustrating the challenges small businesses face in the e-commerce landscape (Kaur U, 2024) (Kumar, P. S., 2014).

Our research also indicated that the Covid-19 pandemic significantly affected the Maheshwari Silk market, leading to a considerable drop in sales for wholesalers and difficulties for retailers in clearing their stock. Additionally, the pandemic caused a shift in consumer preferences, with many choosing synthetic sarees over silk due to budget limitations. This trend was particularly noticeable during the wedding season, which is usually a peak time for Maheshwari Silk sales, and even extended to office wear (www.scribd.com) (Kumar, P. S., 2014).

8. Existing Distribution Practices in the Maheshwari Weaving Cluster

The distribution system used by the Maheshwari Silk business is multi-tiered and involves a large number of middlemen between suppliers of raw materials and final customers. Wholesale, retail, and institutional sales are the three main types of distribution channels used in this market.

Wholesale Distribution

The bulk of transactions in the Maheshwari Silk sector are made by wholesalers, who control the wholesale market. Based on regional tastes and interests, wholesale customers from all over India buy products. Additionally, importers place orders with wholesalers. Sales in this cyclical sector are higher during weddings and festivals (Kaur U, 2024).

Retail Distribution

Wholesalers market their goods to local retailers or through retail stores. Varanasi's stores provide a wide variety of goods, however there is a lack of a well-organized retail framework. In metropolitan cities, some big manufacturers operate as wholesale retailers with retail locations (www.issuu.com).

Institutional Sales

Establishing institutional ties with organized retail chains has been a limited endeavor for the Maheshwari Weaving Cluster. Consequently, institutional sales are very small. The industry's inability to strategically link and its disorganized structure have made it difficult to access this enormous market (www.gaatha.org).

9. SWOT Analysis of the Maheshwari Weaving Industry

The Maheshwari Weaving Industry's SWOT analysis provides a strategic overview of the company's current state by identifying its external opportunities and threats as well as its internal strengths and weaknesses. This is what it shows:

9.1 Strengths:

Unique Selection of Products: Maheshwari brocade is a distinctive and in-demand product because of its lengthy history, which dates back to the Mughal Empire.
Historical Significance: Maheshwari textiles are an Indian specialty that has become internationally recognized as a historical skill, drawing both visitors and enthusiasts.
Skills Instilled Over years: Craftspeople and their families have refined their craft over many years, guaranteeing genuine and superior goods.

9.2 Weakness:

Old and traditional design patterns: Narrow product focus and modern design diversity in classic and conventional designs.
Weavers' Migration: Inadequate salaries have caused weavers to leave the craft, jeopardizing the industry's viability.
Less technology Advancement: The handloom industry lacks technology development, which reduces efficiency and output.
Lack of Awareness: Weavers are frequently uninformed of government aid programs, missing out on potential assistance.

9.3 Opportunities:

Export and Market Expansion: The global fashion market is experiencing an increase in demand for ecological, ethical, and handmade apparel.

Digital India: Online platforms present an opportunity to bridge the gap between manufacturers and consumers, enhancing accessibility and revenue.

Government Initiatives: Government schemes and initiatives can encourage crafts, improve weavers' livelihoods, and boost the industry's overall competitiveness. Skill development initiatives, such as the National Skill Development Corporation's training programs, can help weavers improve their production and quality.

9.4Threats:

Fake Products: Machine-made duplicates undermine authenticity and cost.

Poor R&D: There is little experimentation with novel fabric blends, innovative patterns, utilitarian wear, or modern fashions.

Increase in Power Looms: Power looms are a danger to the handloom business since they provide faster and cheaper production methods, potentially diminishing demand for handmade goods.

Poor earnings: Unsatisfactory earnings may cause weavers to forsake the craft, risking the industry's survival.

Rise in Raw Material Prices: Increasing raw material costs may result in higher production costs, affecting finished goods prices and consequently diminishing demand.

10. PESTEL Analysis of the Maheshwari Weaving Cluster

PESTEL Analysis of Maheshwari Silk aids in understanding the external macro-environmental elements that might influence silk production, marketing, and worldwide appeal.

10.1 Political Factors:

The GI Tag provides legal protection while also ensuring quality and distinctiveness, allowing businesses to distinguish their items from mass-produced imitations. The sector has received support from government initiatives such as the ODOP margin money scheme and training programs. The government has also given weavers with loans and toolkits.

10.2 Economical Factors:

Per capita and national income, resource mobilization, infrastructural development, employment generation, capital formation, and industrial growth all have an impact on the sector. Weavers, who struggle with paperwork and legalities, have suffered as a result of the GST implementation.

10.3 Social Factors:

Weavers are frequently distanced from customers, making it difficult to understand demand.

Working circumstances are difficult, yet craftspeople persevere. Customer segmentation is based on demographics and a desire to purchase Maheshwari Silk sarees.

10.4 Technological Factors:

The industry is lacking in technical advancement, notably in the handloom sector. To encourage technical progress, the government has implemented initiatives such as the Technology Upgradation Fund Scheme (TUFS). Power looms have supplanted handloom machines, capturing the market.

10.5 Environmental Factors:

Dyers employ chemical dyes, which contribute to pollution. Power looms emit noise pollution, and waste materials from manufacturing and printing operations have a negative environmental impact. Using sustainable colors can assist to alleviate environmental problems.

10.6 Legal Aspects:

The GI Tag prevents duplication, therefore protecting weavers' livelihoods, talents, and identities. Government programs, such as the Handloom Mark and the Health Insurance Scheme, assist handloom weavers.
Labor restrictions are rather unfriendly, making life difficult for Maheshwari brocade weavers.

To promote organizational reforms and resource allocation, detailed needs assessments are required. In the case of Maheshwari Silk manufacturing, our investigation found inefficiencies in raw material procurement and inter-process transfers. To overcome these shortcomings, we offer a new supply chain model for weavers that aims to streamline operations, shorten lead times, and improve the whole production-to-consumer experience.

11. Findings

11.1 Inefficient Supply Chain:

The Maheshwari Weaving Cluster's present supply chain is inefficient due to various middlemen, a lack of transparency, and limited market access.

11.2 Limited Technology Adoption:

The industry has a low level of technology adoption, notably in the handloom sector, which reduces efficiency and production.

11.3 Weaver Migration:

Insufficient pay and benefits have resulted in weaver migration, jeopardizing the industry's long-term viability.

11.4 Quality Control Concerns:

Quality control concerns occur as a result of a lack of standardization, insufficient training, and restricted access to high-quality materials.

11.5 Market Access Limitations:

Weavers have limited market access since they rely on middlemen and are not exposed to current patterns and trends.

12. Suggestions

Based on the study done on the cluster some additional points suggested. The proposed points aim to organize the working at Maheshwari weaving cluster, improve efficiency, and enhance the livelihoods of weavers. The suggestion integrates technology, training, and market access to create a sustainable and scalable supply chain.

Implement Digital Platform: Create a digital platform that connects weavers, designers, and buyers, improving transparency, efficiency, and market access.

Provide Training and Skill Development: Weavers can benefit from training and skill development programs that focus on current designs, trends, and quality assurance.

Establish Quality Control Mechanisms: Put in place quality control measures such as standardization, certification, and frequent audits.

Encourage Sustainable activities: Encourage sustainable activities such as utilizing eco-friendly colors, decreasing waste, and applying environmentally friendly manufacturing processes.

Foster Market Linkages: Connect weavers directly with buyers, retailers, and exporters to improve market access and income potential.

Streamline the Workflows: Implementing structured processes and standardized procedures is critical to reducing manufacturing time. For Maheshwari handicrafts, this entails developing explicit step-by-step rules for each level of manufacturing resulting in improving overall productivity in faster turnaround times while maintaining high quality standards.

Optimize Resource Allocation: Meeting production deadlines requires effective resource allocation. Weavers should use tools and procedures to optimize the utilization of resources and labor to eliminate bottlenecks.

Leverage Technology: Implementing digital solutions and automation technologies may considerably speed up manufacturing activities. Integrating technology like as design software for exact patterns, digital inventory management, and automated instruments for repetitive chores might help Maheshwari handicrafts save human labor and time delays.

12.1 Sourcing Ethically: Sustainable Raw Materials

With increased consumer awareness of sustainability, ethical raw material procurement has become non-negotiable. Weavers and manufacturers should prioritize eco-friendly materials and develop transparent sourcing processes to foster confidence among environmentally conscientious clients. To increase your brand's appeal in this category, focus on sustainable raw materials, eco-friendly home items, and ethical sourcing.

Eco-friendly Materials: Prioritize using sustainable, ecologically friendly raw materials.
Transparent Sourcing Practices: Establish transparent and honest sourcing techniques to increase consumer confidence.

Ethical Partnership: Foster ethical partnerships by working with suppliers who follow fair labor practices and sustainability requirements.

Consumer Trust: Establish a brand reputation that resonates with environmentally sensitive consumers.

Sustainability Focus: Emphasize your commitment to ethical sourcing in marketing initiatives.

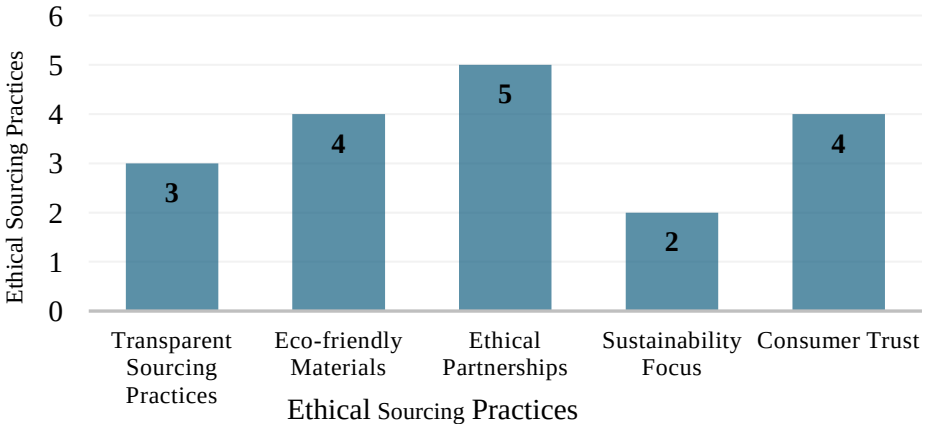

Figure 8: Importance of Ethical Sourcing Practices

12.2 Rehwa Society's Importance for the Maheshwari Handicraft Sector

The Maheshwar handloom tradition is being revived and promoted in large part by the Rehwa Society. This non-profit, which was founded in 1979 by Richard and Sally Holkar, is committed to protecting and advancing the Maheshwari weaving art form. An examination of the Rehwa Society and its noteworthy accomplishments is provided.

Rehwa Society, which played a key role in helping to revive the Maheshwar handloom heritage and raising awareness of it. By giving local weavers access to markets, jobs, and training, the Rehwa Society hopes to preserve and revitalize the Maheshwar handloom tradition. The association wants to give artists financial opportunity while preserving the skill as a vital and essential component of Maheshwar's cultural legacy.

The Rehwa Society provides local weavers with training courses aimed at improving their abilities and exposing them to more complex weaving methods. The weavers are kept informed about new designs, technologies, and market trends through regular workshops and seminars. The Rehwa Society helps weavers make a sustainable income and enhances their quality of life by offering steady work opportunities. By paying fair wages and providing a comfortable working environment, society supports craftspeople.

Maheshwari sarees are heavily promoted by the Society both domestically and abroad. Participating in fashion shows, trade shows, and exhibitions is part of this. The society has also created an online platform to showcase the beauty and artistry of Maheshwari textiles to audiences around the world. The Rehwa Society promotes the Maheshwar handloom tradition and its cultural value through a number of programmes and activities. The association works with merchants, influencers, and designers to sell Maheshwari sarees and increase their market share.

The Rehwa Society has played a crucial role in maintaining the traditional Maheshwari saree weaving methods and designs, guaranteeing their ongoing popularity in modern fashion. By supporting the livelihoods of many weavers and their families and generating job possibilities, the organization's initiatives have had a positive effect on the local economy. The Rehwa Society's marketing and promotional efforts have helped the Maheshwari handloom gain international prominence, which has helped to solidify its standing as a representation of excellence and workmanship.

By investigating new markets, creating cutting-edge goods, and improving its training activities, the Rehwa Society intends to broaden its scope. In order to guarantee that the advantages of the society's efforts are widely distributed and that the tradition endures, ongoing interaction with the weaver community and stakeholders will be a priority.

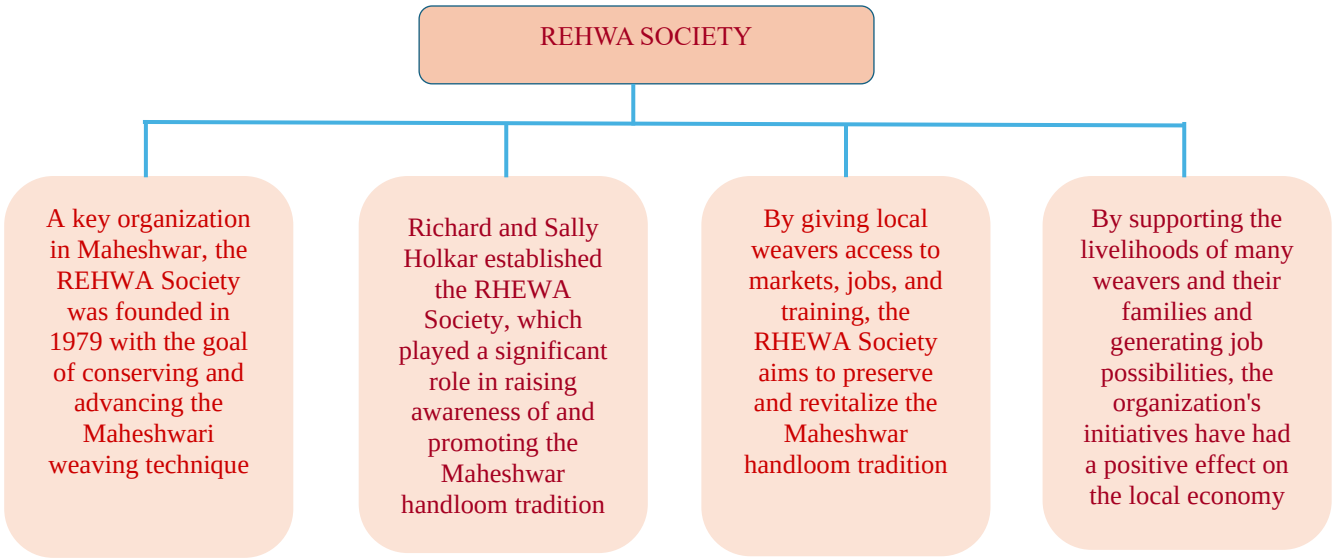

Figure 9: RHEWA Society and its objective

12.2 Importance of Certifications in Maheshwari Handicraft Industry

Certification is essential for Maheshwari Handicrafts to establish credibility and confidence in the handcrafted business. Maheshwari Handicrafts demonstrates its dedication to superior quality and regulatory compliance by gaining necessary industry certifications. Certified handcrafted items from Maheshwari Handicrafts are subject to stringent standards, which improve product reliability and safety. Quality certifications emphasize the brand's commitment to quality, whilst regulatory compliance demonstrates its adherence to industry standards, promoting customer trust and bolstering marketing initiatives. Industry certifications often include:

ISO 9001: Quality Management System.

Fair Trade Certification: Ethical work practices.

GOTS (the Global Organic Textile Standard): Environmentally friendly manufacture.

SA8000: Social accountability in the workplace.

OEKO-TEX Standard 100: Textile Safety.

BCI (Better Cotton Initiative): Environmentally sustainable cotton produce and use.

12.3 Production Sustainability is Guaranteed by Maheshwari Handicraft

Modern production methods must be sustainable, and the Maheshwari handicraft sector is adopting eco-friendly strategies to improve its environmental stewardship. From sourcing materials to delivering the finished product, manufacturers and craftspeople may show their dedication to environmentally friendly practices and win over a discerning customer base by including sustainable practices into every step of production.

Eco-Friendly Methods for Producing Maheshwari Handicrafts.
Green production: Reduce your influence on the environment by using eco-friendly production methods. Utilizing renewable energy sources, cutting waste with effective procedures, and making the most use of available resources are all ways to minimize production's environmental impact.

Reducing Carbon Footprints: Implementing techniques to reduce production-related carbon emissions is one way to reduce carbon footprints. Participation in carbon offset programs, local procurement of materials to reduce transportation emissions, and energy-efficient machinery all help to lessen the carbon footprint.

Reuse and Recycling: Include recycling procedures in manufacturing. This includes encouraging consumers to recycle or upcycle products to prolong their lives, reusing waste materials, and recycling water used in the weaving and dyeing processes.

Sustainable Materials: Make an effort to use raw materials that are either biodegradable or have no effect on the environment. Organic cotton, natural colors, and recycled fibers are a few examples that lessen the final items' negative environmental effects.

Employee Training: Provide sustainable practices education to craftsmen and laborers, guaranteeing that each production step complies with environmentally friendly standards and advances the larger sustainability objectives.

Certification and Compliance: To establish credibility and trust with environmentally sensitive consumers, exhibit a dedication to ethical and environmental standards by obtaining pertinent sustainability certifications, such as Fair Trade or Global Organic Textile Standard (GOTS).

Promotion of Green Initiatives: Emphasize in your branding and marketing initiatives your dedication to sustainability. To draw in and keep environmentally sensitive clients, use phrases like eco-friendly production, green manufacturing, and sustainable home décor.

Sustainability Innovation: Fund R&D to investigate novel sustainable materials, methods, and technologies that might lessen environmental impact and boost industrial efficiency.

Consumer Education: Educate clients about the environmentally friendly features of your goods and motivate them to choose sustainably. In sustainability initiatives, transparency promotes loyalty and helps to establish trust.

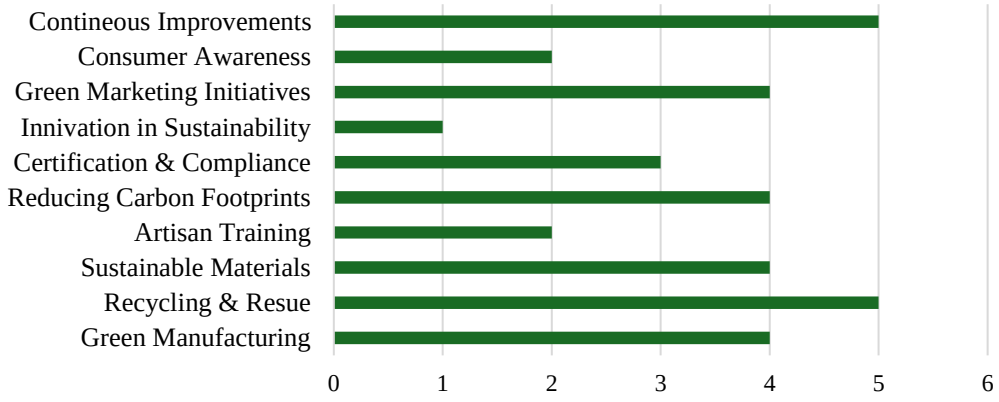

Figure 10: Impact of Sustainable Practices

Continuous Improvements: In order to comply with the most recent sustainability trends and laws, production procedures should be reviewed and updated on a regular basis. Constant improvement guarantees that the procedures stay applicable and efficient in a sector that is changing quickly.

By emphasizing these eco-friendly production methods, Maheshwari handicrafts may establish themselves as industry pioneers and attract customers who respect environmental stewardship while conserving the rich cultural legacy of traditional craftsmanship.

12.4 Social Responsibility and Ethical Craftsmanship of Maheshwari Handicraft

Ethical workmanship and social responsibility are fundamental to Maheshwari handicrafts. Fair trade standards are followed by the sector, guaranteeing that craftspeople are paid fairly and have a safe, encouraging workplace. This dedication includes giving local weavers, including those from underrepresented groups stable income and economic development. While upholding strict quality standards, skill development programs help craftspeople become even more proficient. Additionally, responsible procurement of all materials is guaranteed by transparent sourcing standards, which demonstrate a larger dedication to moral manufacturing and promote constructive social influence in the neighborhood.

Fair Trade Principles: Maheshwari craftspeople follow fair trade guidelines, guaranteeing equitable compensation and secure working conditions for all those engaged in the manufacturing process.

Support for Weavers: The sector gives local craftspeople, frequently from underrepresented groups, a steady revenue stream and a means of achieving economic empowerment. Through supporting economic independence and providing cash for artists, the sector benefits nearby communities. This enhances livelihoods while fortifying community bonds.

Skill Development: Artists are provided with ongoing training and skill development programs to assist them improve their craft while upholding high standards of quality. Handicrafts from Maheshwari provide essential job possibilities, particularly in rural and impoverished areas. By sustaining families and offering steady employment, this makes a substantial contribution to local economies.

Ethical Sourcing: Open sourcing procedures guarantee that all materials used to make Maheshwari handicrafts are sourced ethically, demonstrating a dedication to moral manufacturing.

Preservation of Cultural Heritage: Maheshwari craftspeople are essential to the preservation of cultural heritage because they maintain traditional crafting methods. Their efforts guarantee that these cherished customs are perpetuated across the generations.

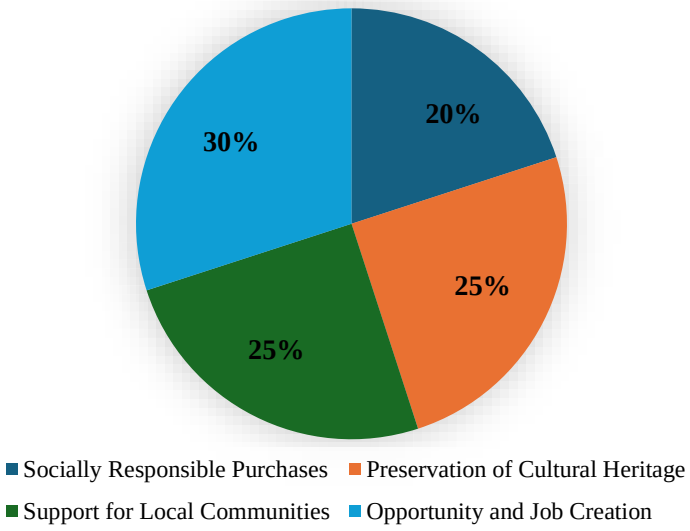

Figure 11: Social Impact of Maheshwari Handicraft

Socially Responsible Purchases: Customers who opt for Maheshwari handcrafted goods are promoting moral consumption. A more equal marketplace is facilitated by this dedication to social responsibility and fair trade.

Community Support: Maheshwari handicrafts have significant social effects that go beyond personal rewards, bolstering the community's cohesiveness and improving everyone's well-being.

12.5 Benefits

Organizing the Maheshwari Silk weaving cluster, increasing productivity, and improving weavers' livelihoods are the goals of the suggested supply chain model. The concept can enhance quality control, boost revenue opportunities, and encourage sustainable development in the cluster by utilizing technology, design, and market access.

Weaver Cluster: Using factors like product specialization, skill level, and geographic location, group weavers into clusters. A leader will oversee cooperation and communication within each cluster.

Improved Efficiency: The digital platform and organized cluster structure will streamline communication, reduce lead times, and increase productivity. To link buyers, designers, and weavers, create a digital platform (web portal or mobile app). The digital platform will facilitate: Order tracking and management, Design sharing and collaboration, Payment processing and settlement, Quality monitoring and feedback.

Design and Training Centers: Establish design and training facilities to give weavers access to contemporary styles and trends, instruction in new weaving methods and technologies, and quality assurance and control.

Enhanced Livelihoods: Weavers will have access to better designs, training, and market opportunities, leading to increased earnings and improved livelihoods.

Raw Material Supply Chain: Form alliances with reputable raw material providers to guarantee silk yarns and other materials are always available and of consistent quality.

Marketing and Sales: The marketing and sales strategy will promote Maheshwari Silk products to domestic and international markets, increasing market access and revenue opportunities. To promote Maheshwari Silk products to both home and foreign markets, develop a marketing and sales plan. Branding and packaging, social media and digital marketing, trade events and exhibitions, and alliances with retailers and distributors are all part of this.

Settlement & Payment: To guarantee prompt and equitable payments to weavers, establish a clear and safe payment system. The digital platform and payment system will ensure transparency and accountability throughout the supply chain.

Quality Control and Assurance: The quality control and assurance mechanism will ensure that products meet high standards of quality and authenticity. Put in place a system for quality control and assurance to guarantee that goods fulfill strict requirements for authenticity and quality.

13. Conclusion

Maheshwar is one of a kind of cultural biosphere and heritage that must be preserved and recognized as a World Heritage Site. Among the many obstacles facing the Maheshwari Silk business are ineffective supply chains, a lack of technological adoption, weaver migration, problems with quality control, and restricted market access. A digital platform, skill development and training programs, quality control systems, sustainable practices, and market connections are all necessary to meet these issues. By putting these recommendations into practice, the sector's competitiveness, productivity, and efficiency may all be increased, which will ultimately benefit weavers' lives and encourage sustainable growth within the cluster.

They have all the potential to be transformed into a museum, information hub, and tourist destination where people can come and contribute to their economy and greatly increase market potential in the aim of preserving Devi Ahilya Bai's magnificent legacy.

Maheshwari handicrafts are not just textiles - they represent heritage, sustainability, livelihood, and identity. They embody the spirit of India’s handloom legacy, carrying forward the artistic vision of the past while adapting to modern design sensibilities.

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A search for commonalities of visual languages of different communities in India

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Abstract
Visual art is used as a language to communicate emotions and thoughts. The visual language may vary from culture to culture, but there may be some commonalities among different cultures in terms of the usage of different visual signs and symbols. This study particularly focuses on the visual languages of different communities in India. In India, there are many communities that belong to remote areas and have their own visual language. Such communities have fewer possibilities to experience cultural exchange with the mainstream population. It naturally makes the community distinctive. To explore the commonalities and differences of the visual language (encoded through different signs and symbols), this study focused on some important art traditions in India and conducted semiotic analysis of the different distinctive art traditions, which covered (1) *Gond* art of Madhya Pradesh, (2) *Rickshaw art* of Uttar Pradesh, (3) *Patachitra* of West Bengal (4) *Chilika* fishing community's art of Odisha, and (5) *Khovar* and *Sohrai* art of Jharkhand. The findings revealed that despite of the different location and diversity in culture of these communities, some significant commonalities exist in visual languages, which are mainly driven by survival concern, cultural praxis, religious belief, rituals and natural environment. Furthermore, it revealed that iconic and symbolic representational approaches are frequently used through different forms among these five traditions, as well as the artists of these art traditions are more familiar with figurative representations rather than abstract images. This study will help visual art researchers to decode and understand the visual language of the significant art traditions of India.

Keywords: Art, Communication, Commonality, Culture, Tradition, Visual language.

Article History: Article Received: 26-06-2025, Revised: 04-08-2025, Accepted: 15-08-2025.

1. Introduction

The visual language is the primitive of all language forms in human civilization, the root of all modern verbal languages (Fischer, 1999). If we look at the cave paintings made by primitive people, we find that the cave paintings were pictographic language which contains different representational visual codes and these codes stand for something else. As Derrida postulates ".. sign as sign is a sign of something else, thus it is most fully itself when it is perceived as something else, but to remain a sign it must also continue to be perceived as different from the thing it represents" (Buchanan, 2018). The present study mainly focuses on the visual language, contained in visual images (signs and symbols, created by the use of line, colors and texture) by traditional artists of different Indian communities. In India, several communities live in different remote areas and their culture, language, religious belief, and profession are different. They are not linked with the mainstream population and they are culturally distinct from the urban people. These community members initiate and obey their understanding of daily life praxis and to some extent they are dependent on their cultural events, rituals, myth, folklore, traditional beliefs and so on. Thus, it is a crucial area to investigate how these communities communicate their thoughts and emotions through an enriched sing and symbol-based visual language.

Visual language often is considered as open-ended interpretative content. Subjective bias is always there; "…in contemporary society, as well as in "ethnological" cultures, visual symbols convey ideas and express emotions, qualities, and feelings. They note varied rank, status, and role, and influence behavior and decisions" (Chalmers, 1981). On the other hand, if the spectator is not familiar with a specific community's visual language, she/he could misinterpret the various signs and symbols of that community and also some visuals may appear as ambiguous content. In a study, Arur and Wyeld (2016) explored the importance of the cultural aspects of *Gond* tribal art of central India and observed that with the march of time, the materials used in tribal art and the subject dealt with have been changed. But this form of art is still striving to continue with the religious background and the traditional techniques. The art of *Gond* is the living expression of this tribe. It is inextricably related to their daily life. They depict the painting mainly on the floor and the wall. Along with other "locally found and naturally colored substances", they use charcoal and limestone to create the paintings on the wall (Patel et al., 2014). There is a subgroup of the *Gond* tribe known as *Pradhans*. Paintings made by them are known as *Gond* art (Gaur & Das, 2013). They are mainly from Madhya Pradesh: "The *Pradhans* were minstrels and genealogists to parent *Gond* tribe". During marriage ceremonies and other festivals, they make painting on the floors and walls. In the context of *Patachitra* of Paschim Medinipur in West Bengal, Hauser (2002) tried to understand the particular way in which scroll painting tradition is recognized as a "folk art" and here "a shift of genre from a primarily oral tradition to a primarily visual tradition (i.e., from the performance of scrolls to their selling as art products) is demonstrated". In Allahabad of Uttar Pradesh (India), Rickshaw art is a distinctive tradition of vehicle painting. It is painted by local artists of Allahabad. Naha (2013) mentioned that like India, in Bangladesh also, the cycle rickshaw is a daily vehicle and the art of rickshaw is "a panorama of color, creativity and charm". But it is often criticized for its delayed speed and the traffic jams it creates. But still, the country gets an identity from it. In the context of the Indian vehicle painting tradition,

Chattopadhyay (2009) explored the text and images found in public buses operated privately in Calcutta. She tried to probe it as a part of popular culture. She discussed these art forms in a wider socio-political context of Kolkata city life. The study revealed that "the artwork acts as a unique mode of communication and everyday resistance". Her exploration tried to establish a "spatial logic" using which "subaltern groups make room for themselves within the bourgeois frame of the city".

Art is often born out of our everyday life. Everyday objects, like doors, walls, courtyards, temples, and boats, are all made beautiful in their small ways. For the small fishing communities around the Chilika Lagoon of Odisha, this is reflected in their use of colors – the blue of the sky, and the blue and the green of the sea – and various traditional motifs. Such art not only reveals the aesthetic dimension of things but also tells us about the desires, aspirations, as well as social and cultural praxis of such communities. Similarly, *Khovar* and *Sohrai* painting traditions of Hazaribag (Jharkhand) are significant expressive mediums to convey the identity of the tribal communities. These traditional tribal arts are found in the remote villages of Kharati and Daujinagar of Hazaribagh, and tribal communities such as *Oraon, Santal* and *Munda* of the dense forest.

The above exploration and a few concerned literature surveys suggest that not much work has been conducted on the visual language of traditional artists following a methodology where different traditions are encountered in a single comparative approach to understand the common visual features (signs and symbols) across cultures in India. The above literatures indicate that the visual language is a crucial medium to convey the traditional artists' thoughts and emotions, because a large number of community members are not very familiar with the textual language, whereas the visual language is mostly intuitive, culture-driven as well as self-driven. Thus, it is important to identify the fundamental visual codes, signs and symbols across cultures to understand the community members' intentions, desires, different issues, and aesthetic sensibilities. This study attempted to explore the context and content of such traditional visual languages. This study is a unique endeavor to understand the commonalities of visual languages among different visual art traditions in India. The findings will help visual art researchers to decode and understand the visual language of the significant art traditions of India.

2. Method

To understand the commonalities of visual codes of different communities and to get proper meaning from specific communities' visual language through their artwork, five case studies have been conducted on traditional arts in different states of India, such as (1) *Gond* tribal art of Madhya Pradesh, (2) Rickshaw art tradition of Allahabad (Uttar Pradesh), (3) *Patachitra* art of Paschim Medinipur (West Bengal), (4) art practice of Chilika fishing community (Odisha) and (5) the *Khovar* and *Sohrai* paintings of Hazaribagh (Jharkhand). The data were collected primarily through field surveys, observations, interviews with local artists and photographic documentation. In context of Khovar and Sohrai art tradition, the author has to depend on his previous collaborative research findings (Das & Gayen, 2018). The basic queries of the field surveys were regarding the community members' professions, rituals, backgrounds, visual art traditions, history of their place, demographic details, literary education and artistic education, their opinions about the society, art, culture and environment, their interests in artistic activity, and how do they express their thoughts and emotions through arts. The above-mentioned five different community members were asked in detail about their art practices - what kind of art they produce, for what purposes those artworks are used, how they bring their basic art materials, and the detailed methodologies of making the artworks etc. They were asked whether they were trained by any *guru* (teacher) or by any art institution and whether their art traditions continued from generation to generation. How many people are involved with the art profession there? What other profession do they follow? After capturing the photographs of the five different art traditions, a semiotic analysis was conducted to understand the dominant representational patterns (for example – iconic representation, indexical representation, and symbolic representations) as well as to understand the dominant visual forms/motifs and the themes of the art traditions. Accordingly, the commonalities and differences of the visual languages of the five art traditions were identified.

3. Findings

3.1 Gond tribal art of Madhya Pradesh

The village Pathangarh Mal, where a large number of Gond artists live, is situated in the Dindori district of eastern Madhya Pradesh. The population of the village is about one thousand and five hundred; out of them, almost seven hundred members are actively engaged in producing art. Both male and female artists belonging to the age group of seventeen to thirty-five are mostly active in the art profession. A few artists of the older generation are still active. The elements used in *Gond* traditional art mostly come from their natural environment, tribal lifestyle, religious belief, rituals as well and their imagination of the outer world. The interesting thing is the strong use of design elements in their artworks. The *Gond* tribal community members use design form to embellish the interior (floor) and exterior (wall and courtyard) of huts. The use of multicolor and very thin or lamented line drawings makes *Gond* Art distinctive from other tribal arts. Although they use multiple colors, the most

Figure 1: Gond tribal art: A performer is performing with his pets

dominating colors are light blue, green, yellow and different hues of red. Earlier, the use of natural color in *Gond* tribe was very common. They used to extract color from soil, tree, coal and stone. The diversity of art forms in *Gond* tribal community is noticeable. If the present trend of *Gond* art is investigated, some interesting features emerge. *Gond* tribes still paint the images of their Gods and Goddesses such as *'Bara Dev', 'Marahi Devi', 'Phulvari Devi', 'Thakur Deva', 'Meherelin Dai,'* etc. They depict their traditional life, of playing *'Bana'* which is a unique musical instrument. There are birds on trees, animals, and humans in harmony with nature. The paintings also represent various celebrations, rituals, their lifestyle and their relationship with nature. They often draw deer, tree, birds, fish, monkey, camel, cow, tiger, lion, snake, human figure with daily life activity and other fictional images. For the most part of their art work they use dots, spiral lines, hyphens, sharp and thin lines etc. (Figure 1).

Nowadays they use mainly black pen, acrylic color and acid-free imported paper. Another notable change has come into the art trend which is the use of the artist's signature. Earlier they did not put their signature and there was no individualistic approach to making artwork. Some *Gond* artists make wood sculptures as well. They bring wood from forests to make images of *'Bara Dev'* and other Gods and Goddesses. Sometimes they make wooden masks that have similarities with animals or demons. Chatura Singh Ruati, who is one of the *Gond* sculptors, makes only wood sculptures. Similarly, they make different crafts with *'Moua'* grass such as hat, bag, mat etc. Many of them do clay relief on the walls of their huts where scorpion, deer, lion, and trees are depicted (Figure 2). The findings of semiotic analysis are represented in the Table 1.

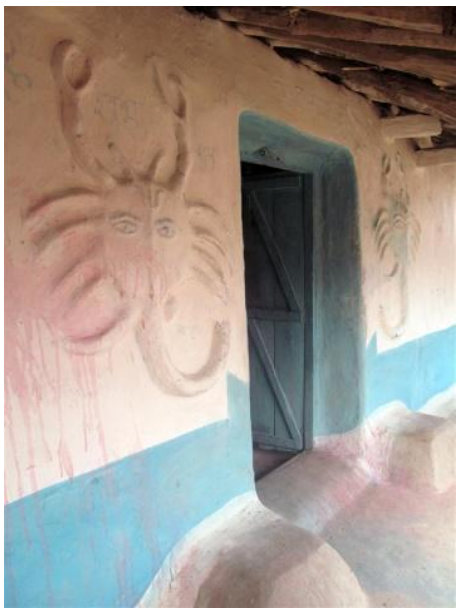

Figure 2: A relief wall mural made with clay at the Gond tribal village Patangarh Mal in Dindori district of Madhya Pradesh

Table 1: The details of the semiotic analysis of the Gond tribal art of Madhya Pradesh.

***Gond* tribal art forms**	**Motifs/forms used in the arts**	**Colors**	**Themes**	**Material and medium**	**Dominant Representation approach**
Wall paintings	geometric forms, floral motifs, ornamental designs, animals, tree, bird (peacock and other birds), human figure, fish, flower	light blue, brown, yellow ocher, black, red, light green, deep green	nature, ritualistic images, everyday activity, animal life	soil pigment, calcium carbonate, natural pigment color, acrylic color	iconic representation, symbolic representation
Paintings on paper	tree, human figure in activity (farming, dancing, hunting, playing instruments, standing with pets etc.), animals (lion, tiger, goat, cow, deer, bull, snake, camel, elephant), birds (peacock, duck, parrot and other birds)	light blue, brown, yellow ocher, black, red, light green, deep green	nature, ritualistic images, everyday activity, animal life	natural pigment color, acrylic color, black pen on paper	iconic representation
Floor design	geometric design, floral design	brown, yellow ochre, white, light blue	abstract, ritualistic	soil pigment, calcium carbonate	symbolic representation
Wooden sculpture	flower, birds, animal, human figure, toys, Gods and Goddesses	brown, white, natural wood color	figurative sculpture	wood	iconic representation
Wooden musk	animal face, demon face, human face in geometric patterns	natural wood color	figurative masks	wood	iconic representation, symbolic representation
Relief sculpture on mud walls	animal, insect, floral motifs	white, natural soil color	nature, ritualistic	clay	iconic representation, symbolic representation

3.2 Rickshaw art tradition of Allahabad (Uttar Pradesh)

The art which is made for all and with no intention to get much benefit from that art, is quite rare. The tradition of painting on Rickshaw in Allahabad, Uttar Pradesh, tells the same story. Even the artists are anonymous, but there is no compromise to give the best to sustain the art tradition. Vehicle painting in India is not rare. We often notice different trucks, auto, bus with different ornamented typography and paintings, but the Rickshaw art tradition in Allahabad is different from other vehicle painting traditions. The ornamented rickshaw tradition of Allahabad is continued for more than six decades. The rickshaw pullers of Allahabad, when asked, cannot say when this painting tradition started. On average between 30 to 50 years of age, they cannot remember when it all began. But it has been there since their childhood.

Figure 3: Rickshaw art of Allahabad: Two birds are sitting together on a tree

The main stylistic features are found on the body of rickshaws. The bodies are made of wood and the visual compositions are depicted by local artists. Themes are varied - young woman in classical miniature painting stance, floral and ornamental motifs. Apart from these, artists depict different images of animals and birds like lions, tigers, deer, doves, pigeons, ducks, peacocks etc. (Figure 3). With changing times, sometimes they even depict portraits of well-known film actors, actresses and woman portraits (Figure 4).

Figure 4: a woman is holding the pallu of the saree

The paintings on the body of Rickshaw are made with enamel color. Mainly primary and secondary colors are used for painting –yellow, red, blue, green, orange etc. Sometimes black color is used for depicting the edge of main motifs and white color is used to highlight those motifs. Sometimes wood engraving is used to decorate the body of rickshaws. The fabric hood of the rickshaw is also richly ornamented, mostly with decorative motifs using materials such as textile, plastic, foil paper etc. The semiotic analysis of Rickshaw art tradition is given in Table 2.

Table 2: The details of the semiotic analysis of Rickshaw art tradition of Allahabad.

Art forms of rickshaw art tradition	Motifs/forms used in the arts	Colors	Themes	Material and medium	Dominant Representation approach
Wooden body of rickshaw	peacock, pigeon, lotus, rose, leaf, duck, parrot, actress, actor, female face, tiger, lion, landscape	light yellow, red, blue, light green, deep green, orange, black, white	nature, portraits of actors and actress, image of animals and birds	enamel paint on wood and iron, acrylic color	iconic representation
Roof of the rickshaw made with textile	ornamental design, floral design, geometric design	black, light green, red, light blue, pink, white, light yellow, yellow ochre, brown, purple, golden	abstract design	textile embroidery, rexine cloth, zari, foil paper, polythene	symbolic representation

3.3 Patachitra or Scroll Painting of Paschim Medinipur (West Bengal)

The exclusive feature of Bengal Scroll Painting (*Patachitra*) is the narration of the story with sequential images (vertically and horizontally). The sequential images of the *Patachitra are shown* manually and it looks like a motion picture. The use of natural color (vegetable color, stone dust, soil color etc.) makes the paintings more unique and attractive. Some artists use water-based colors as well (poster color and watercolor). The *Patachitra* artists use diverse surfaces to paint; for instance, wood, bamboo, fabric, wall and dish made of clay and other daily life objects. Although this painting tradition is mainly represented on the surface of cloth and paper (first they tear *sharee* to paste behind the paper so that it can be scrolled easily). This painting tradition is different from other traditional Indian art forms because the visual narratives are depicted one by one sequentially either vertically or horizontally (Figure 5). The *Patachitra* tradition still survives in the village named *Naya* in the Midnapur district of West Bengal but is transforming. Earlier artists preferred to paint mostly stories based on the life of Hindu Gods and

Goddesses such as *Rama* and *Sita*, *Durga*, *Radha* and *Krishna*, *Jagannath* etc, and stories of freedom fighters and stories of *'Satya Pir', 'Marriage of fish'* and other folk tales. Stories based on the *Ramayana and the Mahabharata, Manasha Mangal, Chandi Mangal' Purba Raga,* etc are still popular (Figure 6). But the modern scroll paintings tell stories of what is happening in socio-cultural sphere e.g., nature preservation, AIDS, gender issues, education, health, protest against superstition, reunion of Hindu and Muslim, political stories, other contemporary issues of daily life and so on.

Figure 5: Scroll painting of Bengal: A pata-chitra artist is demonstrating the scroll painting

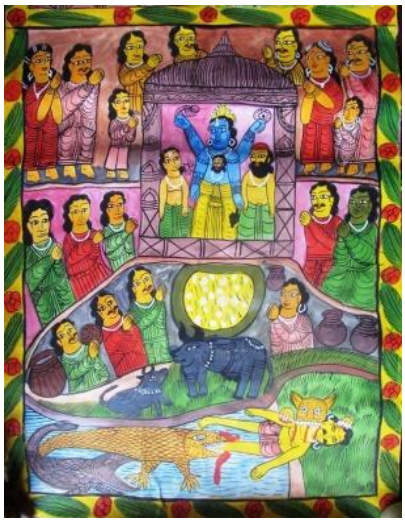

Figure 6: A detailed view of the sequential visual narrative of the tradition at Pingla village of Pashim Medinipur district of West Bengal

Table 3: The details of the semiotic analysis of Patachitra of Paschim Medinipur (West Bengal).

Art forms	Motifs/forms used in the arts	Colors	Themes	Material and medium	Dominant Representation approach
***Patachitra* in scroll format**	Gods and Goddesses, human figures, animal figures, landscape, floral motifs, daily life objects, birds	light green, red, light blue, light yellow, yellow ochre, black, brown, purple, sap green, deep green, orange	contemporary social issues, mythology, folklores, religious, *santal* life, awareness narratives	natural pigment color, acrylic color, water color (on paper which is pasted on fabric)	iconic representation, indexical representation
***Patachitra* on rectangular paper**	Gods and Goddesses, human figures, animal figures, landscape, floral motifs, birds	light green, red, light blue, light yellow, yellow ochre, black, brown, purple, deep green	contemporary social issues, mythology, folklores, religious, *santal* life, awareness narratives	natural pigment color, acrylic color, water color (on paper which is pasted on fabric)	iconic representation, indexical representation
***Patachitra* representation on walls**	Gods and Goddesses, human figures, animal figures, landscape, floral motifs	light green, red, light blue, light yellow, yellow ochre, black, brown, purple, deep green	contemporary social issues, mythology, folklores, religious, *santal* life	natural pigment color, acrylic color	iconic representation, indexical representation
***Patachitra* motifs on different crafts**	Gods and Goddesses, human figures, animal figures, landscape, floral motifs, birds	light green, red, light blue, pink, white, light yellow, yellow ochre, black, brown, purple, see green	religious theme, *santal* life	natural pigment color, acrylic color	iconic representation, symbolic representation

Figure 7: Chilika Lagoon fishing community's art: A marriage logo with the use of typography on a wall at a village of Chilika Lagoon fishing community in Odisha

Figure 8: Some traditional motifs and alpana design on a door

Patachitra painting tradition has a profound relationship with song and performance. Earlier artists used to learn songs from their elders or composed songs that were based on visual narratives, as we come to know from the senior scroll painting artist Shyam Sundar Chitrakar. By showing *Patachitra* painting panels chronologically, telling stories and singing songs, artists used to get money, rice, clothes and other necessary daily life stuff from villagers. They did not have any trend of directly selling scroll paintings. They were performers and social thinkers who attempted to increase social awareness regarding different issues through their songs and scroll paintings from village to village. The songs are very important to them as the paintings are. The artists do not have any written form of those songs.

3.4 Art practice of Chilika fishing community of Odisha

Chilika Lagoon fishing community exemplifies a community that is well known for its fishing profession and rarely been exposed for its rich art practice. The fishing community's visual culture has some significant features which come out from their everyday life, religious belief, rituals etc. The way they embellish fishing boat, walls of huts, floors with decorative design, painting and wood engraving (on door) tells that this community has been expressing their thoughts through such art practice. The paintings on walls are made by local artists. The images are depicted to decorate houses mainly during marriage (Figure 7) and other occasions, for instance, *Lakshmi puja*, *Ganesh puja*, *Ratha Yatra* and in other rituals. The popular forms are namely - women standing with a musical instrument next to a banana tree, sign of heart with names of newly married couple, lord *Jagannath*, lord *Ganesha* and *Lakshmi*, image of peacock, parrot, elephant, creepers plants, lotus, vase with coconut etc. The interior walls are also depicted with various designs, dotted lines and geometric forms. On the doors they depict different *alpanas* and religious objects with white color (Figure 8). They also engrave on wooden doors to create images of animals, birds and fish. Mostly blue, green and red colors are used on engraved wooden doors. Floors are ornamented with white soil color during various *pujas* like *Lakshmi puja*, *Ganesh puja* and during other rituals. Floral motifs, *Lakshmi's* feet, curved design and ornamental designs are very common in floor *alpanas*. This *alpanas* are mainly done by women. In the case of temples decoration, village architects go by tradition and replicate the structure and motifs of *Jagannath* temple of Puri and Konark Sun temple. These temples are painted with multiple colors like yellow, light green, red, light blue, brown, pink etc. They depict scenes from *Ramayana* and *Mahabharata*.

The main art forms of the Chilika fishing communities are such as - wall murals (including relief sculpture and painting), floor *alpanas* (at temples and houses), wood engravings and painting on doors (motifs of animals, floral and geometric design), temple wall art (narratives on *Ramayana* and *Mahabharata*), paintings on boat (different motifs of fish, God and Goddesses). The details of the semiotic analysis of the images of ***Chilika Lagoon*** have been given in the Table 4**.**

Table 4: The details of the semiotic analysis of the artistic practice of fishing community of Chilika Lagoon (Orissa)

***Chilika Lagoon* Art forms**	**Motifs/forms used in the arts**	**Colors**	**Themes**	**Material and medium**	**Dominant Representation approach**
Wood engraving on doors	fish, crane bird, geometric shapes, elephant, cow, duck, ornamental design, floral design, deer	brown, light blue, white, red, deep green, black	nature	wood	iconic representation
Paintings on door	elephant, parrot, coconut, lotus, clay pot, leaf, ornamental design,	deep green, red, white, brown	nature	acrylic painting on wooden door	iconic representation

	floral design, peacock, tree				
Wall mural painting	Gods and Goddesses, musical instrument, woman with musical instrument, banana tree, wedding typography, name of bride, floral motifs, lion, geometric design, icon of temple, image of lamp	light green, red, light blue, pink, white, light yellow, yellow ochre, black, brown, purple, see green	ritualistic image, religious image, graphic design, decoration, marriage or wedding	soil pigment, natural pigment color, acrylic color on wall, plaster on wall, relief mural.	iconic representation, symbolic representation
Floor painting	*Alpanas*, ornamental design, *Lakshmi* feet design, floral design	white, light yellow, deep green, light blue, red	ritualistic design	acrylic color, soil color, natural pigments	symbolic representation
Boat painting	fish, crane bird, Gods and Goddesses, ornamental and geometric design	see green, light blue, deep blue, brown, deep green	iconic theme	synthetic paint color, acrylic color	iconic representation, symbolic representation
Temple wall decoration	ornamental design, geometric design, birds, lion, Gods and Goddesses	red, brown, light green, deep green, see green	religious image, Ramayana narrative	synthetic paint color	iconic representation, symbolic representation

3.5 Khovar and Sohrai art of Hazaribag, Jharkhand

The *Khovar* and *Sohrai* paintings are an integral part of the tribal communities' (*Oraon, Santal and Munda* tribal communities) of Hazaribag, Jharkhand (Das & Gayen, 2018). Primarily the *Khovar* and *Sohrai* paintings were created on cave walls in pre-historic ages and later practiced on the walls of houses (mainly at Kharati village and Daujinagar village) as the evolution took place. *Khovar* wall mural painting is created on mud walls during marriage. This wall painting is depicted with different ornamental design, floral motifs and animal figures on the mud walls of bridal room at the bridal's house where the wedding rituals are performed. During the wedding time, the bride is considered as *'Devi'* or mother goddess. *Khovar* painting is mainly done by the bride's mother and by her aunts to make the place beautiful and sacred (Figure 9). These women first repair the walls (after the last year's weathering), and then prepare the surface of the interior house walls with black mud (*kali matti*). After that, a second layer is applied with white clay (*dudhi matti*). This second layer of clay is then scraped off either with broken combs and bamboo strips or with fingers while the white clay is still wet. Gradually the scraping technique reveals black motifs and the designs of plants, animals and insects are created. These paintings are generally done between January and June. The *Sohrai* wall mural painting is practiced by the same community members of the region and it is known as harvest art (Figure 10). This painting is done on the walls of houses one day after the *Diwali* for celebrating good harvest. Here the main God is *Pashupati* or the Lord of animals and it is connected with the return of *Lord Rama*. Apart from this, there are several motifs, such as different animals (elephant, tiger, dear, snake), birds (peacock), floral designs etc.

Figure 9: Khovar and Sohrai wall painting: a marriage design with ornamental and geometric motifs on an outdoor wall

Figure 10: Khovar and Sohrai wall painting: traditional figurative motifs on indoor wall and at Hazaribag in Jharkhand

The murals are done by housewives and young girls. They use black soil (*kali matti*), white soil (*dudhi matti*), red soil (*geru matti*) and yellow soil (*pila matti*) to layer the mud walls of their houses. As brushes they use chewed Sal wood sticks (*datwan*) and fine cloth swabs. Firstly, the red line is drawn (representation of blood of ancestors', procreation and fertility), then black lines (representation of dead stone and mark of God Shiva), then yellow lines and finally white lines are used to create the motifs (yellow represents protection, fidelity, and the white one is for food). Most of the motifs of *Sohrai* paintings are inspired from the primitive cave painting which is situated not far from the villages. The tribal community members believe that the cave painters were created by their ancestors. The details of the semiotic analysis of *Khovar and Sohrai* are given in the Table 5.

Table 5: The details of the semiotic analysis of the Khovar and Sohrai art of Hazaribag, Jharkhand

Art forms	Motifs/forms used in the arts	Colors	Themes	Material and medium	Dominant Representation approach
Indoor wall painting	animal figures (tiger, lion, deer, elephant, pig etc.), birds (peacock, parrot, duck, hen), snake, floral design, geometric design	yellow ochre, light yellow, brown, black, red, white, gray	nature, animal life, ritualistic image	soil color, stone color, natural pigments	symbolic representation
Outdoor wall painting	geometric design, floral design, tree, flower, animals	yellow ochre, light yellow, brown, black, red, white, gray	nature, animal life, ritualistic image	soil color, stone color, natural pigments	symbolic representation
Floor design	geometric design, floral design,	black, white, gray	abstract design	soil color, natural pigments	symbolic representation

4. Discussion

The five art traditions which have been selected for this study are located in such places where the literal meaning of modernization did not take place much and the nature surrounding them has a deep impact on their visual culture. For instance, the village of *Gond* tribe is situated on hilly areas where a few families live depending upon agriculture and the optional profession is making art and craft to survive. In *Gond* people's art, nature has been represented dominantly. Similarly, their myth, folklore, rituals and daily life experiences are repeatedly appearing into their art practice. So, it is clearly visible that their art tells the way they live, and it also tells certain stories of their thoughts and intentions. This language of visuals expresses their culture with more simplicity in comparison with verbal language. Such communities mostly do not document and archive their valuable cultural practices with verbal languages, but they express it through visual language or art practice. The reason behind it is that they are not much well equipped with academic educational system as urban people are. Therefore, they naturally developed different tools and codes of visual language to communicate their world. The semiotic analysis of Gond tribal art tradition reveals that the dominating representation feature of this tradition is iconic representation and subordinating representation feature is symbolic representation.

When the art practice is made by urban lay people, it takes different shape; for instance, in Allahabad a group of people survive making art work on Rickshaw. Such vehicle art is not new in the country. We often notice bus, truck, auto-rickshaw and other vehicles with different painted images and relevant typography. But Allahabad Rickshaw tradition is quite distinctive in terms of image features and the purpose of making art. Basically this art tradition is intended to attract passengers. On the other hand, the art features are influenced by popular urban visual culture where representation of movie stars (mostly actresses) is a common subject. The paintings sometime look like Mughal or Rajput miniatures' female characters. In addition to this, animals like lion, tiger, parrot, and peacock are depicted. The reason for mentioning this is to show that there is a correlation between the popular visual culture and natural figurative objects. In some Rickshaws, landscape has become the popular subject. One of the interesting similarities with other tribal art tradition is that here the Rickshaw artists are mostly anonymous. It is a common tendency in most of the tribal visual languages, that they make art work collaboratively instead of making it individually. But recently it has been noticed that by the influence of individualistic culture, some tribal artists also have started to inscribe their symbolic name. The semiotic analysis reveals that this tradition frequently uses both iconic and symbolic representation dominantly.

Traditional painting represented in a scroll format is not a very common feature in Indian cultural context. The reason to make representation in such format is to narrate stories. So, the narration of stories through visual elements is the main feature of the scroll painting tradition in West Bengal. Now the basic question is why does this tradition narrate stories into visual format instead of using verbal language? The answer is multidimensional; such as, this community teaches its community members through showing the paintings, and by singing relevant songs. The artists of scroll painting of Bengal depict images of a few historic and patriotic characters, mythological incidents, religious icons and events, contemporary happenings or social issues to make people aware of that. This approach of making art and demonstration to the audiences can be seen as a fundamental version of multimodal teaching strategies. Therefore, it is clearly identified that this community uses visual art as a main

language to communicate their thoughts and emotions. On the other hand, this tradition serves an important role to re-generate aesthetic sensibility among the viewers of all age group. In this traditional art practice, the use of natural color is also a noticeable feature which is found in other traditional arts made by traditional artists. The artists of this community do not have any professional knowledge regarding the use of representational methodologies and materials. They employ their own strategies for the same and collect art-making materials mostly from nature (colors from flora and fauna) to articulate their visual language. The semiotic analysis of this tradition reveals that the most dominating representation feature is iconic representation and the subordinating feature is indexical representation.

Chilika Lagoon fishing community members' visual language is quite different from the above discussed traditions. In this tradition, artists are very much influenced by their culture and environment. In this regard, in an article, Lubart (1990) suggested that the "effects of culture on creativity are understood within an interactive framework that incorporates both the person and the environment". Like the above-mentioned art traditions, Chilika Lagoon fishing community's art tradition is also influenced by cultural praxis, rituals, religious belief, myth, and daily life purposes. The semiotic analysis reveals that, in this tradition the visual language is used as a direct approach of communication where most of the visual elements are iconic representation. For example, images of Hindu Gods and Goddesses - Laxmi, Ganasha, Jagannath etc. And, in some cases, symbolic representation is found; such as - the invitation logo of marriage, birthday or other such occasions (representation through text). Here, the artists use typography as visual element to make the communication close ended.

In case of *Khovar* and *Sohrai* paintings of Hazaribag, it is observed that the artists are very much connected with their natural environment, their cultural praxis and religious belief. Like the above-mentioned art traditions, the tribal artists of Hazaribag directly collect natural colors from their surroundings and mostly depict animals and floral motifs. In this tradition, artists mostly use symbolic representation. Thus, it is clearly observed that there are many similarities among all these five art traditions in terms of representational approach, representational content and art mediums. And, the art forms are very much connected with their environment, rituals, culture, and religious belief.

5. Conclusion

This study attempted to understand the similarities of the visual language represented by different Indian traditional artists of different regions. In this study, I mainly focused on the five significant art traditions of India, it includes - *Gond* tribal art of Madhya Pradesh, Rickshaw art tradition of Allahabad (Uttar Pradesh), art practice of *Chilika* fishing community's art practice of Odisha, *Patachitra* (Scroll Painting) of Paschim Medinipur (West Bengal) and *Khovar* and *Sohrai* paintings of Hazaribagh. After rigorous study and analysis, the findings revealed that most of the traditions narrate the story of their own life very spontaneously and the artists are more concerned about their natural environment, religious beliefs, rituals, cultural praxis, folklore etc. The visual languages of the five traditions distinctively stand opposite of the individualistic cultural approach of art and these are driven by the artists' everyday aesthetic sensibilities. These traditions also reveal a very strong understanding of visual components that are used to narrate certain emotional, thoughtful narratives of life. Although, the artists of the tribal communities have been considered as lay people (not trained in any art traditions), their visual culture reveals its richness at a greater level. The dominating use of iconic (most dominating) and symbolic (subordinating) representation of various thoughts clearly show the convergence of visual representation technique among these five art traditions. These iconic and symbolic representations are mostly driven by the cultural praxis, rituals and religious beliefs. It can be assumed that each culture has certain culturally embedded visual codes which are used frequently by the local artists. The artists are familiar with the icons and symbols of their cultures and they use the visual codes as their own visual language. Another important finding of this study is that the artists of these five art traditions are more familiar with figurative representations rather than abstract images. This study will help visual art researchers to decode and understand the visual languages of these five significant art traditions of India.

Acknowledgment

The author is grateful to Professor Priyadarshi Patnaik, Dr. Gobinda Banik, Mr. Totan Das and Mr Partha Das for their insights, motivations and suggestions. All the images of this study were taken by the author during the field visit except the images of *Khovar* and *Sohrai* paintings. The two images of *Khovar* and *Sohrai* paintings (Fig 9 and Fig 10) were taken by Mr. Totan Das, who gave the consent to use the two images for this study. The author is thankful to Mr. Totan Das for his kindness.

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Woven Identity: Design, Motifs & Socio-Cultural Significance of Tai Phake Textiles of Nam-Phake Village, Assam

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Abstract:

This ethnographic study explores the vibrant textile heritage of the Tai Phake community of Upper Assam, where weaving is deeply interwoven with cultural identity, spiritual symbolism, and communal life. Traditionally woven by women on waist-tied looms, garments such as *Phanung*, *Pha-Phauk*, *Scin*, and *Nang-wat* are worn across all age groups, with variations in colour and pattern reflecting age and occasion. Rooted in oral tradition, the knowledge of weaving and natural dyeing is transmitted across generations. These traditional clothing hold significant value in both life-cycle rituals and everyday use, expressing the community's ethos of unity in diversity. Motifs are imbued with symbolic meaning drawn from nature, belief systems, and collective memory.

Using qualitative methods, this research draws on extended field visits, oral interviews with weavers and elders, observation, photographic documentation, and motif analysis. The study documents the processes of weaving on waist-tied looms, natural dyeing techniques, symbolic uses of motifs, and the transmission of knowledge through generations, primarily through women. However, this heritage faces growing challenges. Alongside the decline in traditional weaving practices, The Tai Phake also struggle with the decline of their language, traditions, and attire, which together create an interconnected system of cultural continuity. Globalization, migration, and the influx of factory-made textiles have disrupted local economies and daily practices. Despite these pressures, the community continues to assert its identity through its textiles, which are woven not just from thread, but from memory, belief, and belonging. Although digital tools and online banking have been incorporated into daily life, these changes coexist with traditional customs.

This study underscores the significance of Tai Phake weaving as a living, adaptive cultural practice. It contributes to broader conversations on indigenous resilience, intangible heritage preservation, and sustainable cultural continuity. The documentation aims to support future safeguarding efforts by offering an in-depth study of an evolving yet rooted textile tradition.

Keywords: Cultural Identity, Indigenous Weaving, Motif Study, Ritual Clothing, Tai Phake Textiles.

Article History: Article Received: 26-06-2025, Revised: 04-08-2025, Accepted: 15-08-2025.

1. Introduction

The Tai Phake community is one of the smallest groups of the broader Tai communities who migrated and settled in Assam in the latter part of the 18th century. Nestled amidst lush greenery, approximately 60 kilometers from Dibrugarh in Upper Assam, lies Nam Phake, a remote Buddhist Tai Phake village beside Burhi Dihing river known for its cultural integrity and spiritual significance. Home to one of Assam's largest Buddhist monasteries, the village remains disconnected from mobile networks yet deeply connected to its roots. The preservation of ethnic identity has always been a priority for all ethnic groups, regardless of how globalisation has impacted each and every community. Despite a dwindling population with only 80 families, the Tai Phake community continues to actively preserve its language, rituals, textiles, food practices, and ethnic identity. The Tai Phake community of Assam preserves a deeply rooted textile tradition that reflects their Buddhist beliefs, cultural identity, and social values. (Kurmi, 2023).

Figure 1: Nam Phake village map (Source: Local Nam-Phake Museum)

During the visit, the member from the Tai Phake museum warmly welcomed the author with traditional meals, and she spent the night in a Chang Ghor, a stilted bamboo house typical of the region. Beneath almost every such home, women work on traditional back-strap looms, crafting vibrant textiles marked by checks, stripes, and minimal extra weft. Characterised by minimalist stripes, checks, floral motifs, and vibrant colour, Tai Phake textiles embody Buddhist aesthetics of simplicity,

balance, and harmony. Bags are woven, often incorporating extra-weft techniques. Clothing colour and style vary based on age and marital status. Married women wear subtly different hues and draping styles, while widows have no prescribed dress code but they use dark colours like deep blue; men typically wear checked Phanung (lungis). The community also continues the ancient practice of natural dyeing, drawing inspiration from their natural surroundings and the symbolic palette of the Buddhist flag. The unique loom structures and weaving aesthetics reflect cultural specificity and the resilience of a community striving to protect its intangible heritage. Women typically participate actively in the weaving process, whereas men do the handholding supports, such as helping to fix the loom and collecting raw materials from the market. They used hand-spun Eri, Muga, and cotton to weave the fabric. In modern times, however, threads like wool, polyester, filament, and other readily available materials have been utilised in addition to silk. They make the clothes according to their requirements using the conventional "Ki Hook"(handloom).

Figure 2: Flag of Nam Phake Monastery, Tong-Khwan (Hand woven by a woman producer of Tai Phake village)

Tong-Khwan: The Tai Phake community takes inspiration from the Buddhist flag when making clothes. The flag consists of five vertical bands of blue, yellow, red, white, and orange. These colours embody spiritual and philosophical values through hues, shades, and blue, yellow, red, white, and orange tones. Usually, the cloth is woven with fine bamboo sticks in three odd divisions, such as three, five, and seven. Each bamboo stick has colourful fringes hanging from it for additional ornamentation.

2. Materials and Methods

The Tai Phake communities are one of the smallest groups of people of the major Tai communities, who migrated and settled in Assam and a few parts of Arunachal Pradesh in the latter half of the 18th century. The researcher studied Tai Phake textiles and their motifs and socio-cultural beliefs in Nam-Phake village of Dibrugarh district of Upper Assam. The village is home to 80 Tai-Phake families. The place is surrounded by lush greenery, Buddhist monasteries, and a culturally rich community far from city life. Assam is home to six different Tai groups, such as Tai Ahom, Tai Aiton, Tai Phake, Tai Khamiyang, Tai Turung, Tai Shyam, and some sub-Tai groups. Every member of this community, especially women and girls, actively participates in weaving and natural dyeing. Earlier, the loom structure was fixed in one place, reflecting older weaving practices. The primary objective of this research is to document and analyze the colours, motifs, design aesthetics, weaving techniques, traditional attire, and dressing styles of the Tai Phake community. As the Tai Phake community passes down much of this knowledge, from the names of tools and techniques to the stories behind each motif through oral tradition, outsiders remain largely unaware. With the community's population steadily declining, documenting this living heritage has become increasingly urgent. The researcher conducted the study based on direct fieldwork, including interviews with local weavers, artisans, and elders, as well as visual and material analysis of textiles and tools. The documentation aims to safeguard this intangible cultural knowledge for future generations of Tai Phake youth and contribute meaningfully to textile heritage and curriculum development.

Figure 3: Men's Clothing of Tai Phake Community (Illustration done by the author)

2.1 Background

Since the 18th century, a Tai-speaking Buddhist community known as the Tai Phake settled in Upper Assam. They are maintaining a vibrant textile tradition with local indigenous knowledge of dyeing and weaving from earlier times, since they first settled in Assam. They learnt orally from their ancestors, and the knowledge of weaving, dyeing, cooking, agriculture, tradition, language, food habits, clothing, folklore continues by transmitting traditional knowledge and religious beliefs from one generation to another. According to the article by M. Devi and D. Devi, women in every household in North East India actively participate in weaving, an integral part of their socio-cultural life. (M. Devi, 2020) Another article highlighted by R. Das, the weaving by waist-tied loom and traditional natural dye practices reflects broader regional practices of using indigenous plant-based natural dye making processes within the community, collecting materials from the region only. (Das R., 2017) According to another journal article by A. Sharma, the Tai Phake community is becoming endangered daily; Only around 2,000 community members now continue to live in a few parts of Assam and Arunachal Pradesh. Their cultural heritage is increasingly at risk due to socio-economic changes, migration, and the adaptation of different cultural practices. However, this community is proud to speak in their language and protect their cultural heritage. (Sharma, 2016) It is high time to make community-based documentation; with designer-artisan collaboration with the community's society, preservation efforts are urgent and essential.

2.2 Research Gap

Though earlier studies documented the weaving customs of Assam's major ethnic groups, there is no specific research on the Tai Phake's design language, motif study, and socio-cultural references. This article uses an ethnographic study based on fieldwork and personal experience to bridge this gap.

2.2 Socio-Cultural Identity

They weave textiles for their own needs on their traditional loin-loom (Ki-Hook). Textiles are made exclusively for domestic purposes. Village women cultivate and weave on their own with Muga and Eri. Nowadays, mill-made yarns mostly replace home-spun cotton yarn. They continue to use natural dyes for their dyeing. The clothes they used daily have been woven entirely within the community, mainly by the village women on waist-tied looms. These textiles, marked by minimalist stripes and symbolic checks, are used in daily life, rituals, festivals, and life-cycle ceremonies. More than garments, they are embodiments of memory and belonging. Sometimes, together with the weaver's name and address, the designs are woven from natural sources such as birds, butterflies, flowers, trees, etc. (PHUKON, 2019). Below is a discussion of the textile products made by the Tai-Phakes, Pha-Fek-Mai, a shoulder cloth used by both men and women during social gatherings or when they go to the Buddha Vihar. It is a fine cotton cloth, motifs made with muga yarn at both ends, 2.80 - 3.00 meters in length & 1.50 - 1.75 meters wide. Pha-nung, Men's attire, used for covering the lower part of the body from the waist, mostly striped or checked patterned, colour used mostly yellow, violet, black, blue, green, white, etc. The weavers need to make two pieces of cloth, ranging from 2.00 to 2.25 meters in length and 0.70 to 0.80 meters in width. Both pieces are woven separately and stitched together.

Figure 3 shows Males wear pha-hu (turban), pha-kong-kho (similar to a towel), phanung (lungi), souh (shirt), as their primary clothing. Colour varies for the young and older generations. Pha-Kong Kho is similar for all age groups.

2.3 Dress of Married and Unmarried Women

Unmarried women usually wear Pha-pho, while married women mainly wear Nangwat to cover their breasts. The striking thing about Tai-Phake clothing is that the colours and styles differ according to
the wearer's age.

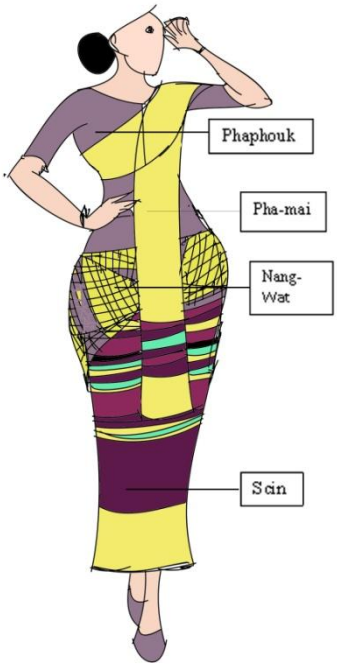

Figure 4: Clothing of Married Women
(Illustration done by author)

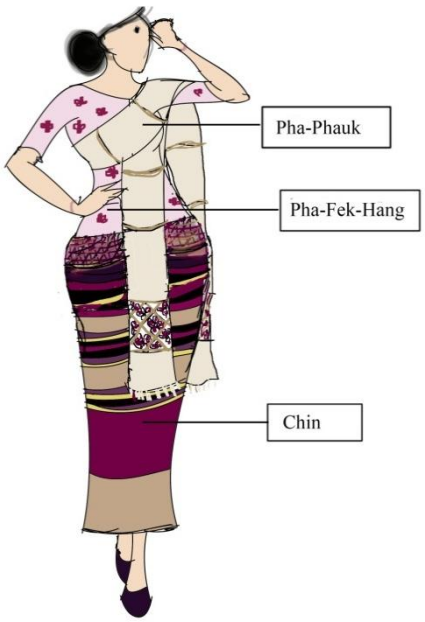

Figure 5: Clothing of Unmarried Women
(Illustration done by author)

Figure 4: Females wear Chin (mekhela), Nangwat (cloth worn in the breast, only used by married women), Pha-phok (dress worn by the unmarried and married both), Nangwat pojung (used during marriage), Chyu (shirt), Thung mok (bag), Pha-mai is the shawl used during winter, and so on. Observing her attire can identify whether a woman is married or single. The unique feature of Tai Phake clothing is that the styles differ based on the person's age.

The colour married women use is violet, yellow/sea-green/parrot green, and the older women use dark blue and beige, a subtle tone they use. With age, older people begin to use more vibrant colours without any zari. For example, young people and newlywed females have employed colours like blue, red, yellow, and pink. The elderly, however, tended to wear clothes with no glitter. Another significant feature of the Tai-Phake is the absence of a separate clothing code for the widow.

Dress during marriage

For brides, they use hand-woven Muga Pha-Phauk, along with Pink Checked Nang-Wah and Magenta with Off-White Chin and White cotton/mulberry silk Pha-Mai with Muga extra weft motif on it.

Figure 5 shows, Pha-Fek Hang is a traditional garment worn by grown-up girls. Women wrap it over the Chin (Sin) to cover the breast, allowing both ends to hang in front. Artisans typically decorate the Pha-Fek Hang with delicate white cotton yarn, weaving floral motifs at both ends using coloured threads. The colour of the Chin varies according to the wearer's marital status. Young girls usually wear Chins in shades of magenta and off-white, Muga, or golden yellow in the lower section. In contrast, the upper part features magenta, black, off-white, Muga, or golden yellow stripes.

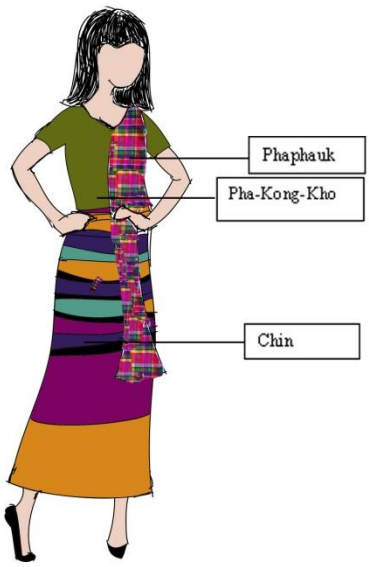

Figure 6: Clothing of young girls of the Tai Phake community (Illustration by the author)

Dress for kids

Figure 6: Ages from 3 to 14, they usually wear Phapauk, Chin, and Pha-Kong-Kho; their chin is different in colour from those of the elderly people. different colours have been used, even the Pha-Kong-Kho, similar like Pha-Phek Hang, but they make with different colours mostly inspired by the Tong-Khwan, (The Origin and Meaning of the Buddhist Flag), sometimes floral motifs are also added in Pha-Kong-Kho. Boys may wear Pha-Nung in occasions, but in regular life they wear Shirt and pants,

3. Local Tai Phake Motifs (Extra Weft motif)

Locally termed, Tai Phake motifs are simple in terms of visual intricacy and have a strong connection to their rural way of life, Theravāda Buddhist values, and communal identity. These motifs may vary slightly between families or villages like Namphake, but consistently carry spiritual and social meanings. There are some motifs used in Tai Phake textiles, like Ngi Ngao Kham (mythical bird represents protection and ancestral belief), Dok-Phai (Bamboo flower represents renewal), Dok Champa (a floral motif represents purity, love and devotion), Khoum Tai (Circular or semi-circular motif represents festivity), Mei-Huo (Lamp flame represents spiritual enlightenment), Mak Dok star or seed motif represents fertility, growth, and the life cycle), Nam Lai (zigzag lines represent flowing water, continuity), Kho-Muang (Claw), the most commonly used motif is Phai Lin (Diamond motif).

3.1 Motifs used in Nang Wat

Figure 7 & 8: Tai Phake women's garment (Nangwat) fabric featuring multi-coloured checks and extra-weft 'Khon-dok' motif band. This textile, woven on a back-strap loom, displays the signature checkered pattern in vibrant magenta, yellow, green, and purple hues reflecting the Buddhist flag. The geometric extra-weft band at the border signifies protection and balance, commonly found in ceremonial or festive attire.

Figure 7: Tai Phake women's garment (Nangwat) fabric featuring multi-coloured checks and extra-weft 'Khon-dok' motif band. Motifs used in Nangwat: Dok Mai, or floral motifs have been used by married women. These fabrics were made by Mrs. Emok Weinghen (Woman from that village)

Figure 8: Yellow check textile with woven details, commonly used as daily wear among Tai Phake women

Figure 8 shows yellow check textile with woven details, commonly used as daily wear among Tai Phake women. A simpler piece highlighting the structured use of checks in yellow and purple, often used for lower garments like cha-fan. The detailed horizontal bands are woven using subtle extra-weft techniques, occasionally customized based on age and status.

3.2 Motifs used in Thung (Bag)

Figure 9: Hand-woven in Loin-Loom, shoulder bag with floral extra-weft motifs on a black base. The fabric is made by Emok Weigken, a woman produce of that village. This handmade bag illustrates the Tai Phake community's use of extra-weft weaving to produce vivid red, green, yellow, and pink floral patterns. The symmetrical repetition of flower motifs symbolizes fertility and the cyclical rhythms of nature, and is often associated with youthful or festive wear. The shoulder bag is in progress on a back-strap loom, displaying rose-like extra-weft floral motifs. This work-in-progress textile features densely woven flower motifs, echoing rose or rosette forms, bordered by fine vine-like bands. These designs emphasize growth, life force, and continuity themes, demonstrating the weaver's control over complex extra-weft insertions.

Figure 9: Hand-woven in Loin-Loom, shoulder bag with floral extra-weft motifs on a black base. The fabric is made by Emok Weigken, a woman produce of that village

4. Looms and their parts

Women in the Tai Phake community of Assam primarily operate the weaving frame, locally known as a Ki-Hook, which plays a vital role in their cultural and economic life. Through weaving, they meet the household's clothing needs and strengthen their economic independence. (Goswami, 2002). Tai Phake women traditionally use the *kokal bandha sal* technique to weave narrow fabrics, typically measuring up to one and a half feet in width. (Borah, 2015) The loom is waist-tied, with the weaver's body providing the necessary tension via a strap traditionally crafted from deer skin. Weavers manipulate two sets of warp yarn, using a large *maku* (shuttle) and a *goroka* (bamboo lifting rod) to interlace the weft and warp threads. (Dutta, 2019). Although modest in mechanical complexity, this method supports a high degree of skill and control.

The weaving setup comprises approximately fifty-two to fifty-seven accessories from indigenous materials such as bamboo, wood, deer skin, and *phragmites*. Key components include the *kounkak* (bobbin hanger), *kounpan* (spinning wheel), *louwat* (pirn), *tanw* (shuttle), *tam hang* (bobbin), *banbeyan* (large sweft), *kounkhya* (sweft hanger), *phum* (reed), *kham phum* (batten), *ot at* (a loom part), *kounkai* (temple), *khau huk* (warp thread harness), *maiyep key* (treadles), Cetap (Lease rod), Keu a thin long bamboo stick) and *cannak* (beam of the loom) (Saikia, 2020). This indigenous weaving system is being passed down by the Tai Phake community as a sustainable textile tradition, enhancing their self-reliance and cultural identity. (Devi, 2021)

Maku - Tao, Khun Myan - spine of Porcupine which is used for selecting extra thread, Loom - Ki-hook, Belt - Chai Tanna, Nachoni - Ot Er, they worked on loin loom, nowadays they made it modular and movable so that they can work according to the climatic condition.

Figure 10: Parts of the Ki -Hook (Handloom) The pictures are clicked by the author during the visit

5. Traditional Dyeing Practices among the Tai Phake Community

The Tai Phake people have long practised natural dyeing, drawing on their ecological knowledge, Buddhist beliefs, and textile traditions. They primarily use blue, yellow, red, white, and orange, in their dyeing practices. (Barua, 2018). Dye sources are entirely natural and locally available like turmeric *(Curcuma longa)* for yellow, lac *(Kerria lacca)* and madder root *(Rubia cordifolia)* for red, indigofera leaves *(Indigofera tinctoria)* for blue, and teak leaves *(Tectona grandis)* or jamun bark *(Syzygium cumini)* for deep browns and black tones (Das R., 2017). In order to improve dye absorption and fixing, cotton or eri silk yarn are pre-treated by scouring and mordanting, frequently with alum, ash water, or plant-based acids like tamarind extract. The yarns are sun-dried after dyeing and then kept for weaving. The entire process is manual, sustainable, and transferred orally, mostly by women of the community, who are essential to preserving this system of traditional knowledge. (Phukan, 2020). These traditional dyeing processes not only reflect the Tai Phake's spiritual and ecological perspective but also contribute to the persistence of their ethnic textile identity in the face of industrialisation.

6. Conclusion

Despite having a small population, the Tai Phake community continues to take immense pride in preserving their rich ethnic heritage, including their language, customs, multicoloured textiles, local bamboo-made architecture, religious practices, and intricate knowledge systems tied to nature and society. This long-lasting cultural continuity is evidence of the Tai Phake community's ingrained fortitude and relentless commitment to their identity. They are still in danger of losing their traditions in their original form due to factors including globalisation, socioeconomic changes, cultural degradation, and modernisation. There is an urgent need to document and record the craft practices. Without active support and intergenerational transmission, this community's future will be difficult, and the Tai Phake community's textiles will only be preserved and found in Museums.

7. Acknowledgement

The author sincerely thanks Mr. *Paim Thi Gohain*, his family of Nam Phake village, and Mrs. *Eng Mou Pya Tsmoung* of the Tai Phake Samity for their invaluable support and hospitality during the fieldwork. The author is grateful to the officials of the DC Handloom, Dibrugarh, and WSC, Guwahati, for their assistance during the field work. Conducting the research in a remote location like Nam Phake village, which has challenges like language barriers, limited transportation, and low connectivity, though this research is deeply enriching. This experience allowed her to witness the resilience and cultural richness of the community, for which the author remains truly grateful.

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Ajjaram Brass Craft: Preserving a Centuries - Old Artisan Heritage

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Abstract:

Background:
Ajjaram, a small village in the West Godavari district of Andhra Pradesh, is home to a centuries-old brass industry that blends craftsmanship, tradition, and cultural identity. For over 200 years, artisans in Ajjaram have been creating handcrafted brass utensils, temple accessories, and agricultural tools, preserving an art form deeply rooted in rural India's heritage.

Methods:
This research is based on fieldwork conducted in Ajjaram, involving interviews with artisans, examination of traditional tools and artifacts, and the collection of oral histories. Archival research and literature review were also conducted to explore the historical evolution of this industry and identify the existing research gap.

Results:
Findings reveal that nearly 85% of the village population is dependent on the brass industry. Despite its historical and cultural value, the craft faces critical challenges including mechanization, youth disinterest, lack of documentation, and insufficient institutional support. However, the unique value of Ajjaram brassware—marked by fine detailing, durability, and cultural symbolism—offers a foundation for revival.

Conclusion:
The study highlights the urgent need for preservation strategies such as formal craft education, branding initiatives, government-backed schemes, and wider market access. The inclusion of fine arts education and digital marketing could open new opportunities for sustainability and growth.

Scope/Significance:
This article aims to fill a significant research gap by documenting the socio-economic and cultural aspects of Ajjaram's brass industry. It proposes actionable measures to ensure the survival and revival of this endangered rural craft, contributing to both cultural preservation and rural development.

Keywords: Ajjaram, Brass Craft, Cultural Heritage, Handicrafts, Rural Industry, Traditional Art.

Article History: Article Received :02-07-2025, Revised: 02-09-2025, Accepted: 03-09-2025

1. Introduction

Art, craft, and design are essential forms of human creativity. Art expresses emotions and thoughts; craft demonstrates skilled, often traditional, hand-made work; and design combines performance with aesthetics. Together, they shape culture, heritage, and creativity, enriching everyday life through meaningful, beautiful, and practical creation rooted in both tradition and modernity. Andhra Pradesh is famous for its rich handicraft heritage, including Kalamkari textiles, Etikoppaka lacquerware, Kondapalli dolls, Bobbili veena making, and leather toys. Artists combine tradition with creativity and produce complex metalwork, woodwork, and handloom textiles. These handicrafts reflect the dynamic culture of the state and the superiority of centuries-old craftsmanship.

The art of brass in rural India has immense historical and cultural value. In Ajjaram village of West Godavari district in Andhra Pradesh, this tradition is not just a means of livelihood—it is a heritage. For more than 200 years, villagers have been making brass items, including temple implements, farm tools, and household utensils.

Existing literature offers very limited information on Ajjaram's brass-making tradition. The Byrraju Foundation (n.d.) provides a brief overview of the village's heritage, while journalistic accounts, such as Sailendra (2023), highlight the continued practice of bell-making by successive generations. However, there is almost no comprehensive academic documentation that captures the artisans' methods, historical evolution, or socio-economic impact. This absence underlines the need for focused scholarly research.

This study contributes uniquely by offering the first systematic documentation of Ajjaram's brass tradition. Unlike earlier references that only note its existence in passing, this research provides a detailed analysis of its historical evolution, artisanal practices, cultural symbolism, and present socio-economic challenges. By combining oral histories, field documentation, and archival review, it fills the academic void and provides a foundation for policy support, heritage preservation, and cultural revival. Without such efforts, this valuable cultural heritage is in danger of being forgotten or misrepresented.

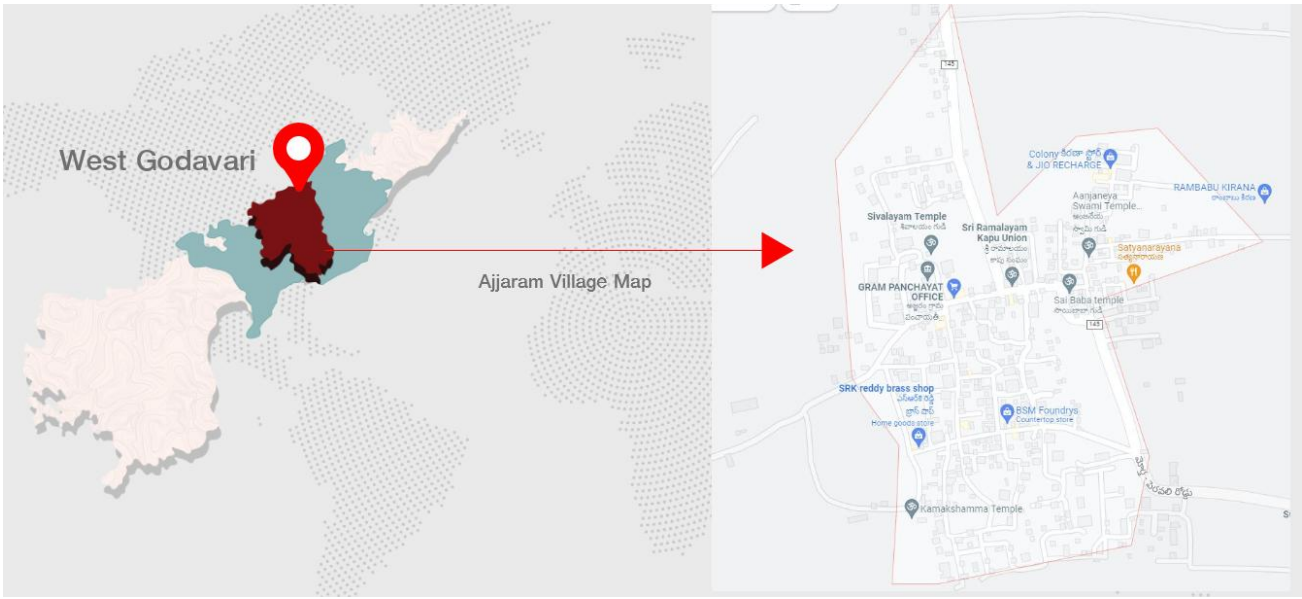

Figure 1: Location map (Ajjaram n.d.)

1.1 Historical Background

There is no clarity on how the town got its name Ajjaram. According to the locals, a 16th century poet named Ajjarapu Periyalingam received this as a gift from the Gajapati kings, and since then, it is said that the town got its name Ajjaram due to this Agrahara.

1.2 The Public perceptions regarding the health implications of bronze metal

Known as bronze in many Indian languages, the bronze has been an important part of traditional Indian kitchens for centuries, not only for its use but also for its health-enhancing properties. While its use has declined in modern times, ancient wisdom—especially Ayurveda—highlights the many health benefits of cooking and eating in bronze vessels. The metal, dating back to the Bronze Age 3,000 years ago, is known for its healing properties. Ayurveda refers to bronze kitchenware as the "hand of grace" and emphasizes its role in boosting intelligence, improving eye sight, boosting immunity and helping with weight loss. Unlike modern non-stick or aluminum cookware, a food made of bronze is said to retain up to 97% of its nutrients, which often leads to significant nutrient loss. In addition, bronze not only purifies food but also preserves its warmth due to its excellent heat retention properties. This allows meals to stay fresh and nutrient-rich for a longer period of time. Traditionally, bronze vessels were common in households, representing health and cultural wealth. As we become more conscious of holistic well-being and sustainable living, reviving the use of bronze kitchen appliances is a step towards regaining the ancient wisdom that was once the foundation of healthy Indian living.

2. Materials and Methods

2.1 Data Collection

Data for this research was collected through a combination of fieldwork, qualitative interviews and archival research. A significant portion of the study was conducted in the village of Ajjaram, where direct conversations with local artisans provided valuable insights into their techniques, challenges and life experiences. In-depth interviews were conducted with senior and young artisans to understand the generational perspectives on the brass industry. In addition, various artifacts, tools and finished products were examined to document the traditional methods and materials used in production. Oral histories collected from village elders helped to trace the historical evolution of the craft over time and its cultural significance. In addition to the primary data, available archival records and limited secondary literature were reviewed, although the paucity of formal research on Ajjaram's brass work highlighted the urgent need for further academic research.

Figure 2: Process of making brass water pot

2.2 Tools and Techniques

Metal casting in brass and bronze is a traditional art that is widely practiced across India, especially to create utensils and temple decorative items. Using techniques such as last-wax casting and sand casting, artists mold complex designs with precision. Brass and bronze are suitable for their durability, aesthetic attractiveness and cultural significance. Common items include dinner plates, cooking utensils, temple bells, lamps (lamps), kalash and Makaratoranas. These products are not only active but also have deep religious and cultural symbols. The casting process involves melting, molding, finishing and polishing, which are often done by hand. This ancient craftsmanship continues to reflect India's rich metal and spiritual heritage. Artists traditionally use hand tools such as chisels, hammers, anvils, and melting furnaces to design brass objects. Natural molds and manual casting processes are used to maintain the integrity of the designs. The finishing is done by intricate polishing and engraving techniques.

Figure 3: Hand Bell, Temple Bell, Makara Torana, Water Pots (from left to right)

3. Results and Discussion

3.1 Scope of Products

The village of Ajjaram has received widespread praise for its varied and intricately designed brass products that meet domestic and religious needs. The artists here, with their seasonal skills, make a wide range of objects that showcase the depth of their craftsmanship. In household appliances, objects such as bindels, gundigals, kugules, and tin bowls are typically produced, each designed keeping in mind the practicality and elegance. The village is equally famous for the temple's architecture and rituals by supplying sacred objects such as Makartoranas, kalash, covers of flag pillars and intricately moulded panchaloha idols. Ajjaram's specialty is the making of brass temple bells available in various sizes ranging from a lightweight of 50 grams to a weight of 500 kg. Not only do these hours work, but they are also appreciated for their resonating voices and decorative aesthetics. Apart from these, the village also manufactures durable 10 liters of brass sprayers used in agriculture. What makes this brassware stand out is its fine detail, high durability, and the intense manual effort used in each craft. Historically, raw materials were collected from industrial centers such as Calcutta and Madras, although manufactured products had a distinct identity, which separated them. The fame of these artists spread across Andhra Pradesh through shops known as "Ajjaram's Brass", which became synonymous with quality and traditional superiority.

3.2 Socio-economic Impact

The brass industry in Ajjaram plays a key role in shaping the socio-economic structure of the village. Almost 2,500 of the population of approximately 2,700 are directly or indirectly engaged in this ancient occupation.(Sailendra, 2023) For many families, brass handicrafts are not only a tradition but also a reliable source of livelihood that has supported generations. This cottage industry provides employment opportunities at different levels of production—from metal casting and molding to

polishing and sales—thereby creating a strong local economy that extends beyond the artisans. The financial stability it provides enhances financial independence, allowing families to meet their basic needs, educate their children, and invest in their communities. Moreover, the industry has become a hub for handicraft activities, which attract workers from the surrounding villages who migrate to Ajjaram in search of better opportunities. The social nature of handicrafts also reinforces social bonds, as families often work together in workshops or small home-based units. In summary, the brass industry is not just a profession in Ajjaram- it is a source of livelihood that sustains the economic and social well-being of the village.

3.3 Challenges Faced

Despite its immense heritage and economic importance, the brass industry in Ajjaram is currently struggling with a number of challenges that threaten its survival. One of the most important problems is the increase in the effect of mechanization. With the growth of heavily produced goods, manufactured in cheap, quickly manufactured factories, the demand for complex hand-crafted brass goods has declined considerably. This change in consumer preference has sidelined traditional artisans and reduced their market share. Another major concern is the migration of youth. The youth are moving away from traditional handicrafts for modern and urban employment opportunities. The knowledge and techniques that once went from one generation to another are now in danger of disappearing. Economic instability further complicates the problem. Artisans often face a decline in sales while dealing with rising raw material costs, which has pushed many into cycles of debts and financial hardship. In addition, institutional negligence has deprived the industry of meaningful support. Noteworthy is the lack of targeted government schemes, incentives or infrastructure that will help sustain and modernize the craft. Without intervention, these challenges could lead to a decline in the cultural heritage that has defined Ajjaram for centuries.

3.4 SWOT Analysis

The findings on Ajjaram's brassware industry can be synthesized through a SWOT (Strengths, Weaknesses, Opportunities, and Threats) framework to highlight both its enduring value and the challenges it faces.

Strengths: Ajjaram's brassware tradition is distinguished by fine craftsmanship, durability, and cultural symbolism. The village produces a wide range of domestic and ritual objects, including its renowned temple bells, which are admired for their resonant sound and intricate design. With nearly 2,500 villagers directly or indirectly engaged in the craft (Sailendra, 2023), the industry sustains livelihoods, preserves heritage knowledge, and fosters community cohesion.

Weaknesses: Despite its strengths, the industry struggles with dependence on labor-intensive manual methods, rising raw material costs, and limited access to broader markets. Many artisans face financial instability and debt cycles. The younger generation often views brass-making as less rewarding compared to modern employment, leading to declining interest in continuing the tradition.

Opportunities: Growing awareness of sustainable living and demand for authentic handmade crafts offer new avenues for expansion. Heritage tourism, digital marketing, and online platforms can connect Ajjaram products to national and international buyers. Recognition through a Geographical Indication (GI) tag would strengthen the craft's identity and market value. Training programs that blend traditional skills with contemporary design could attract younger artisans and open new markets.

Threats: The increasing dominance of mass-produced, low-cost alternatives has eroded demand for handcrafted brass items. Youth migration to urban areas reduces intergenerational transmission of artisanal knowledge. Price fluctuations in raw materials add further uncertainty. Without timely policy support and institutional recognition, Ajjaram's brass tradition risks cultural erosion and possible decline.

4. Conclusion

Ajjaram stands out as a powerful symbol of India's craftsmanship, but its future depends largely on timely and consistent interventions. While the village identity is deeply rooted in the tradition of brass handicrafts, the lack of modern support systems has pushed it towards the margins. A multi-pronged approach is needed to revive this legacy. The introduction of formal education in fine arts and traditional handicrafts will inspire younger generations to see their legacy as a viable and respectable career path. Training programs that combine traditional skills with modern design thinking and marketing techniques – especially through digital platforms – help artists reach a wider audience and compete in contemporary markets. Government programs such as skill development schemes, subsidies on raw materials, platforms to showcase Ajjaram products at national and international fairs will play a key role. The installation of a GI (Geographical Indication) tag on the Ajjaram brass material not only recognizes its uniqueness but also protects it from simulations. In addition, integrating this art into academic curricula at the school level can foster early appreciation and participation. By bringing together local artists, policy makers, academics, and vendors, Ajjaram can regain its past glory and have the potential to re-emerge as a thriving center of cultural and economic consciousness.

Acknowledgement:

The authors gratefully acknowledge the artisans and elders of Ajjaram village for sharing their knowledge and experiences, which were invaluable to this study. We are especially grateful to Achari, aged 52, a skilled artisan; Kotilingam**,** aged 82, the respected owner of B.S.M Foundries; and Hemanth**,** aged 35, an active entrepreneur in the brassware business. Their contributions were instrumental in shaping the depth and authenticity of this study.

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Reimagining the Royal Craft of Hookah: Tradition, Transformation, and Sustainable Design Interventions

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Abstract:

The hookah, historically associated with royalty, luxury, and sociability, embodies a rich cultural legacy that has evolved across centuries. Originating in South Asia and the Middle East, its prominence in Mughal courts elevated it into a symbol of aristocracy, artistry, and refinement, influencing craft traditions in glass, metal, and gemstone ornamentation. Over time, hookah culture diffused across Islamic and colonial contexts, adapting materials and forms, from coconut-based rural variants in India to elaborate *bidri*-ware and European adaptations. Despite the rise of modern smoking habits, the regal aura of hookah continues to be preserved through antiques, auctions, and contemporary adaptations. This paper adopts a mixed methodology combining historical research, design analysis, and user-centered innovation to address three interlinked objectives: (i) examining hookah culture, traditions, and preservation practices, (ii) critically analyzing hookah design evolution across Safavid, Mughal, Ottoman, and modern contexts, and (iii) proposing healthier innovations to sustain its legacy.

Archival research, museum studies, chronological mapping, and literature review are employed to trace cultural significance and preservation methods. Comparative design analysis and visual examination of artifacts reveal transitions in materials, techniques, and uses. To integrate cultural authenticity with contemporary needs, the paper has employed user-centered tools such as surveys, brainstorming, prototyping, and evaluation. The paper concludes that hookah, beyond its functional role as a smoking device, it can be reconsidered as a royal craft item that integrates artistry, ornamentation, and cultural symbolism. Proposals for design innovation emphasize sustainability, healthier consumption, and modern ergonomics while respecting traditional aesthetics. By bridging historical tradition with contemporary user needs, the paper presents pathways to sustain the royal legacy of hookah in a form that is both culturally resonant and socially responsible.

Keywords: Smoking culture and tradition, Tobacco and Shisha, Hookah design, Design innovation, User-centric design, Design evolution.

Article History: Article Received :30-06-2025, Revised: 06-09-2025, Accepted: 08-09-2025

1. Introduction

The name Hookah was known as ‘Shisha’ in the ancient times and later ‘Huqqa’ in the mediaeval times. The term Hookah is derived from the word ‘Huqqa’ means ‘vase’ or ‘vessel’. Hookah is a smoking device with cool smoke inhale system with help of a smoking pipe and filtered process (Martin, 2024). The smoking culture had been largely practiced over a long period of time, date back to 8000 BC in Egypt. Gradually the smoking tradition and elements has been changed over the time and depending on the culture. After Shisha, Tobacco became the most smoked element among the communities. The concept of Hookah originated during the Safavid dynasty. And later, with the Persians, the hookah was introduced in India. During the 16th -17th century, the royal mechanism of smoke inhaling had been invented in the Mughal empire by the Persian physician of Akbar, in Fatehpur Sikri, India. Then the journey of the magnificent hookah spread across the eastern and near eastern parts, comprehensively in the Islamic countries. The design of hookah started representing its glory with the elegance of precious stones, intricately carved surface engraving, generous use of expensive metals and also got popular as a craft.

Over the periods, with the change of dominions, the hookah design has been evolved, also new smoking culture entered in India with the Americans and British. But the Hookah tradition was still be carried by the Zamindars, aristocrats and many other wealthy people (Chatterjee, welcome collection, 2022). Hookahs were offered in the gatherings, parties, or in the meetings to represent their class of aristocracy. The hookah culture was so popular at that period, that an urge to adopt the hookah smoking rose in the native villagers. Inspired by the mechanism of hookah, they started a smaller version of the hookah with the easily available materials, like coconut shell, baked clay and wood. During the period of the zamindars, particularly under the Mughal Empire and later during British colonial rule, hookah smoking was a significant cultural practice among the elite and landed gentry. The zamindars, who were landowners and often held considerable social and political influence, adopted hookah smoking as a symbol of status and leisure. Different regions had their own styles and traditions related to hookah smoking. For example, in Bengal, the hookah was often a centerpiece in the zamindar’s courtyard, while in Rajasthan, it was integrated into the royal customs and daily life of the nobility (Chatterjee, welcome collection, 2022).

2. Literature review

The present section of literature review delves deep into the origin, legacy, cultural diffusion and adaptation of hookah smoking practice. The section also forwards a part on health concerns and possibilities of redesign the hookah for ensuring sustainability to the smoking culture

2.1 Royal Origins and Courtly Legacy

The hookah (*ḥuqqa*, shisha, narghile) is one of the most recognizable artifacts of early modern Asian courts, emerging as both a smoking device and a cultural emblem. Its origins are linked to ancient smoking practices in Africa and Asia, where rudimentary smoking instruments were fashioned from natural materials such as stones, bones, and clay (HI-TECH Club, 2024). The introduction of tobacco into Eurasia through global trade in the sixteenth and seventeenth centuries provided the foundation for the hookah's institutionalization in courtly culture (Kazemi, 2016).

In Safavid Iran, the hookah became an emblem of aristocratic refinement, deeply tied to the material and commercial networks of tobacco (BBC, 2009; Kazemi, 2016). Within Mughal India, it achieved a distinctive prominence, appearing in portraiture and luxury objects such as *bidriware* huqqa bases, which were integral to court ritual, leisure, and diplomacy (Sardar, 2003; Metropolitan Museum of Art, 2003). The Ottoman Empire, in parallel, witnessed the waterpipe's entrenchment in both elite salons and public coffeehouses, provoking debates over morality and sociability while cementing its place in early modern cultural life (Grehan, 2006).

These courtly and imperial associations established the hookah as a symbol of power, refinement, and hospitality. It functioned not merely as a device for smoking but as an artifact that mediated conversations, alliances, and ceremonies. This royal legacy underpins the enduring cultural prestige of the hookah in subsequent centuries (Chatterjee, 2022a; Martin, 2024).

2.2 Cultural Diffusion and Adaptation

Following its royal consolidation, hookah culture spread widely across Asia, the Middle East, and beyond. In the Ottoman Middle East and North Africa, it became central to coffeehouse sociability (History cooperative, n.d.; Martin, 2024). In South Asia, colonial encounters reframed the huqqa as both a continuation of aristocratic practice and a contested cultural marker in the hybrid spaces of Calcutta's colonial elite (Chatterjee, 2022b).

In Europe and later in diasporic contexts, the hookah was reinterpreted as both a nostalgic object of heritage and a modern recreational commodity (Marrakchi, 2021; Khalil Mamoon, 2023). The adaptability of the hookah across different geographies illustrates its resilience as a cultural form, retaining traces of its royal origins while accommodating new social and commercial frameworks (Naara Café, n.d.; Icon hookah, n.d.).

2.3 Health Concerns and Re-evaluation

Despite its aristocratic and cultural significance, modern medical research has revealed significant health risks associated with hookah use. Contrary to widespread perceptions of water filtration as a safety measure, studies demonstrate that hookah smoke delivers substantial amounts of nicotine, carbon monoxide, heavy metals, and carcinogens, often exceeding those from cigarettes (Akl et al., 2010; Waziry et al., 2017). Waterpipe smoking has been linked to cardiovascular stress, respiratory disorders, and long-term addiction, particularly among youth (Bhatnagar et al., 2019; Klein, 2008). Although this body of research underscores the hazards, it also identifies the technological determinants of harm—particularly charcoal combustion, heating temperatures, and flavoring agents—as the most critical contributors to toxicant yield (Jaccard et al., 2020). This provides pathways for rethinking design in line with public health without abandoning cultural heritage.

2.4 Prospects for Redesign: Sustaining the Royal Legacy

Recent scholarship emphasizes the potential for innovation in hookah design to address health risks while retaining cultural and artisanal significance. Alternatives such as electric heating systems eliminate the most harmful emissions associated with charcoal combustion, while controlled temperature mechanisms reduce the generation of aldehydes and polycyclic aromatic hydrocarbons (Jaccard et al., 2020; Zaki et al., 2025). Innovations in filtration, herbal substitutes, and material design also indicate attempts to align the hookah with twenty-first-century wellness discourses (European Business Review, 2023; Hookah-filters, n.d.).

Importantly, the preservation of craft traditions—ornate metalwork, glass, and artisanal assembly—ensures continuity with the hookah's royal and courtly legacy. In this sense, redesign is not only a public health imperative but also a cultural strategy: it allows the hookah to remain a living tradition, reimagined for new contexts while paying homage to its Safavid, Mughal, and Ottoman heritage (Metropolitan Museum of Art, 2003; Khalil Mamoon, 2023).

The literature demonstrates that the hookah is a hybrid object—royal artifact, cultural mediator, and public health concern. Its historical and artistic significance across courts and empires secures its place within global heritage, but its modern practice requires urgent re-evaluation. The convergence of historical prestige and technological innovation offers an opportunity to redesign the hookah in ways that sustain its royal legacy while mitigating health risks. Thus, scholarly and design efforts must

collaborate to reconcile cultural continuity with scientific responsibility, ensuring that the hookah's future embodies both its aristocratic past and healthier possibilities for contemporary society.

3. Objective

This paper sets out to explore the royal legacy of Hookah and new innovations in futuristic design, reflecting on its deeper patterns, challenges and practical implications.
Considering the background context of this research, the following objectives have been formulated:

I. Study of the hookah culture, tradition and preservation of the antiques.
II. Study and critical analysis of the design of hookah from ancient to modern time considering material, techniques and uses.
III. Proposing design innovations to enhance the healthy experience of the users for Sustaining the Royal Legacy.

4. Methodology

This study adopts a mixed approach combining historical research, design analysis, and user-centered innovation to address the objectives as mentioned in Table to 1. The cultural and traditional aspects of hookah are examined through archival sources, museum collections, historical texts, and documented oral traditions, using tools such as chronological mapping and content analysis. The evolution of hookah design is analyzed by comparing artifacts across Safavid, Mughal, Ottoman, and modern contexts, focusing on materials, techniques, and functional uses through visual and structural analysis.

Table 1: Representation of Objective wise methodology implemented, tools and outcome

Objectives	Tools/Techniques	Outcomes
Study of hookah culture, tradition, and preservation of antiques	Archival research, museum studies, chronological mapping, Literature review and analysis	Understanding cultural significance and preservation practices
Critical analysis of hookah design from ancient to modern times	Comparative design analysis, visual analysis of artifacts, cross-cultural synthesis	Identification of design evolution, materials, and uses
Propose design innovations for healthier experiences	Surveys, user persona development, brainstorming, prototyping, evaluation	Health-conscious, user-friendly designs that sustain the royal legacy

Finally, to propose healthier design innovations, user-cantered design methods are applied, including surveys, brainstorming, and iterative prototyping. A total 33 number of users have been surveyed in terms of their association with hookah and the smoking culture and in terms of the satisfaction level of the users with new proposed tobacco free hookah design for healthier consumption. Both qualitative and limited quantitative evaluations are used to assess the cultural authenticity, ergonomics, and acceptability of the proposed innovations, ensuring that the royal legacy of hookah is sustained in a healthier and more culturally sensitive form.

5. Smoking culture and its history

The history of hookah invention as a special device for cleaning and cooling of the smoke is lost in centuries. There is a description of 40-50 litre holes in the ground which were covered with clay. Ancient people threw a heavy stone inside the holes and closed them with a lid made of twigs covered with clay as well. They inserted through it a special pipe with a bowl on top, adding fume-extraction tube. The steam of smoke, hitting the rock, split into bubbles and was purified by passing through water. Already cooled smoke was inhaled through the shank. Such structures were used in the mountains of Afghanistan and southern Africa. People used it for smoking glucogenic and herbs to reach a soothing or intoxicating effect.

History has been traced Hookah smoking culture date back to the 8000 BC in the Arabic countries like Egypt, Sudan and the Gulf. In ancient Egypt local people particularly used carved pumpkins for shisha smoking. In fact, even today some tribes in Africa use such items. More reusable and resistant items for smoking were hookahs made out of stones, bones and baked clay. The tradition of smoke inhalation through the water filter had the tendency to improve with the development of copper and bronze processing. The most possible ways of the extending of water pipe smoking tradition were from India to the countries of north of Persia, Ethiopia, Arabia and Turkey (Alexandar, 2018). With the development of trade relations, it was brought to further Eastern areas. As hookah was a quite compact and expensive item to be traded during the early Middle Ages, local craftsmen developed this trade, as well as the manufacture of weapons and household items. In Persia, hookah was so fond by their inhabitants that they modified it almost into an unrecognizable form. Firstly, they made flasks from nut, pumpkin and porcelain. (Allen, 2022). After that, instead of straw, they began to use solid and flexible hoses made of snake skin or core. These were practical and durable hoses, which were called "snaky knots". During this period of time hookah-lovers used tobacco, which Persians used for hookah smoking. In Turkey precious metals and glass were used for hookah hoses improvement, and they used skin instead of rigid branch tubes. 500 years ago, Turkish shisha had shapes and proportions very close to the modern classic hookah (Allen, 2022). The size of hookah changed significantly. Among Indian miniatures there is an image of two nobles under the palm trees playing chess, and behind them there were two hookahs of huge size. Hookahs

were even higher than hookah servers. But usually, hookah was still not larger than a man sitting in the lotus position. The purpose of hookah also changed much. The Indians began to use hookah for getting an analgesic effect. Afterwards, the hookah smoking became one of the main elements of culture and tradition (Hanan Qasim, 2019). Shisha acquired its present value as a means of pleasure, relaxation and rest from the usual routine. Its ritual function also increased: an offer to smoke hookah was an important sign of attention and respect. At the same time the refusal was accepted as a serious insult. The same custom was in Ethiopia and Turkey during the Ottoman Empire. Actually, it has preserved in the tradition of patriarchal societies of Azerbaijan and Afghanistan. It was introduced to Egypt through trade routes from India and Persia. In Egypt, the hookah became a symbol of social interaction and hospitality, much like in other regions (TRDRP, 2022).

Archaeological studies suggest the use of tobacco in around first century BC, when Maya people of Central America used tobacco leaves for smoking, in sacred and religious ceremonies. It then later started spreading as far as high up to the Mississippi Valley with the Maya community migrating from down south of America, between 470 and 630 AD. Gradually, it was then adopted by neighbouring and native tribes. Native American "Shamans" developed tobacco use for religious rites (Alexandar, 2018) (Allen, 2022). At the end of the eighteenth century an interest in the culture of the East European countries and America increased greatly. It stimulated the studying of waterpipe smoking ritual. First, as a souvenir and wonder, then it turned into an interesting alternative to casual smoking.

5.1 Adaptation and popularization of smoking culture

Smoking has a long and varied history, dating back thousands of years. Smoking culture was adopted by different communities in ancient times. After the traces of hookah or shisha smoking in the past history of Egypt in the 8000 BC, historians got the earliest evidence of smoking dates back to around 5000 BC in the Americas. Indigenous peoples used tobacco and other hallucinogenic substances in shamanistic rituals.

Many ancient civilizations, such as the Babylonians, Indians, and Chinese, burned incense in religious rituals. Some of these incenses included psychoactive substances like cannabis and opium. For example, the ancient Assyrians used cannabis fumes to treat ailments like arthritis. With the arrival of Europeans in the Americas in the 16th century, the use of tobacco spread rapidly. Tobacco was initially used for its medicinal properties and later became popular for recreational use. Tobacco was believed to facilitate communication with the spiritual world and was also used as a gift to forge social connections. As Europeans began to explore and colonize different parts of the world, they introduced tobacco to Europe, Africa, and Asia. By the 17th century, smoking had become a widespread practice globally. Smoking culture evolved significantly over time, influenced by social, religious, and medicinal practices (Martin, 2024).

The royal hookah culture, or water pipe smoking, was adopted by several communities across different regions during the ancient and medieval periods.

a) **The Mayan community (1st century BC):** The Mayan people had a rich and complex smoking culture that was deeply intertwined with their rituals, daily life, and spiritual practices. Tobacco, known as Nicotiana rustica, played a significant role in their society. Tobacco was often used in ceremonial contexts. Shamans and priests would smoke tobacco to enter trance states, which were essential for performing rituals and making important decisions. The Mayans even depicted deities, kings, and shamans smoking in their art and hieroglyphics. The Mayan smoking culture is a fascinating example of how a single plant can hold profound spiritual and practical significance in a society (Stanion, 2018).
b) **Mughal India (16th century AD):** The hookah, or huqqa, became a symbol of royalty and sophistication in the Mughal courts. It was introduced during the reign of Emperor Akbar in the 16th century by his physician, Hakim Abul-Fateh Gilani. The Mughals developed elaborate rituals around hookah smoking, and it became an integral part of courtly life. The practice spread throughout Indian society, becoming a status symbol among the nobility (Alexandar, 2018).
c) **Safavid, Persia (16th – 18th century AD):** In Persia, the Safavid kings were also great connoisseurs of the hookah. The practice was similar to that in Mughal India, with intricate designs and a variety of flavours for the tobacco. Hookah smoking was a central part of social gatherings and a symbol of hospitality (Kazemi, 2022) (BBC.co.Uk, 2009).
d) **Ottoman Empire (17th century AD):** The Ottomans adopted the hookah culture from Persia and India. It became popular in the 17th century and was known as 'nargileh'. The Ottomans introduced their own designs and customs, making it a staple in coffeehouses and social settings. The 'nargileh' became a symbol of relaxation and social interaction (pipeboutique, 2023).
e) **Egypt (19th century):** In Egypt, the hookah, known as shisha, became widespread during the Ottoman period. It was commonly used in social gatherings and cafes, where people would gather to smoke and converse. The Egyptian shisha culture remains vibrant to this day (Marrakchi, 2021).
f) **Colonial India (18th century onwards):** During the British colonial period, the hookah was adopted by British colonials in India. It became a symbol of wealth and status, often featured in social gatherings and dinners. The British East India Company officials and wealthy merchants embraced the hookah as part of their lifestyle (Chatterjee, welcome collection, 2022). These communities not only adopted the hookah but also contributed to its evolution, adding their own unique touches and customs to the practices.

5.2 Earliest smoking tools and equipment

The earliest smoking tools used around 5000 BC were quite different from what we see today. There were varieties of smoking mechanisms according to their culture, tradition and religion.

i. **Smoking Tubes:** In the Americas, indigenous peoples used simple smoking tubes made from reeds or other plant materials. These tubes were used to inhale the smoke from burning tobacco and other hallucinogenic substances during shamanistic rituals (Alexandar, 2018).
ii. **Incense Burners and Censers:** In ancient civilizations like those of the Babylonians, Indians, and Chinese, incense burners and censers were used to burn substances such as cannabis and opium. The smoke was inhaled indirectly during religious and medicinal practices.
iii. **Hot Rocks and Charcoal:** In Eurasia, before the widespread use of tobacco, various plants, including cannabis, were vaporized on hot rocks or charcoal. This method allowed the inhalation of psychoactive fumes without direct smoking (Allen, 2022).
iv. **Chillum:** The chillum, also known as *chilam*, is a traditional conical smoking pipe with a rich history, particularly in India. The chillum has been used in India for centuries, particularly by Sadhus (holy men) and yogis. It is traditionally made from clay or soft stone like steatite or catlinite (Marrakchi, 2021) (BBC.co.Uk, 2009). These early tools highlight the diverse ways in which ancient cultures engaged in smoking practices for religious, medicinal, and social purposes.

5.3 Origin of the concept of hookah and it's royalty

The concept of the hookah, also known as shisha or waterpipe, has a rich history that dates back to the early 16th century. It is widely believed to have originated in India, particularly in the regions of Rajasthan and Gujarat. The invention of the hookah is attributed to Abul Fateh Gilani, a Persian physician in the court of the Mughal Emperor Akbar, in the city of Fatehpur Sikri. Initially, the hookah was created to purify tobacco smoke by passing it through water. Early designs used materials like coconut shells and bamboo sticks. The practice quickly spread from India to Persia, where the design was refined, and then to the Near East and other parts of the world. Hookah smoking became a symbol of nobility and social status, particularly among the Indian elite, and it remains a popular social activity in many cultures today.

6. Ideology behind the invention of hookah

The invention of the hookah was driven by both practical and cultural motivations. There are some key ideological aspects behind its creation.

a. **Health Concerns:** The primary practical reason for the invention of the hookah was to address health concerns associated with smoking. Abul Fateh Gilani, a Persian physician in the court of Mughal Emperor Akbar, devised the hookah to purify tobacco smoke by passing it through water. This process was believed to filter out harmful substances, making smoking less detrimental to health.
b. **Social and Cultural Significance:** The hookah quickly became a symbol of social status and cultural refinement. In the Mughal courts, it was not just a smoking device but a centrepiece of social gatherings and discussions. The elaborate designs and materials used in hookahs reflected the wealth and sophistication of their owners (Allen, 2022).
c. **Artistic Expression:** The creation and use of hookahs also provided an avenue for artistic expression. Craftsmen used precious metals, gemstones, and intricate designs to create beautiful and unique hookahs. This artistry was a way to showcase cultural values and the high status of their tradition. In many cultures, the hookah became a symbol of hospitality and communal bonding. Sharing a hookah was a way to welcome guests and foster social connections. This tradition emphasized the importance of community and social interaction. As the hookah spread from India to Persia, the Ottoman Empire, and beyond, it integrated into various cultural practices. Each region added its own unique elements to the design and use of the hookah, making it a versatile and enduring symbol of cultural exchange (Alexandar, 2018).

These ideological aspects highlight how the hookah evolved from a practical invention into a rich cultural tradition that continues to be celebrated today (Martin, 2024).

7. Hookah and the Royalty: Revisiting the Mughal lifestyle

The hookah held significant cultural and social importance in Mughal royalty, symbolizing luxury, sophistication, and social status. Here are some key aspects of its significance:

In the Mughal courts, the hookah was a symbol of nobility and prestige. It was introduced by Abul Fateh Gilani, a Persian physician, during the reign of Emperor Akbar. The elaborate designs and materials used in Mughal hookahs, such as gold, silver, and precious gemstones, reflected the wealth and high status of their empire (Khalil Mamoon, 2023). Hookah smoking was an integral part of social and ceremonial gatherings in the Mughal courts. It was common for nobles and dignitaries to share a hookah during important discussions and social events. The presence of a hookah added an element of elegance and

formality to these gatherings (Khalil Mamoon, 2023). The craftsmanship of Mughal hookahs was a form of artistic expression. Artisans created intricate designs and decorations, making each hookah a unique piece of art. This artistry was a way to showcase cultural values and the sophistication of the Mughal elite. The hookah also played a role in hospitality and social bonding. Offering a hookah to guests was a sign of respect and hospitality. The act of sharing a hookah emphasized community and social connections, making it an important part of Mughal social rituals.

In the Mughal courts, there were dedicated servants known as "*hookah burdars*" who were responsible for preparing and maintaining the hookah. This role highlighted the importance of the hookah in royal culture and the level of care and attention given to its use. The legacy of the hookah in Mughal royalty continues to influence its cultural significance today, where it remains a symbol of elegance and social connection (Chatterjee, welcome collection, 2022).

***Figure 1:* Shisha pipe smoking during Mughals**
(Source: Welcome collection)

The royal Mughal lifestyle was one of opulence, sophistication, and intricate social customs, with the hookah playing a central role in their daily and ceremonial life. Hookah smoking was a daily ritual for many Mughal nobles and royals (Figure 1). It was common to see courtiers and dignitaries enjoying hookah sessions in the royal palaces. These sessions were not just for leisure but also served as opportunities for discussion and decision-making. The presence of a hookah added an element of relaxation and camaraderie to these gatherings (Chatterjee, welcome collection, 2022) (Khalil Mamoon, 2023). Even the females in 'haram' or 'harem' also used to have the tradition of smoking with hookahs during few rituals or games or in occasions. During important ceremonies and celebrations, the hookah was a prominent feature. Whether it was a royal wedding, a victory celebration, or a diplomatic meeting, the hookah was always present. It symbolized hospitality and the high status of the host. The use of hookahs in the royal courts developed its own etiquette and rituals (Sardar, 2003) (Hanan Qasim, 2019). There were specific protocols for preparing, presenting, and smoking the hookah, which were followed meticulously. The elaborate designs of the hookahs used in these events reflected the grandeur of the occasion. The Mughals were great patrons of art and craftsmanship, and this extended to their hookahs. Mughal hookahs were often masterpieces of art, made from precious metals like gold and silver, and adorned with jewels and intricate carvings and ornamentations. The design of a hookah was a reflection of the owner's taste and status, and artisans took great pride in creating these beautiful objects (Khalil Mamoon, 2023) (Sardar, 2003).

The royal Mughal lifestyle, with its emphasis on luxury, art, and social rituals, was beautifully complemented by the presence of the hookah. It was more than just a smoking device; it was a symbol of the elegance and sophistication that defined the Mughal era (Sardar, 2003).

8. Design of the hookah and variety of materials used in making

Hookah, also known as shisha, nargileh, or waterpipe, is a traditional smoking device with several key components (Figure 2) that work together to create a unique smoking experience.

The Hookah Bowl: Holds the flavored tobacco (shisha) and the coals. Typically made of clay, but can also be found in glass, silicone, or stone. The bowl is crucial as it heats the tobacco, producing the smoke that travels through the hookah.

Hookah Stem: Connects the bowl to the base and serves as the main pathway for the smoke. Usually made of stainless steel, but can also include decorative elements like wood or epoxy. Ensures smooth airflow and is easy to clean, preventing rust and maintaining hygiene.

Hookah Base: Holds water, which cools and filters the smoke. Commonly made of glass, but can also be found in crystal or metal. The base is the foundation of the hookah, providing stability and enhancing the aesthetic appeal.

Hookah Hose: Allows the user to inhale the smoke. Traditionally made of leather, vinyl, or plastic, with modern versions often using silicone. A good hose is durable and easy to clean, ensuring a pleasant smoking experience.

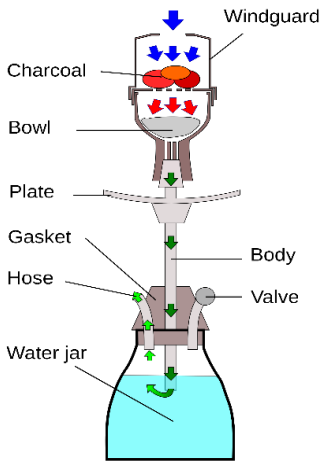

Figure 2: Hookah anatomy
(Source: Tobacco in Australia)

Mouthpiece: The part of the hose that the user inhales from. Can be made from various materials, including plastic, metal, or wood. Ensures hygiene and comfort during use.

Blowout Valve: Helps regulate airflow and clear stale smoke from the base. Typically integrated into the stem. Maintains the quality of the smoke and prevents buildup of stale smoke.

Each of these components plays a vital role in the overall functionality and experience of using a hookah. The design and embellishments of royal hookahs were a testament to the artistry and craftsmanship of the time, reflecting the luxury, wealth, status, and cultural values of their owners (Sardar, 2003) .

Royal hookahs were often made from precious metals such as gold, silver, and brass. These materials not only added to the aesthetic appeal but also signified the high status of the owner. The use of such expensive materials made the hookah a symbol of luxury and opulence. The body of the hookah was often adorned with intricate carvings and engravings. These designs could include floral patterns, geometric shapes, and even scenes from mythology or daily life (Sardar, 2003). The level of detail in these carvings showcased the skill of the artisans and the cultural significance of the motifs used. Many royal hookahs featured embellishments with precious and semi-precious gemstones. Rubies, emeralds, sapphires, and pearls were commonly used to decorate various parts of the hookah, such as the base, stem, and mouthpiece. These gemstones added a dazzling effect and further emphasized the hookah's status as a luxury item (Sardar, 2003).

The craftsmanship involved in creating a royal hookah was exceptional. Artisans spent countless hours perfecting each piece, ensuring that every detail was meticulously crafted. This high level of craftsmanship was a reflection of the cultural importance placed on the hookah as both a functional object and a work of art (Khalil Mamoon, 2023). Royal hookahs were often personalized to reflect the tastes and preferences of their owners. This could include custom engravings, family crests, or specific design elements that held personal significance. Such personalization made each hookah unique and a true reflection of its owner's identity. Despite their ornate appearance, royal hookahs were also designed to be highly functional. The use of high-quality materials and precise engineering ensured a smooth smoking experience. Features such as multiple hoses, advanced filtration systems, and ergonomic designs were incorporated to enhance usability. The designs and embellishments of royal hookahs were not just about aesthetics; they also carried cultural and symbolic meanings. The motifs and patterns used often had deep cultural significance, representing themes such as prosperity, protection, and divine favor (Sardar, 2003).

These elements combined to make the royal hookah a symbol of elegance, sophistication, and cultural heritage. The legacy of these beautifully crafted hookahs continues to influence modern designs, where the emphasis on artistry and luxury remains strong.

8.1 Tracing the Design development and evolutional journey of Hookah from India to near eastern Islamic countries

The fascinating history of hookah that traces its origins back to India and its subsequent journey through Persia to the Near Eastern Islamic countries.

Origins in India:

The hookah was invented in the 16th century during the Mughal Empire in India. It is attributed to Abul Fateh Gilani, a Persian physician of Emperor Akbar in Fatehpur Sikri. Initially, it was designed to smoke opium and hashish, and the early models were simple, often made from coconut shells. The introduction of tobacco to India by the Portuguese led to the development of the hookah as a means to purify the smoke through water (Allen, 2022) (Alexandar, 2018).

Spread to Persia:

From India, the hookah spread to Persia (modern-day Iran), where it underwent significant modifications. Persian craftsmen refined the design, incorporating intricate woodworking and metalwork, which gave the hookah its more recognizable form. In Persia, it became known as "*nargileh*" and was widely adopted across different social strata, not just the nobility. In Persia, the hookah, known as "*qalyan*," was also a symbol of prestige. The Persian influence on hookah design and culture significantly shaped its development and spread to other regions (Allen, 2022) (Hanan Qasim, 2019).

Adoption in the Near East:

The hookah continued its journey to the Near Eastern Islamic countries, including Turkey and the Arab world. In these regions, the hookah became deeply embedded in the social and cultural fabric. Turkish hookahs, for example, featured elaborate designs and were often used in social gatherings to signify trust and hospitality. The use of flavoured tobacco, known as maussel or maassel, also became popular in these regions, adding a new dimension to the hookah experience (Marrakchi, 2021).

Throughout its history, the hookah has been more than just a smoking device; it has been a symbol of social interaction and cultural exchange. In the Middle East, hookah cafes became popular spots for socializing, discussing politics, and enjoying leisure time. The design and use of the hookah have evolved, but its role as a cultural and social artifact remains significant.

8.2 Influence of Islamic tradition and religion behind the evolution of hookah

Islamic tradition and religion have significantly influenced hookah culture and design, particularly in regions where Islam is a dominant cultural force. In many Islamic cultures, hospitality is a highly valued virtue (Khalil Mamoon, 2023). Offering a hookah to guests is a traditional gesture of hospitality and social bonding. Hookah cafes, known as shisha cafes, are common in Middle Eastern countries and serve as social hubs where people gather to relax, converse, and enjoy each other's company. Hookah smoking is often seen as a way to unwind and engage in leisurely activities (Chatterjee, welcome collection, 2022). This aligns with the Islamic emphasis on community and relaxation after daily prayers and work. Islamic art is renowned for its intricate geometric patterns and calligraphy, which are often incorporated into hookah designs. The craftsmanship of hookahs reflects the broader artistic traditions of the Islamic world, including detailed metalwork, glassblowing, and ceramic art. Many hookahs feature designs that include Islamic symbols and motifs. These can range from floral patterns to calligraphic inscriptions of Quranic verses, which are believed to bring blessings and protection. While smoking is generally discouraged in Islam due to health concerns, the use of hookah has been more culturally accepted in some Islamic societies. However, the principle of moderation is emphasized, and excessive use is frowned upon. In some conservative Islamic communities, the use of hookah is adapted to align with religious norms. For example, non-tobacco herbal shisha is often used to avoid the health risks associated with tobacco (Sardar, 2003).

The spread of hookah culture can be traced back to the trade routes that connected the Islamic world. Merchants and travellers carried the tradition of hookah smoking from Persia to the Ottoman Empire and beyond, leading to its widespread adoption. Islamic rulers, particularly in the Ottoman and Mughal empires, played a significant role in popularizing hookah smoking. Their patronage led to the development of elaborate and luxurious hookah designs that became symbols of status and refinement (Martin, 2024) (Khalil Mamoon, 2023).

The influence of Islamic tradition and religion on hookah culture and design is a testament to the rich cultural heritage and artistic expression of the Islamic world.

9. A comparative analysis of hookah design evolved over time

From the ancient period to the modern world, the hookah pipe smoking style has been evolved hugely and over the periods and different dynasties, culture, lifestyle, preferences; the designs have also been changed through the time.

9.1 Evolution Through the Centuries

16th Century: The hookah design we see in the present times, was first created in this period. During this time, Islam was heavily influenced by exquisite art, engravings and ornamentations. They used expensive metals, stones and precious gemstones to decorate and embellish these hookahs. Since there was a lot of glass use during this period and different crafting styles done on glass, these hookahs also show abundance of glass. Early hookahs used coconut shells as bases and bamboo sticks as stems. Tobacco leaves, known as *Tombeki*, were used as the smoking substance.

17th Century: The hookah reached the Ottoman Empire, where it became a symbol of social status and hospitality. Turkish craftsmen introduced brass designs and leather hoses, enhancing both the aesthetic and functional aspects (Jacob, 2023).

19th Century: The design continued to evolve with the introduction of new materials and techniques. Glass bases became more common, and the use of metal for the smoke column became standard (Khalil Mamoon, 2023) (Marrakchi, 2021).

Figure 3: Different types of hookah over the periods (Source: Locosshisha)

9.2 Modern Innovations

Modern hookahs are crafted from durable materials like stainless steel, aluminium, and high-quality glass. These advancements have not only enhanced the durability but also the aesthetic appeal of hookahs. Innovations such as the phunnel bowl design, which prevents juice leakage, have improved the smoking experience. Initially, hookah tobacco was unflavoured or mixed with simple ingredients like honey and herbs. Today, shisha comes in a wide range of flavours, from traditional apple and mint to exotic blends like blueberry muffin and mojito. Awareness of health concerns has led to the development of herbal shisha, which contains no tobacco or nicotine. Additionally, advancements in heat management devices have made smoking safer and more efficient.

9.3 Comparison with Modern Times

Modern hookahs are often sleek and stylish, with customizable parts and a variety of designs to suit personal preferences. The use of high-quality materials and innovative designs like the phunnel bowl, has significant roles in improving the smoking

experience in the modern times. Modern heat management devices have made smoking safer and more efficient (2023). The integration of modern elements like LED lighting and electronic hookahs has further enhanced the appeal of these spaces (2023). Today, hookah is enjoyed worldwide, with significant popularity in the United States, Europe, and other regions. The hookah industry has grown, with specialized cafes and lounges dedicated to hookah smoking. Hookah remains a social activity, but it has also adapted to modern lifestyles. It is now common in urban settings and among younger generations. Modern hookah culture embraces innovation, with new flavours, designs, and smoking techniques.

10. Futuristic ideas of modification and implementation came out of this study

The future of hookah culture holds exciting possibilities, blending tradition with modern innovation. Smart hookahs with features like temperature control, automated cleaning, and even connectivity to apps for social sharing and customization could become popular. With growing health awareness, there could be advancements in making hookah smoking safer. This might include the development of herbal or non-tobacco alternatives and improved filtration systems to reduce harmful substances. As global cultures continue to blend, we might see new flavors and styles of hookah that incorporate elements from various traditions, creating a more diverse and inclusive hookah experience. Eco-friendly materials and sustainable production methods could become a focus, aligning with global efforts to reduce environmental impact. Imagine virtual hookah lounges where people from around the world can gather and interact in a shared digital space, enhancing the social aspect of hookah culture. The design of hookahs could continue to evolve, with artists and designers creating unique, customizable pieces that reflect personal and cultural identities. The future of hookah culture is likely to be shaped by a combination of technological advancements, health considerations, cultural integration, and sustainability efforts. This evolution will ensure that hookah remains a relevant and enjoyable social activity for generations to come.

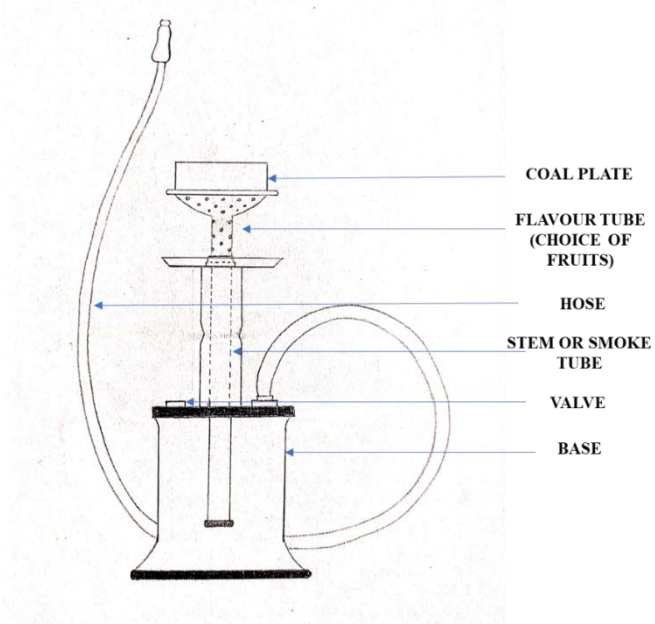

Figure 4: Health friendly natural flavour hookah design (Source: Author)

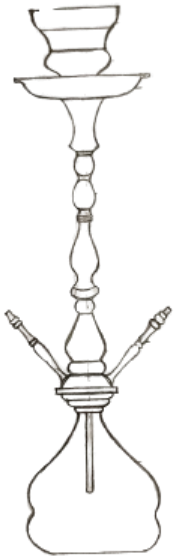

Figure 5: Traditional design (Source: Author)

10.1 Mechanism of the Healthy Fruit-Flavour Hookah Design

This reimagined hookah (Figure 4) preserves the structural language of upgraded designs while transforming its core purpose, to offer a pure, tobacco-free experience by emphasizing natural fruit infusions.

Coal Plate (Top Section): The coal plate remains at the top, serving its essential role as the heat source. Heated charcoal is placed here, but instead of igniting tobacco, it gently warms the flavor tube below.

Flavor Tube with Perforations: This is the heart of the innovation. Unlike a conventional hookah bowl containing flavored tobacco (shisha), the flavour tube is placed with real fruit. The small perforations across its surface allow the warm air from the heated charcoal to gently draw out aromatic vapors and essential oils from the fruit. This vapor is then carried downward by the airflow created during inhalation. It's a clean, health-conscious approach that retains the multisensory allure of hookah without exposing users to nicotine or synthetic flavorings.

Stem: The stem serves as the conduit, channeling the fruit-infused vapor from the flavour tube down into the water base. It also functions as a cooling passage, enabling a smooth flow while avoiding harshness.

Water Base: As the vapors pass through the water base, they undergo cooling and filtration. While traditional hookahs often rely on this stage to soften the impact of tobacco smoke, here it acts more as a temperature the fruit essence to stay crisp and refreshing.

10.2 Working Principle

Upon inhalation through the hose (Figure:4), negative pressure is created, causing the heated air to pass through the fruit-laden flavour tube. Aromatic vapors are extracted, cooled by the stem and water base, and then delivered to the user a healthier, sensorial alternative rooted in culinary and aromatic pleasure rather than combustion. There also can be develop a design with coal and tobacco free mussel, with a different design experience proposed (Figure 4).

10.3 Attributing aesthetics and Surface Ornamentation of the Hookah

Two designs have been proposed for tobacco free consumption of hookah promoting heathy lifestyle. Figure 6 proposes a design featuring the traditional surface decoration with a touch of new material, i.e., frosted glass. The surface ornamentation of the non-tobacco hookah (Figure 6) draws from a poetic interplay of material and motif, where frosted glass serves as the primary canvas, softly diffusing light to evoke a sense of ritual calm. The brass accents are not merely functional but ceremonially placed. Ceramic elements, glazed in muted ivory or terracotta, introduce tactile warmth, while the rubber components are discreetly integrated to preserve the visual purity of the form. Each joint and valve is positioned with reverence, ensuring that the ornamental rhythm flows uninterrupted. The overall aesthetic is one of quiet opulence, where heritage whispers through texture, and every surface invite touch, memory, and meaning.

The Figure 7 represents modern, simple and clean design that aids to continue the legacy of hookah with more healthier benefits. The surface ornamentation of this non-tobacco hookah (Refer to Figure 7) is conceived as a tactile and visual narrative, where each material speaks to ritual, memory, and cultural resonance. Rather than serving as mere embellishment, the ornamentation is integral to the object's identity, weaving contemporary minimalism. Frosted glass becomes a vessel of quiet mystique, diffusing light like incense smoke in a temple alcove. The surface design ensuring that the ornamental rhythm remains uninterrupted. This ornamentation has each surface inviting touch, reflection, and reverence.

Figure 6: Traditionally ornamented frosted glass hookah design (Design 1) (Source: Author)

Figure 7: Final Proposed design of Tobacco-free hookah and surface ornamentation (Design 2) (Source: Author)

Table 2: Components and materials of hookah

Components	Materials	Aesthetics and Advantages
Base vessel	Borosilicate glass / glazed ceramics	Heat resistance, transparency or artisanal texture
Stem and neck	Brass / Steel / Copper	Durability, traditional elegance
Hose Wrap	Handwoven cotton or silk	Cultural resonance, tactile warmth
Mouthpiece	Rosewood / Neem wood	Natural feel, antimicrobial properties
Ornamentation	Gold leaf/mother of pearl / gemstones	Symbolic richness, artisanal depth

Materials Used:

Base Vessel (Glass or Ceramic): Intricate *alpana*-inspired patterns etched or painted in white or gold, symbolizing cycles, femininity, and celebration. Hand-etched or screen-printed filigree with subtle metallic accents (gold leaf, copper dust). Patterns, spiral upward, mimicking smoke trails, creating a sense of movement and breath (Table 2)

Stem & Neck: Material Contrast: Polished brass or matte black steel with engraved script has been added. Textural play with hammered metal finish or embossed floral vines. Inlay work of Mother-of-pearl or semi-precious stone inlays for tactile richness.

Hose & Mouthpiece: Fabric Wrap: Handwoven cotton or silk wrap in earthy tones, kantha stitch detailing for heritage touch. Mouthpiece with sculpted wood (rosewood or neem) with lacquer finish, optionally adorned with a small terracotta bead or brass ring.

11. Data analysis and discussion

This section represents a concise and closer look of the data gathered, highlighting key points and insights. By analyzing the responses of the collected data, and emerging with the corelating trends, the aim is to uncover the prospect of meaningful observation that led the direction for approaching new design possibilities forward in reference to final proposed design prototype presented in Figure 7.

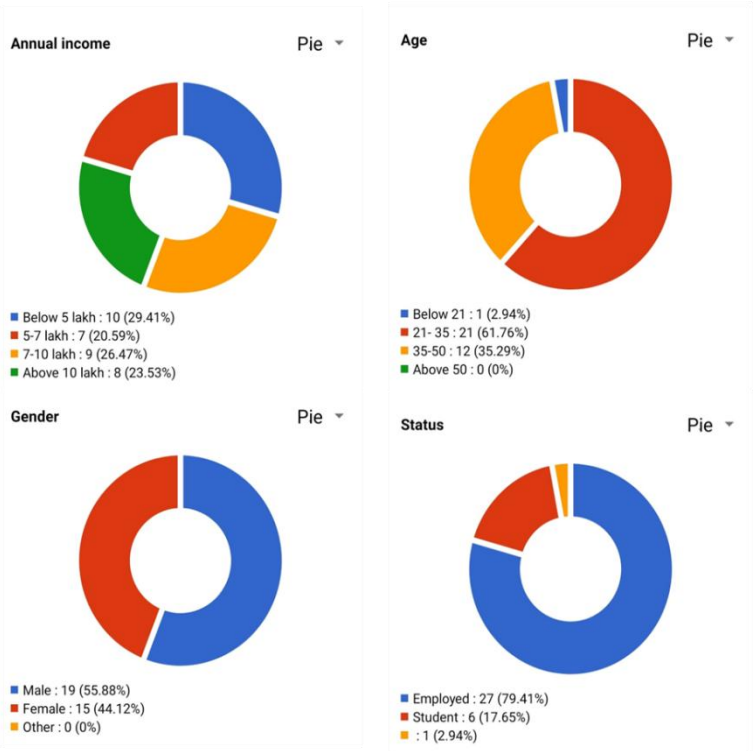

Figure 8: Visual representation of gender and economic status of the user (Source: Author)

From Figure 8, the survey data reveals a predominantly young and professionally active respondent base, with 61.76% aged between 21–35 and 79.41% currently employed. Gender representation is relatively balanced, with 55.88% identifying as male and 44.12% as female, while no respondents identified outside the binary categories. Income distribution spans across brackets, indicating a mix of middle- and upper-income participants. This demographic composition suggests that the redesigning of hookah resonates most strongly with working adults in their twenties and thirties, across varied income levels, and appeals to both male and female users, providing a solid foundation for targeted design and positioning strategies.

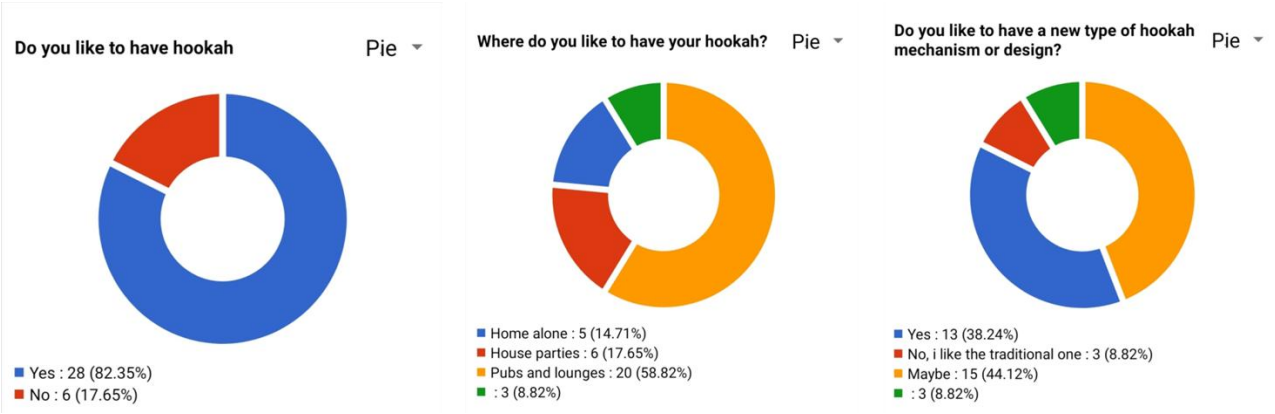

Figure 9: Visual representation on the smoking preferences of the user (Source: Author)

From Figure 9, the survey results indicate strong user engagement with hookah, as 82.35% of respondents expressed a clear preference for its use. When asked about preferred settings, the majority (58.82%) favoured pubs and lounges, followed by house parties (17.65%) and solitary use at home (14.71%), with 8.82% selecting an unspecified location, highlighting the social nature of hookah consumption. Regarding openness to innovation, 38.24% showed interest in new hookah mechanisms or designs. Only 8.82% preferred traditional formats, and another 8.82% gave unspecified responses. These findings suggest that

while traditional elements retain some value, there is significant potential for introducing new design concepts, particularly in socially oriented environments.

From Figure 10, the survey responses reveal a nuanced balance between tradition, innovation, and health consciousness in

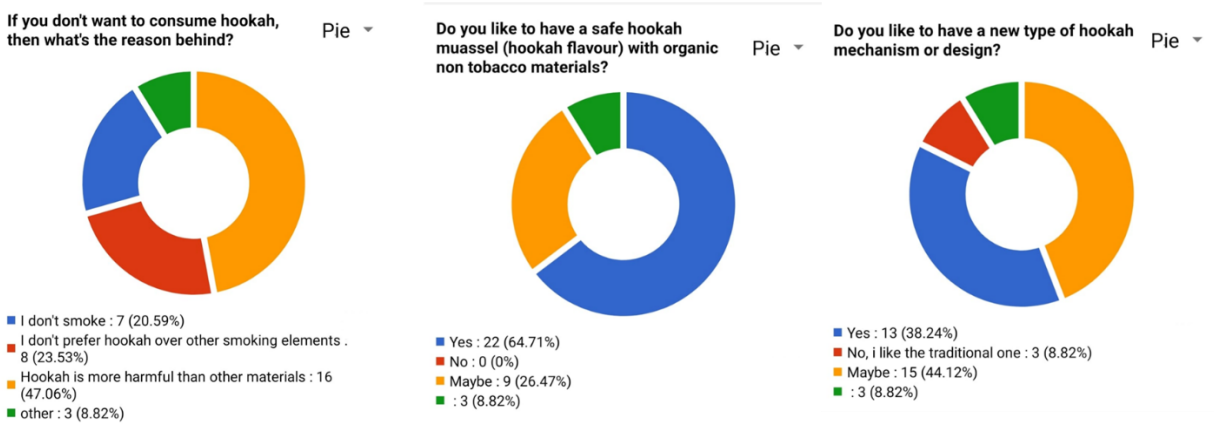

Figure 10: **Visual representation on specification and taste of the hookah of the user** ***(Source: Author)***

hookah consumption. A significant majority (73.53%) prefer the traditional coal-based method, indicating strong attachment to established rituals, while only 14.71% favour electrical alternatives and 11.76% selected other methods. At the same time, 64.71% support the idea of organic, non-tobacco mussel, with 26.47% expressing tentative interest and no outright opposition, suggesting growing receptivity to safer formulations. Among those who abstain from hookah, 47.06% cite health risks as their primary concern, followed by 23.53% who prefer other smoking options, 20.59% who do not smoke, and 8.82% with miscellaneous reasons. These findings highlight an opportunity to innovate within culturally familiar frameworks, integrating wellness-oriented features without compromising the experiential essence of hookah.

The cumulative survey findings strongly support the development of a non-tobacco hookah mechanism that honours traditional usage while integrating health-conscious innovation. With over 80% of respondents expressing enjoyment of hookah and a clear preference for social settings like pubs and lounges, the design must preserve the ritualistic and communal essence of the experience. Simultaneously, the majority's openness to organic, non-tobacco mussel and new design possibilities—paired with significant concern about health risks, signals a demand for safer alternatives. While traditional coal-based methods remain favoured, the data suggests a viable path forward: a hybrid design that retains familiar aesthetics and sensory cues while introducing organic materials and modernized mechanisms to meet evolving consumer expectations.

11.1 Feedback of the design

To better understand how the design was received, a feedback survey was conducted among participants. Responses were gathered to evaluate satisfaction, relevance, and overall impact. The results offer valuable insight into how the design resonated emotionally and aesthetically, highlighting areas of strength and potential refinement.

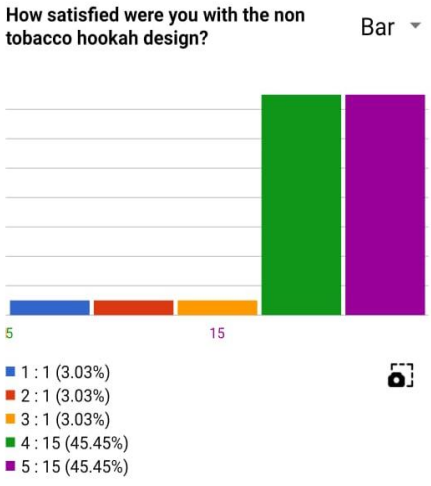

Figure 11: **Feedback chart 1** ***(Source: Author)***

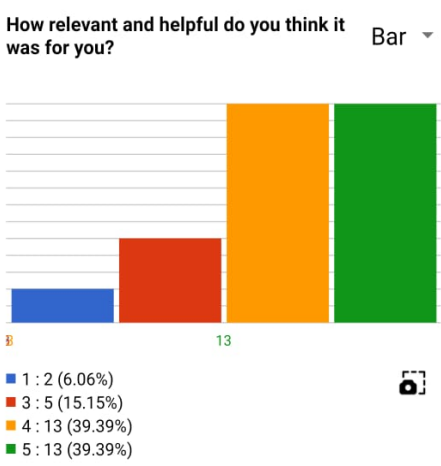

Figure 12: **Feedback chart 2** ***(Source: Author)***

From Figure 11, the feedback shows to evaluate satisfaction with the non-tobacco hookah design. The results show that 45.45% of participants rated their experience at level 5, and an equal 45.45% selected level 4, together forming a strong majority of

highly satisfied responses. Only 9.09% of responses fell below level 4, with one participant each selecting ratings of 1, 2, and 3. This distribution suggests that the design was widely appreciated, with most users finding it both visually and conceptually compelling. The presence of a few lower ratings may point to individual preferences or areas for refinement, but overall, the feedback reflects a successful and well-received design.

From Figure 12, the feedback shows to assess how relevant and helpful the experience was for participants. The results show that 39.39% of respondents selected a rating of 5, and an equal 39.39% chose 4—together forming a strong majority who found the experience highly meaningful.

A smaller portion, 15.15%, rated it as 3, while only 6.06% selected the lowest rating of 1. This distribution suggests that the offering was largely appreciated and considered useful, with most participants recognizing its value. The presence of a few lower ratings may reflect individual expectations or areas for refinement, but overall, the feedback points to a thoughtfully designed experience that resonated with its audience.

From Figure 13, the feedback shows to Feedback was collected to evaluate satisfaction with the design, and the results reveal a strong overall approval. Nearly half of the respondents—48.48%—rated their experience at the highest level of 5, while another 36.36% selected level 4. Together, these ratings form a clear majority, indicating that the design was widely appreciated. A smaller portion of responses fell below level 4, with 9.09% choosing 3 and only 3.03% each selecting 1 and 2. This distribution suggests that while a few participants may have had differing expectations, the design was largely successful in conveying its intended aesthetic and emotional impact. The feedback reflects a thoughtful and resonant creative direction that connected meaningfully with most viewers.

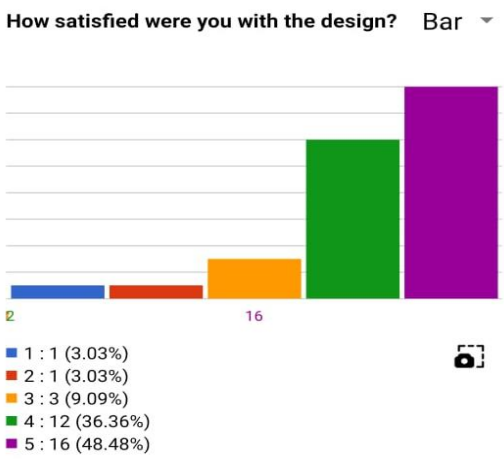

Figure 13: **Feedback chart 3** *(Source: Author)*

The overall feedback gathered across all survey charts reflects a consistently positive reception of the non-tobacco hookah design and its associated experience. A clear majority of participants rated their satisfaction and perceived relevance at the highest levels, primarily 4 and 5; indicating that the design was both aesthetically compelling and emotionally resonant. While a small percentage of responses fell below these top ratings, they were minimal and suggest only isolated preferences rather than widespread critique. The balance of visual appeal, cultural symbolism, and thoughtful functionality appears to have struck a chord with most respondents. Taken together, the data affirms that the design successfully communicated its intended vision and was appreciated not just as a product, but as a meaningful experience.

11.2 Findings and Insights

There's a quiet evolution happening. Young working professionals, across all genders are embracing hookah not just for its tradition or social charm, but for a softer, safer, and more refined experience. Analyzing the data, there should be a possibility to make a healthier version of hookah which will be less harmful even if it's used up to an hour. Majority of people would prefer a new version of hookah design yet a traditional hint of touch in it.

It is to evident that the young working professionals today, are seeking something more gentle, organic and aromatic experience. The findings suggest strong potential for reimagining hookah design into a tobacco free, healthier, more culturally resonant form, that retains the sensory richness. The new design direction could incorporate aromatic flavours using fresh or dried fruits, herbal mist, replacing harsh smoke with soothing infusions. Visually the hookah could be also evolved into an artistic centerpiece, adorned with embellishment of intricate design, brass detailing, stone ornamentation, royal engravings, floral *jaali* designs that reflects royal elegance and richness. Ultimately this approaches possibilities to create design emerging soulfulness, royalty and health benefits to the forthcoming world.
This opens a path to create something more than a product; it's an atmosphere in form. A design that feels playful yet soulful, inspired by the sweetness of fruit, the lightness of being, and the deep-rooted symbolism of sharing. The entire form whispers of renewal, a sense of belonging at the table, designed not just to be beautiful, but to foster connection, laughter, and memory.

12. Conclusion

The culture of hookah smoking has a rich and diverse history, spanning several centuries and continents. It became a symbol of social interaction, relaxation, and cultural exchange. Throughout its history, the design and use of hookahs have evolved, reflecting the artistic and cultural influences of the regions where it was adopted. In many cultures, the hookah was not just a smoking device but also a piece of art, often intricately decorated and crafted from various materials like glass, brass, and wood. The hookah culture is a testament to the enduring human desire for social connection and cultural expression. Its journey from the courts of Mughal India to contemporary lounges worldwide highlights its adaptability and the universal appeal of shared experiences. Modern hookah culture is a dynamic blend of tradition and innovation. It continues to be a popular social activity,

enhanced by technological advancements, health-conscious alternatives, and artistic designs. Whether in a traditional setting or a contemporary lounge, hookah remains a beloved pastime that brings people together. Antique hookahs are fascinating artifacts that offer a glimpse into the past. They combine historical significance, artistic beauty, and cultural richness, making them cherished collectibles. For the history enthusiasts or an art lover, antique hookahs can be a captivating addition to any collection. Beyond its historical and cultural resonance, the future of hookah lies in thoughtful reinvention. The proposed design, crafted with frosted glass, ceramic, brass, and rubber, embodies a shift toward ritual purity and aesthetic refinement. It's responding to contemporary demands for safety, sustainability, and sensory elegance. Survey feedback affirms the urgency for tobacco-free, natural alternatives and safer coal mechanisms, which this design addresses through both material innovation and user-centric functionality. In this way, the hookah evolves not only as a safer inhalation device but as a vessel of cultural continuity, where heritage meets healing, and artistry meets intention.

ACKNOWLEDGEMENT

This research paper immensely helped me to develop my sense of visualisation, research skill, thorough knowledge in an extensive context through the learning experience. I sincerely express my gratitude and thanks to my guide Dr. Tanima Bhattacharya Ma'am for the guidance, suggestions, advice and motivation throughout this research paper. This wouldn't have been successful without the help of her.

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Loomed to Life: A Timeless Fabric Manipulation Technique

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Abstract:
According to the Handloom Reservation of Articles for Production Act of 1985, a handloom is any loom other than a power loom. As soon as Handloom and sustainability meet together, the same loom becomes more than a tool—it becomes a part of the voice of heritage craft, cultural and conscious craftsmanship to support allied people who are directly and indirectly associated. The Handloom fabric, India's historical and cultural heritage, has been used for ethical connection and economic support for many decades. This fabric is known for its traditional craftsmanship, sustainable and economic development from the historical era.

Along with diversity and variety, handloom is known for experimenting with indigenous possibilities. Today, the textile/fashion industry moves forward with the crown of championship for sustainable and intended methodological journey. Consumers love to maintain a decent standard of living with advanced developed products, which may be in conjunction with sustainable practice and consciousness towards the environment. When creation thrives with open-ended, open-minded, continuous changing intervention without fear of rejection, each step becomes a new horizon with new possibilities. Likewise, there are always immense possibilities for multiple creation of handcrafted handloom products. For many decades, 2D Handloom fabric to multiple range of 3D products are competing with alternative resources. In this present journey the word 'impossible' reveals as 'I-M-POSSIBLE' when a three-dimensional structure / 3D-fabric has been made on a loom, which is functional and decorative as well. There are no such as pre-determined rules for practice and invention when experimenting with new concepts. It is all about the handloom's inherent nature of experimentation to overcome conventional farmwork to go beyond the bounded prospective.

***Keywords*:** 3D-fabric, Eco-friendly, Handloom, I-M-POSSIBLE, On-loom.

Article History: Article Received :11-07-2025, Revised: 15-08-2025, Accepted: 20-08-2025

1. Introduction

Textiles woven by hand are a timeless facet and a valuable part of the inherited heritage. It also illustrates the wealth and diversity of our country. Weaving on handlooms is one of the richest and most vibrant aspects of preserving our rich cultural heritage (Roy Maulik, 2021). It holds immense significance not only in preserving traditional craftsmanship but also in contributing to sustainable economic development. Recently, with a growing global focus on sustainability and ethical production, the role of handloom in India's economy has gained renewed attention. The ever-increasing significance of holistic growth in the handloom sector is indirectly influenced by several factors like structured and organised textile enterprises including the human development and skill upgradation, political and social impacting parameters, and various textile-specific government policies. After farming, the handloom industry is one of India's most significant decentralised rural-based economic activities (Pandit et al., 2020).

Along with diversity with variety, handloom is known for experimenting with indigenous possibilities. Handloom has played an important role in the long journey from the historical era to the present scenario as the most eco-friendly process of fabric manufacturing. This incredible loom is best known for producing various types of two-dimensional fabrics for apparel, home furnishings, and other uses. It has been well known that different three-dimensional forms of a fabric are created by cutting, stitching, and a variety of other methods. It's a different segment of manufacturing which involves so many different machineries, techniques, production processes, safety measures, spaces, multiple investments and many more. (Bhattacharya et al., 2012) Whereas it has an evergreen truth that handloom production always minimises carbon footprint by avoiding the use of heavy machinery. But producing 3D fabric on a simple hand loom has been considered a myth and well established as quite impossible. It is a common misconception that three-dimensional fabric on a handloom requires additional shapes and mechanical attachment. However, dimensional shapes can be formed on a simple handloom by following the basic principles of weaving, and there are numerous opportunities to produce functional and decorative products. It becomes possible even if the mostly unpractised concept is practised with persistence.

These fabric embellishment ideas create sculpturing and embellishing effects on fabric in order to give it texture and a unique appearance. Rresidual part of so many pieces may adjust differently and start a new journey. To get the three-dimensional fabric structure during weaving manipulate and control fabrics differently so that they become more dimensional, contrasts, create a sense of fullness, and establish desire surface effects with a certain structure. Now a days when global focus switch towards green and sustainable technology, handloom contributing a vital role for eco-conscious design development for product and process. Its traditional and contemporary design not only represent the culture heritage but also unfolding the inherent beauty of multidimensional possibilities.

2. Objective of the experiment:

Handloom has immense potentiality with simple basic loom structure. In the present study, efforts have been made through application based on basic weaving principles in innovative ways to form dimensional shapes.
Explorations have also been done on how fabric manipulation and embellishment techniques—both traditional and contemporary—can be adapted to sculpt and texture fabric directly on the loom.
Another objective was to create a design which has functional properties as well as aesthetically approachable.

So, broadly, the potential of producing three-dimensional fabric structures using a traditional handloom, by applying fundamental weaving principles and fabric manipulation techniques—without the aid of mechanical attachments or industrial machinery have been explored — thereby challenging conventional limitations and promoting sustainable, low-carbon textile innovation.

3. Materials and methods

3.1 Material

40 Ne and 60 Ne cotton yarns, 100 GSM ,120 GSM, 80 GSM cotton fabric, EPI-72 & PPI-60 used for frills/gather effect.

3.2 Loom and accessories

Four shaft sample handloom, tools and equipment for weaving like pirn, bobbin, Bamboo rings, needle, etc.

3.3 Methods

3.3.1 Protruding selvedge technique

In textile the word 'protruding' refers as stand(s) of fiber(s) that stick-out from the surface of the yarn or fabric structure often known as yarn hairiness where as the word 'selvedge' represent the edges of a fabric. The concept of Protruding Selvedge Technique is based on the additional attachment of textile or non-textile materials at the edge of the base fabric during weaving to give a decorative or functional look. Normally, this kind of additional material is introduced off-loom according to design requirements. For example: handle of a bag or any kind of gathering/frill of fabric which may added with the base product according to design demand. But in this present work the following methods have been used on-loom during time of weaving going on. In this case, additional woven fabric was added to the edge of the selvedge(s) according to the design's intent. To get gatherings on the selvedges, the long length of extra yarn from the additional fabric was interlaced on such an interval through the selvedge and securely attached to the main fabric (Figure 1) In traditional weaving techniques, selvedges must be properly finished; even minimal extra weft as a small loop on the selvedges may spoil the entire look of the product. Selvedge finishing quality is sometimes used to determine the quality of the fabric. But this present study proposes to develop gathering pleated/frills look on the selvedge for the final product. It is known to all that on loom warp yarns are normally fixed according to the width of the fabric. But some cases design needs allowances, addition which indeed. So, this present technique may be useful to permit the product design for garments, bags (Figure 3), wall decor, floor mats and others variety of mats (Figure 2a & b) and many more.

Figure 1: Baby Mat (on-loom)- Protruding Selvedge Technique (Source: Picture during on-loom experiment by author)

3.3.2 On-loom extra fabric manipulation

Fabric manipulation is typically practised after loom fabric formation. It not only elevates artistic look through visual presence but also is intended for functional purposes.

Figure 2: a) Baby Mat and b) Bay Mat with Baby (Source: Finished product of on-loom experiment)

Figure 3: Bags (on-loom)- Protruding Selvedge Technique
(Source: Picture of on-loom experiment by author and Finished product)

There are different techniques, such as Appliqué, Patchwork, Smocking, Quilting, Layering, etc., which are used to highlight functional and decorative properties on the post loom fabric processing. It is often seen that additional structure on the base fabric surface is not only for aesthetic or useful of aesthetic beauty, but also adds seasonal vibration to the final product. Keep in mind all these things during the weaving process (on-loom), additional fabric has been interlaced with the base fabric, to serve an extra function as mentioned. It is very common in available that, there are many non-ecofriendly materials which have been used to give fabric/clothing a decorative appearance, which is sometimes hazardous, so a loom-made eco-friendly decorative structure can be safer to use. The additional fabric may be twisted, flat or any other form before the interlacement according to design demand. The picture (Figure 4) shows a twisted form of fabric manipulation for decorative purposes. This structure, known as 'bow', may be used for children's wear.

Figure 4:Bow (Source: Picture during on-loom experiment by author)

Another structure of manipulation (Figure 5a) has been made flat formation of additional fabric interlacement with the base fabric. The fringes yarns from top to bottom of the both ends, are interlaced firmly. The additional fabric in this study place in on fold condition to get the final look (Figure 5b). As we know the reinforcement of the pocket is one of the main key factors which may be serve as compared to the traditional machine stitch. These design concept may not be limited to pocket design only but can unfold with others so many possibilities.

So, the design intervention is not limited to extra weft interlacement during weaving process, extra fabric manipulation throughout interlacement can be develop many more prospective design variations.

Figure 5: Pocket a) Pocket on the fabric and b) Pocket in side
(Source: Picture during on-loom experiment by author)

4. Results and Discussion

The Figure 6 is resonated as a mood of inspiration of the present work, where there very less or no more possibility of a new life. But under certain condition a new possibility has been rooted. The present work was an initiative to explore something special on handloom without change any mechanical shift on the said loom.

So, for this experimental shift the mind has to create a mood which is very essential before a creative modification. The word 'Impossible' is metamorphosed to 'I M possible'-a expected profound shift that may unfold so many possibilities. In the same way the word resonates profoundly to handloom weaving where traditional methods can shift into multi fold ways. In handloom weaving there are two types of yarns (warp, weft) which are inherently flexible, offering dynamic elements for exploration and interpretation. It may be seemed that, the thinking pattern on a fixed loom based on a fixed mindset towards dimensional patterns is thought as impossible. It needs to shift the mindset that the loom is fixed, but yarns, which are another important component of construction, are flexible and easy to move. So, like 'I' and 'M', the yarns are shifted with the necessary requirement to give the desired shape and look, and as a result, wounder of warp-weft with a 'POSSIBLE' product line appears. Francis of Assisi (an Italian mystic, famous as a poet and Catholic friar) truly said, "Start by doing what's necessary; then do what's possible, and suddenly you are doing the impossible".

'Nothing is impossible. The word itself says I'm possible.' - Audrey Hepburn

Figure 6: Life with roots of possibilities
(Source: Picture from real life nature by self-click)

Along with diversity with variety, handloom is known for experimenting with indigenous possibilities. Handloom has played an important role in the long journey from the historical era to the present scenario as the most eco-friendly process of fabric manufacturing. This incredible loom is best known for producing various types of 2D fabrics for apparel, home furnishings, and other uses. Different 3D forms are created by cutting, stitching, and a variety of other methods from the 2D fabric. But in case three-dimensional structure practice on a simple traditional loom becomes possible through the mostly unpractised concept is practised with persistence. The world started shifting its focus and is concentrating on 'Green Technology'- which is becoming an essential measure in the current scenario. (Annaldewar,2021). So, the present approach may be a fundamental model for many others future design prospects of on-loom and off-loom design which can be a part of eco-green innovation. The said extra fabric manipulation technique can create multi-functional design variation for two dimensional as well as for three-dimensional hand-woven fabric which may a vital count for sustainability and eco-green breakthrough specially for handloom.

Today, the textile/fashion industry must take the initiative to create sustainable approaches on account of the present situation. A decent standard of living with better products is always desirable for personal growth and environmental sustainability. The newly invented technology and design engineering are emerging in such a way that they transform India in the eyes of the world into a better India. Choosing eco-friendly, sustainable approaches may appear to be costly and impossible at first, but with our proper strategy, it will be able to serve cost-effectively for long-term benefits. Now is the time to change for the better, embrace sustainable product lines on purpose, and improve overall quality with sustainability. In the realm of invention, the loom's possibilities are never bound by reals-it's shaped by members of exploration and positive intent. Cost-effective design intervention can be implemented without fear of rejection. More experimentation is required in the design to achieve out-of-the-box surprises (Hossam, 2018). So, to unlock the something extraordinary, design experiment must go through with some uncertainty to reach the unexpected. According to product demand achieving the innovative breakthrough in the design is all about uncertain degree of creative risk-taking. As a result, surprising outcomes often emerge which may be beyond of imagination.

5. Conclusion

Handloom fabrics are exquisite, decorative, and have a superior texture and look. For small and medium-sized businesses, this value addition and product diversification will create a wealth of employment and business opportunities. It is indisputable that market-driven products are valuable. According to current practice, conducting thorough market research, examining consumer needs, and creating a variety of products for a specific market segment are the first steps towards success. During the time of assessing the demand for a new product, it's not always necessary to follow the crowd; occasionally, gaps can present a dynamic opportunity for future demand.

The hand woven 2D fabrics that can be used for clothing, home decor, and other things, are developed through different intermediate processes like cutting, sewing, and other methods. This study may use to develop a variety of design and methods, which added values in some extend not only to the handloom fabric but also for its allied associated. The outcome design has possibilities to serve as a functional canvas of future clothing, home furnishings, and other potential sections. By promoting traditional handloom weaving, it might be placing more of an emphasis on the depth of the story while utilising various practical techniques.

Exporting handloom textiles has become an important way to bring the industry back to life. Not only does sending these heritage-rich fabrics to international markets help the economy grow, but it also introduces the art with new more possibilities to get warp-weft wounder in real world. This renewed, regenovate and collaborative interest for handloom gives a new horizon to explore with seamless contribution to weavers, dyers, designer, artisans and ensuring their continued existence.

Acknowledgement:

The author is highly indebted to Shri Tapan Sharma, Deputy Director, Weavers Service Centre, Jaipur and WSC Jaipur family for their enormous impact during on loom product development in the year 2022.

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