

Human-AI Co-Creation in Pattachitra - A Participatory Design Intervention with Artisans of Raghurajpur

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Abstract— Recent developments in Artificial Intelligence (AI), especially generative AI, have facilitated novel collaborations between machine intelligence and traditional craftsmanship. Although prior research has largely addressed the digitization, documentation, and digital marketing of heritage crafts, there has been limited focus on Human-AI co-creation through participatory design interventions with artisans. This study examines the integration of AI within the Pattachitra craft ecosystem of Raghurajpur, India's first heritage crafts village, to assess how AI can support creative collaboration while maintaining cultural authenticity.

A qualitative case study was conducted using ethnographic and participatory design methods with 20 Pattachitra artisans aged 17 to 60 years. Data collection involved participant observation, semi-structured interviews, and a 5-day Human-AI co-creation workshop utilizing ChatGPT and Midjourney for prompt development and AI-assisted concept generation. Thematic analysis was employed to examine artisans' experiences, perceptions, and interactions with AI.

The findings suggest that AI can serve as a collaborative ideation tool by facilitating motif exploration, design experimentation, and concept visualization, while artisans maintain creative control through interpretation and manual painting of final designs. Drawing on these results, the study introduces a Human-AI Co-Creation Model that integrates computational and artisanal intelligence via participatory design. This model provides a framework for promoting design innovation, enhancing creative capacity, and supporting sustainable craft development while preserving the cultural identity of Pattachitra. The study advances the discourse on Human-AI collaboration in heritage crafts and offers practical guidance for the responsible integration of AI into traditional artisan communities.

Index Terms— Co-Creation, Pattachitra, Participatory Design, Artisanal Intelligence, Generative Artificial Intelligence

I. INTRODUCTION

Traditional crafts play a vital role in preserving cultural heritage, indigenous knowledge, and sustainable community-based production systems, while also supporting rural livelihoods and responsible design (Clark, 2008; Fletcher, 2010; Fletcher & Grose, 2012; Gwilt, 2014; Khaire, 2011). Pattachitra, one of India's oldest narrative painting traditions, is practiced in Raghurajpur, Odisha, which is recognized as India's first heritage crafts village (INTACH, 2000). This tradition is distinguished by intricate line work, mythological storytelling, natural pigments, and hereditary craftsmanship. However, it currently faces challenges such as shifting consumer preferences, limited digital literacy, restricted market access, and the need to adapt traditional motifs for contemporary markets, all of which compromise authenticity (Kanungo et al., 2020).

Recent developments in Artificial Intelligence (AI) have enabled Human-AI Co-Creation, in which computational intelligence augments artisans' creative expertise through design ideation and visualization rather than replacing it (Davis et al., 2021; Sinha et al., 2024). Given the scarcity of participatory research in this area (Tsao et al., 2025), the present study examines a Participatory Design intervention with Raghurajpur artisans to investigate AI-supported creativity while preserving cultural authenticity.

1.1 Economic significance of the Indian craft sector

The Indian handicraft sector is one of the world's largest decentralized creative economies, supporting over 7 million artisans, preserving cultural heritage, and making substantial contributions to rural livelihoods and exports, which totaled ₹33,122.79 crore in FY 2024–25 (Development Commissioner Handicrafts, 2019; EPCH, 2024; EPCH, 2025). Despite these achievements, the sector still faces significant challenges, including reliance on intermediaries, limited digital literacy, insufficient design innovation, and constrained access to digital markets (Planning Commission, 2008; Khaire, 2011; British Council, 2025). In the context of Raghurajpur, Human-AI Co-Creation offers a culturally sensitive strategy that combines computational capabilities with artisanal expertise to promote design innovation, expand creative opportunities, and ensure long-term sustainability.

II. LITERATURE REVIEW

2.1 Raghurajpur: A Living Heritage Craft Ecosystem

Raghurajpur, near Puri in Odisha, is renowned for Pattachitra painting, palm-leaf engraving, papier-mâché, woodcraft, stone carving, and Gotipua dance (INTACH, 2000; Kanungo, Sethi, & Biswal, 2020). Figure 1 shows Raghurajpur's location on the Odisha map. Traditional crafts are practiced in nearly every household, enabling the transmission of intergenerational knowledge through community-based apprenticeships (Das & Mishra, 2015). The use of natural materials and adherence to structured artisanic conventions in Pattachitra help preserve cultural identity, ecological sustainability, and intangible heritage (Menon, 2010; UNESCO, 2022; Panda, 2022).



Fig 1. Location of Raghurajpur in the Odisha Map
Source: Kumar (2015)

2.2 Evolution of Pattachitra: Traditional and Contemporary Practices

Historically, Pattachitra was produced on prepared cloth or palm leaves using chalk and tamarind seed paste, as well as natural pigments including hingula, haritala, indigo, lamp black, and conch shell white. Figure 2 shows the natural pigments used in Pattachitra painting. The paintings were finished with lacquer to enhance durability (Mohanty, 1979; Tripathy, 1998). Thematic content was primarily derived from Vaishnavite, Shaivite, Shakta traditions, and the Jagannath cult (Mohanty, 1979). Figure 3 illustrates Lord Jagannath, Balabhadra and Subhadra's Paattachitra painting. Marketing strategies depended on pilgrimage tourism, the Rath Yatra festival, home-based sales, exhibitions, and personal networks (INTACH, 2000; Jena, 2007; Roy, 2018; Nayak, 2024). Fig 1.2 and 1.3 shows the natural colors and Lord Jagannath Pattachitra Painting respectively.

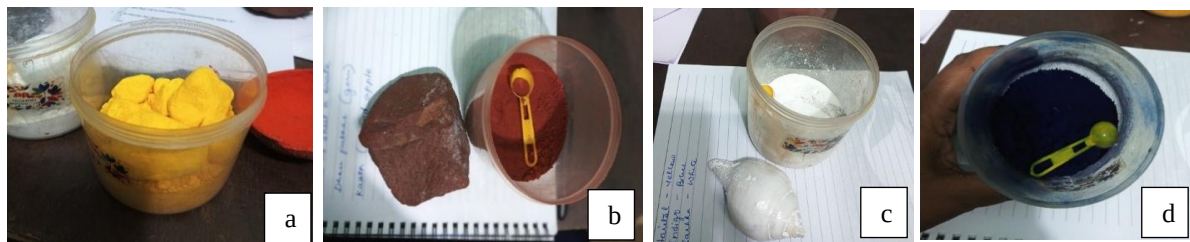


Fig .2. (a) Yellow from Orpiment (*haritala*), (b) Red from minerals like Cinnabar (*hingula*),
(c) White from Shankha (d) Black from Soot
Source: Author's field-work (2025)



Fig. 3. Lord Jagannath, Balabhadra and Subhadra
Artisan: Bamdeb Das
Source: Author's fieldwork (2025)

Driven by shifting consumer preferences and the expansion of global markets, Pattachitra has diversified by adopting synthetic pigments, commercially produced canvases, and contemporary product applications alongside traditional techniques (Samantaray, 2005; Panda, 2022). Digital platforms, including Instagram, Etsy, Gaatha, and Direct Create, have broadened market access by connecting artisans with international consumers (Indian Express, 2024; Das & Mishra, 2015). Although digital marketing has expanded income-generating opportunities, artisans remain constrained by reliance on intermediaries, weak bargaining power, and inequitable market access, which continue to undermine sustainable livelihoods (Kanungo et al., 2021). Nevertheless, these advancements have prompted concerns about cultural authenticity, standardization, and the potential erosion of traditional practices.

2.3 Challenges within the Raghurajpur Craft Ecosystem

Although Raghurajpur has achieved both national and international recognition, the village still faces significant socio-economic and technological challenges that jeopardize the long-term sustainability of its craft ecosystem. Artisans' livelihoods remain heavily reliant on seasonal tourism, leaving them economically vulnerable. This vulnerability was particularly evident during the COVID-19 pandemic, when a decline in visitor numbers led to substantial reductions in craft sales and household incomes (Raviprakash et al., 2019). Furthermore, limited digital literacy, inadequate technological infrastructure, reliance on intermediaries, restricted access to contemporary markets, and insufficient diversification of design offerings constrain artisans' capacity to adapt to changing consumer preferences (Roy & Dey, 2022; Chattopadhyay & Sahoo, 2021; Ministry of Tourism, 2023). While initiatives such as the INTACH Heritage Village Project and the designation of Raghurajpur as India's Best Tourism Village (2023) have increased the village's visibility, persistent structural barriers continue to restrict the economic potential of the artisan community (INTACH, 2000; Ministry of Tourism, 2023). Given that addressing all socio-economic challenges is

beyond the scope of a single study, the present research focuses on design innovation and creative collaboration as specific strategies to enhance the sustainability and market relevance of the Pattachitra ecosystem.

2.4 Human-AI Co-Creation: Opportunities for Heritage Craft Innovation

Recent advances in Artificial Intelligence (AI), particularly in generative AI and computational design, have transformed creative industries by enhancing ideation, visualization, and design exploration. In the craft sector, AI is increasingly viewed as a collaborative partner that augments human creativity by integrating computational intelligence with artisans' tacit knowledge. This integration enables motif generation, design experimentation, adaptive customization, and digital storytelling (Crafts Council of India, 2023; Sagdeo & Khan, 2024). The concept of Human-AI Co-Creation highlights the complementary relationship between artisanal and computational intelligence. Artisans contribute cultural interpretation, embodied skills, and aesthetic judgment, while AI supports rapid visualization, pattern generation, and iterative design exploration (Boden, 2004; Magistretti et al., 2019). However, AI adoption in traditional craft ecosystems remains constrained by digital illiteracy, infrastructure limitations, ethical concerns, and limited artisan participation (Roy & Dey, 2022; Bhardwaj & Ghosh, 2023; Chattopadhyay & Sahoo, 2021). To address these barriers, this study investigates a participatory Human-AI Co-Creation approach to promote sustainable innovation within the Pattachitra ecosystem of Raghurajpur.

2.5 Theoretical Framework

This study is grounded in two complementary frameworks: Participatory Design (PD) and Human-AI Co-Creation. Participatory Design is informed by the work of Spinuzzi (2005) and Sanders and Stappers (2008), while Human-AI Co-Creation draws on theories of computational creativity (Boden, 2004), Human-Centered AI (Shneiderman, 2020), and AI-assisted creative collaboration (Elgammal et al., 2017; Wu et al., 2021). Together, Participatory Design (PD) and Human-AI Co-Creation integrate computational intelligence with traditional artisanal knowledge within the Pattachitra ecosystem.

Participatory Design positions artisans as active collaborators, emphasizing collaborative decision-making, mutual learning, and iterative development to ensure that technologies reflect users' knowledge and experiences (Spinuzzi, 2005; Sanders & Stappers, 2008). This approach is especially relevant to heritage crafts, where artisans possess tacit cultural knowledge and embodied skills that computational systems cannot replicate.

Human-AI Co-Creation complements Participatory Design by positioning AI as a creative partner that supports pattern recognition, generative design, visualization, and iterative exploration. Artisans contribute cultural interpretation, aesthetic judgment, contextual reasoning, and ethical decision-making (Boden, 2004; Elgammal et al., 2017; Shneiderman, 2020; Wu et al., 2021). Integrating artisanal and computational intelligence enables collaborative creativity, preserves artisan authorship and cultural authenticity, and fosters design innovation through participatory, AI-assisted workshops within the Pattachitra tradition of Raghurajpur.

2.6 Research Gap

Existing research on Pattachitra and heritage crafts has largely focused on cultural documentation, sustainability, digitization, market access, and AI-assisted design. Although recent studies acknowledge AI's potential in creative industries, there remains limited investigation into participatory Human-AI Co-Creation models that position artisans as active collaborators in AI-assisted design. Furthermore, empirical evidence is scarce on integrating computational intelligence with artisanal expertise, particularly in ways that preserve cultural authenticity, creative agency, and traditional knowledge within heritage craft ecosystems. To address these research gaps, the present study develops and evaluates a participatory Human-AI Co-Creation model for Pattachitra artisans in Raghurajpur, with the aim of assessing its capacity to promote design innovation and sustainable craft development.

2.7 Objectives and Research Questions

Research Objectives

1. To investigate the integration of Artificial Intelligence within the Pattachitra craft ecosystem in Raghurajpur.
2. To develop and evaluate a participatory Human-AI Co-Creation model that integrates computational intelligence with artisanal knowledge to foster design innovation.

Research Questions

- **RQ1:** In what ways can Human-AI Co-Creation be incorporated into the Pattachitra craft ecosystem through a participatory design approach
- **RQ2:** How do artisans perceive and engage with AI-assisted co-creation in relation to creativity, cultural authenticity, and design innovation?

III. METHODOLOGY

3.1 Research Design

A qualitative case study design was used to investigate Human-AI co-creation within the Pattachitra craft ecosystem of Raghurajpur, Odisha. This procedure enabled an in-depth analysis of artisans' experiences, perceptions, and interactions with Artificial Intelligence in a traditional craft context. Raghurajpur was purposively selected as the study site due to its recognition as India's first heritage crafts village and its longstanding Pattachitra painting tradition. The research combined ethnographic inquiry with a Participatory Design (PD) intervention. Initially, participant observation and semi-structured interviews were carried out to document existing craft practices, design processes, market obstacles, computer literacy, and artisans' responses to developing consumer preferences. Preliminary findings indicated that, although artisans possessed extensive traditional knowledge and craftsmanship, many experienced problems in adapting their designs to contemporary market requirements and digitally mediated purchaser expectations.

This information informed the development of a 5-day Human-AI co-creation workshop, in which AI was presented as a creative support tool rather than a replacement for artisanal expertise. Consistent with Participatory Design principles, 20

purposely selected Pattachitra artisans, aged 17 to 60 years and including master artisans, mid-career practitioners, and younger artisans, voluntarily participated after providing informed consent. During the workshop, participants collaborated with the researcher and two design students to explore AI-assisted motif generation, design ideation, color experimentation, and the creation of contemporary product concepts grounded in traditional Pattachitra aesthetics. Student facilitators were selected for their proficiency with ChatGPT and Midjourney. Participants critically assessed AI-generated outputs, refined them using their artisanic expertise, and reflected on the opportunities and limitations of Human-AI collaboration. Participant observations, interview transcripts, workshop discussions, AI-assisted design outputs, and post-workshop reflections constituted the primary qualitative data for evaluating the proposed Human-AI Co-Creation model.

3.2 Development of the Human-AI Co-Creation Model

The Human-AI Co-Creation Model was developed through an iterative process that integrated evidence from a literature review, a theoretical framework, and preliminary ethnographic fieldwork in Raghurajpur. Initial participant observations and semi-structured interviews revealed several challenges in the Pattachitra ecosystem, including limited adaptation to evolving consumer preferences, obstacles to developing contemporary product designs, low levels of digital literacy, and concerns about preserving cultural authenticity. These findings underscored the need for a collaborative design approach that supports innovation while respecting traditional craft practices. The model draws on Participatory Design principles, which prioritize collaborative engagement, mutual learning, and the active involvement of users throughout the design process (Spinuzzi, 2005; Sanders & Stappers, 2008), as well as the concept of Human-AI Co-Creation, in which Artificial Intelligence augments rather than replaces human creativity (Boden, 2004; Shneiderman, 2020).

The model integrates “artisanal intelligence,” encompassing traditional knowledge, cultural narratives, craftsmanship, aesthetic judgment, and tacit skills, with “computational intelligence,” including AI-assisted ideation, motif generation, visualization, prompt-based exploration, and rapid design iteration. The model was implemented through a 5-day participatory workshop in which artisans collaborated with AI as a creative support tool to explore new motifs, reinterpret traditional themes, and develop contemporary design concepts, while maintaining creative authorship and cultural authenticity. This workshop also served as the primary intervention for evaluating artisans' responses, engagement, perceived usefulness of AI, and the feasibility of Human-AI co-creation within the Pattachitra craft ecosystem.

3.3 Participatory Design Workshop

A 5-day Participatory Design Workshop was held in Raghurajpur from 27.11.25 to 31.11.25 to implement and evaluate the proposed Human-AI Co-Creation model within the Pattachitra craft ecosystem. The workshop examined how Artificial Intelligence could support traditional craft practices while preserving artisans' creative agency and cultural identity. Grounded in Participatory Design principles, the intervention fostered collaborative learning, experimentation, and dialogue among artisans, researchers, students, and AI throughout the creative process.

At the start of the workshop, participating artisans were introduced to the fundamentals of generative artificial intelligence and its potential applications in design. Because most participants had limited prior exposure to AI technologies, researchers and two design students demonstrated how to use ChatGPT to generate and refine text prompts and Midjourney to produce AI-assisted visual concepts. Both the researcher and two design students worked closely with artisans to translate their design ideas, traditional motifs, mythological narratives, and product concepts into prompts suitable for interpretation by the AI tools.

The AI-generated images served as sources of inspiration rather than final designs. Artisans critically evaluated the outputs, discussing their cultural relevance and aesthetic quality, and selectively modified, combined, or rejected AI-generated elements based on traditional knowledge, artisanal judgment, and craftsmanship. Through iterative cycles of prompt refinement, AI image generation, group discussions, and manual reinterpretation, the workshop fostered collaboration between artisanal and computational intelligence, ensuring that creative authorship remained with the artisans.

Throughout the intervention, participant interactions, behavioral responses, AI-generated outputs, and post-workshop interviews were systematically documented. These qualitative data were then analyzed to assess artisans' perceptions, engagement levels, willingness to adopt AI-assisted design practices, and the feasibility of the proposed Human-AI Co-Creation model in the traditional Pattachitra craft ecosystem.

3.4 Data Collection

Data collection was conducted in three sequential phases.

Phase I: Ethnographic Exploration

Fieldwork in Raghurajpur included participant observations and semi-structured interviews with twenty purposely selected Pattachitra artisans from diverse age groups, experience levels, and family-based craft backgrounds. The interviews explored artisans' perceptions of shifting consumer preferences, adaptation to contemporary product requirements, digital literacy, awareness of emerging technologies, and openness to experimenting with new design approaches.

Phase II: Human-AI Co-Creation Workshop

Insights from the ethnographic phase informed the design of a Human-AI co-creation workshop. In this workshop, artisans were introduced to generative AI tools that generate design concepts from text prompts. The researcher and two design students helped artisans craft prompts, interpret AI-generated outputs, and adapt the concepts to traditional Pattachitra design principles. AI served as a collaborative ideation tool to stimulate creative possibilities, rather than replace traditional craftsmanship. Participant interactions, behavioral responses, discussions, and design decisions were systematically documented using field notes, photographs, and video recordings throughout the workshop.

Phase III: Post-workshop Interviews

Following the workshop, semi-structured interviews and informal discussions were held with participating artisans to document their experiences with Human-AI collaboration. The interviews examined perceptions of usefulness, ease of learning, cultural authenticity, creative ownership, willingness to adopt AI in future practice, and concerns about preserving traditional knowledge.

3.5 Data Analysis

Data collected through participant observation, semi-structured interviews, workshop discussions, field notes, photographs, video recordings, and AI-assisted design outputs were analyzed using inductive thematic analysis, following Braun and Clarke's (2006) six-phase framework. Interview transcripts and observational records were reviewed multiple times to ensure familiarity with the data. Subsequently, meaningful statements and observed behaviors were systematically coded. Similar codes were consolidated into broader themes that capture artisans' experiences and perceptions of Human-AI co-creation, including adaptation to changing consumer preferences, digital readiness, design innovation, cultural authenticity, creative ownership, and the opportunities and challenges associated with integrating Artificial Intelligence into traditional craft practices.

Descriptive frequency analysis complemented the thematic analysis by summarizing the distribution of recurring response categories identified in the qualitative data. After coding participants' responses, the number of artisans in each category was counted and reported as frequencies and percentages. This approach facilitated the visual presentation of findings through pie charts that depicted artisans' levels of engagement with AI (positive, adaptive, neutral, and reluctant) and their perceptions of AI-generated design outcomes (enhanced traditional designs, hybrid designs, retained traditional aesthetics, and culturally distorted designs). These descriptive statistics served only to illustrate the prevalence of qualitative themes and were not intended for statistical inference or hypothesis testing.

The credibility of the findings was enhanced through methodological triangulation, which compared evidence from participant observation, interviews, workshop interactions, AI-generated design outputs, and researcher field notes. The convergence of these multiple data sources strengthened the trustworthiness of the interpretations and provided a comprehensive understanding of the feasibility of the proposed Human-AI Co-Creation model within the Pattachitra craft ecosystem.

IV. FINDINGS AND DISCUSSION

4.1 Findings from the Ethnographic Exploration (Before the AI Workshop)

This section presents the understanding from participant observation and semi-structured interviews.

4.1.1 Traditional Design Practices and Craft Process

Participant observation and interviews indicate that Pattachitra remains a family-based craft, with knowledge passed down through generations. Artisans adhere to traditional techniques and produce motifs rooted in mythology and cultural narratives. Although product offerings have diversified in response to market demands, participants consistently emphasize the need to preserve the authenticity, symbolism, and artisanal identity inherent to the Pattachitra tradition.

Sipun Das, a male artisan, said, *"I learned this artisanal skill from my father and grandfather. From an early age, I closely observed their painting process. Initially, my role involved preparing the canvas and mixing colors. Over time, they taught me to outline, paint figures, and interpret the narratives associated with each motif. My education was entirely informal, gained through consistent daily practice within the family."*

Table 1: Traditional Design Practices and Craft Process

Can you describe how you learned the art of Pattachitra painting? How important is it for you to preserve the original style and identity of Pattachitra?		
TRANSCRIPTS	CODE/SUB THEMES	FREQUENCIES (n = 20)
"I learned this art from my parents and grandparents"	Intergenerational knowledge transfer	20
" Our paintings represent more than mere designs; each motif conveys a narrative and holds significance"	Narrative symbolism and cultural significance	18
"While we may create new products, the identity of Pattachitra must remain intact".	Tradition before innovation	16
"No formal training."	Informal apprenticeship	20

Analysis: The findings indicate that Pattachitra rests on intergenerational knowledge transfer, cultural symbolism, and traditional craftsmanship. Consistent with Mohapatra (1989), Samantaray (2005), and Panda (2022), artisans prioritize authenticity while carefully adapting to evolving market demands. These results underscore the need to consider cultural foundations when integrating Human-AI co-creation into the Pattachitra ecosystem.

Implications: The findings indicate that Human-AI co-creation should augment, rather than supplant, existing artisanal knowledge. Informed by Participatory Design principles (Sanders & Stappers, 2008), AI interventions are expected to support creativity while preserving traditional motifs, narratives, and artisanal practices. This approach can foster sustainable design innovation without compromising Pattachitra's cultural identity.

4.1.2 Challenges in Adapting to Changing Consumer Preferences

Participant observation and interviews indicated that artisans struggle to adapt to shifting consumer preferences while preserving the traditional identity of Pattachitra. Despite diversifying their products to meet market demands, many artisans reported difficulty interpreting emerging trends and reconciling commercial innovation with cultural authenticity, which constrains their market competitiveness.

Bapuji Maharana, senior male artisan: *"Earlier, people mostly bought traditional Pattachitra paintings. Now, customers ask for products like jewelry, coasters, bookmarks, and home décor. They want something both useful and artisanal. Sometimes it is difficult to understand what customers want. Trends keep changing, and we don't always know which products will sell in the market."*

Table 2: Challenges in Adapting to Changing Consumer Preferences

How have customer preferences changed over the years? Do you find it difficult to meet changing market demands?		
TRANSCRIPTS	CODE/SUB THEMES	FREQUENCIES (n = 20)
"We have ideas for new products, but we are not sure whether customers will like them"	Willing to innovate	18
"Trends keep changing"	Evolving market trends	16
"Customers ask for jewelry, coasters, bookmarks, lamp shades"	Changing consumer preferences	19
"We also lack proper guidance about market trends and consumer preferences."	Limited market knowledge	20

Analysis: The findings reveal that artisans face challenges in adapting to changing consumer preferences, despite their willingness to innovate. Consistent with Samantaray (2005) and Panda (2022), limited market knowledge restricts product diversification, emphasizing the need for participatory approaches that integrate traditional craftsmanship with contemporary market insights.

Implications: The findings suggest that Human-AI co-creation can enable artisans to better understand consumer preferences and generate market-relevant design concepts while maintaining cultural authenticity. Implementing AI through a participatory approach may enhance product diversification, increase market responsiveness, and support sustainable livelihoods without compromising the traditional identity of Pattachitra.

4.1.3 Limited Digital Literacy and Technology Exposure

Participant observation and interviews indicate that most artisans demonstrate limited digital literacy and minimal exposure to emerging technologies, such as Artificial Intelligence. Although some younger artisans are familiar with smartphones and social media, the majority continue to rely on traditional marketing methods and have limited experience with digital design tools. This restricts their capacity to access broader markets and to engage with technology-enabled design opportunities.

Abakash Nayak, senior male artisan: "I only use my smartphone for calling and sending WhatsApp messages. If I need to post pictures of my paintings online, my son usually helps me because I'm not familiar with social media. Before this workshop, I had never heard of Artificial Intelligence or used any digital tools for designing. We mostly rely on tourists and craft exhibitions to sell our products."

Table 3: Limited Digital Literacy and Technology Exposure

How familiar are you with digital technologies such as smartphones, social media, or AI? Have you ever used digital tools to support your craft or marketing?		
TRANSCRIPTS	CODE/SUB THEMES	FREQUENCIES (n = 20)
"No, I never used a smartphone for craft marketing. I use it for calls and WhatsApp."	Basic digital literacy	14
"My son helps me upload photos"	Dependence on younger family members	16
"I had never heard of artificial intelligence"	Limited AI awareness	15
"We depend on tourists and exhibitions"	Reliance on the conventional market	17

Analysis: The results indicate limited digital literacy and minimal AI awareness among artisans. Comparable challenges have been reported by Panda (2022) and Samantaray (2005), suggesting that insufficient digital capability continues to impede innovation. Consequently, these findings support the adoption of a Participatory Design approach to facilitate the introduction of AI within the Pattachitra ecosystem.

Implications: The findings indicate that effective Human-AI co-creation necessitates digital capacity-building prior to technology adoption. Accordingly, AI interventions should incorporate hands-on training and participatory learning to enhance artisans' digital confidence. This approach can facilitate meaningful engagement with AI, preserve traditional craftsmanship, and promote sustainable participation in the market.

4.1.1 Perceptions of Contemporary Design and Innovation

Participant observation and interviews showed that artisans generally view contemporary design positively, though they are cautious about excessive modernization. They recognize innovation as important for expanding market opportunities, but consistently stress that new designs must preserve the traditional motifs, narratives, and artisanal identity of Pattachitra. Innovation should complement, not replace, cultural heritage.

Bamadeb Das, senior male artisan: "Innovation is essential, as customers seek unique offerings. We welcome new products and ideas, but the essence of Pattachitra must remain intact. Traditional stories, motifs, and painting styles define our identity. While we can modernize our products, we must preserve the soul of the art."

Table 4: Perceptions of Contemporary Design and Innovation

What are your views on incorporating contemporary designs into Pattachitra? What is your perspective on experimenting with new ideas while maintaining traditional elements?		
TRANSCRIPTS	CODE/SUB THEMES	FREQUENCIES (n = 20)

"I try to create new products as per the choice of customers"	Openness to Innovation	14
Innovation is important for survival	Positive perception of Innovation	16
"We should never lose traditional stories and motifs while following new trends"	Preserving Cultural Authenticity	15
"New ideas should respect the identity of Pattachitra"	Innovation within tradition	17

Analysis: The findings establish a baseline for RQ2, indicating that artisans consider innovation essential, but only when it maintains cultural authenticity. This perspective supports Luckman's (2015) concept of adaptive continuity and aligns with Participatory Design principles (Sanders & Stappers, 2008), in which innovation is directed by artisans' values and cultural knowledge.

Implications: The findings indicate that Human-AI co-creation should promote culturally sensitive innovation instead of unrestricted design experimentation. AI systems should support artisans in developing contemporary product ideas while upholding traditional motifs, narratives, and artisanic identity. This participatory approach may foster creativity, enhance market relevance, and contribute to the preservation of Pattachitra's cultural heritage.

4.1.5 Need for Design Intervention

Participant observation and interviews indicated that artisans acknowledged the necessity of design interventions to sustain Pattachitra within an evolving market context. Although artisans demonstrated strong traditional skills, they articulated a need for support in product innovation, digital technologies, and market-oriented design strategies that would broaden opportunities while preserving the cultural identity of the craft.

Charchala, a woman artisan, said, *"I have a deep understanding of traditional art; however, the contemporary market is evolving rapidly. We need guidance to develop products that appeal to modern customers while preserving our cultural heritage. Training in innovative design and digital technologies would enable us to expand our audience and improve our livelihoods while preserving the unique identity of Pattachitra."*

Table 5: Need for Design Intervention

In your opinion, are design or technology-based interventions necessary to support artisans? What forms of support would most effectively enhance your craft and expand your market opportunities?		
TRANSCRIPTS	CODE/SUB THEMES	FREQUENCIES (n = 20)
"We need guidance and training in new design methods, digital technologies, and market-oriented support that customers will like."	Need for design support, capacity building	14
"Digital technologies and marketing would help."	Need for digital intervention	13
"The market is changing quickly."	Need to respond to market changes	15
"Without losing the identity of Pattachitra."	Innovation while preserving authenticity	17

Analysis: The findings shows that artisans seek for new designs, digital technologies and market-oriented support that customers will like. In alignment with Participatory Design principles (Sanders & Stappers, 2008), participants expressed a preference for collaborative interventions that enhance existing artisanal knowledge rather than supplant it. This evidence offers a clear justification for the proposed Human-AI Co-Creation Model.

Implications: The results suggest that effective Human-AI co-creation requires the integration of design training, digital capacity-building, and collaborative innovation. Artificial intelligence should be implemented through participatory workshops that enable artisans to explore new design opportunities while maintaining cultural authenticity. These interventions have the potential to enhance creativity, expand market access, and support sustainable livelihoods within the Pattachitra craft ecosystem.

4.2 Findings from the Human-AI Co-Creation Workshop

This section details the events and processes during the intervention.

4.2.1 Artisan Engagement with AI During the Workshop

Participant observation during the workshop showed that artisans actively engaged with AI during the workshop. Although many were initially hesitant because of limited digital experience, repeated use of ChatGPT and Midjourney AI-generated visualizations increased their confidence and curiosity. The workshop's participatory approach fostered collaborative learning and enabled artisans to explore AI as a creative design support tool.

Paromita Praggya Das, a female artisan, said, *"Initially, I felt apprehensive due to my lack of experience with AI and anticipated challenges in using it. However, with the researcher's guidance, I found it straightforward to experiment with various ideas. The process introduced new design possibilities, although I remained committed to selecting and adapting the final design to align with our Pattachitra style."*

Table 6: Artisan Engagement with AI During the Workshop

What were your initial impressions of using AI in the workshop? How would you describe your experience using AI to generate design ideas?		
TRANSCRIPTS	CODE / SUB THEMES	FREQUENCIES (n=20)
"I was nervous because I had never used AI before"	Initial hesitation	17
"It gave me new design possibilities."	Creative exploration	14
"It was easy to experiment with different ideas."	Increased confidence	14
"I wanted to choose and modify the final design."	Human control in co-creation	16

Analysis: The findings indicated that artisans developed increased confidence in using artificial intelligence (AI) through participatory learning. Initial hesitation was replaced by active engagement, aligning with Participatory Design principles (Sanders & Stappers, 2008), in which collaborative experimentation facilitated technology adoption and preserved artisans' creative control over design decisions.

Implications: The findings indicate that Human-AI co-creation is most effective when implemented through guided, hands-on participation. Artificial intelligence served as a creative support tool rather than a replacement for artisans, thereby reinforcing the proposed Human-AI Co-Creation Model, in which computational intelligence enhances ideation while preserving artisan agency and cultural authenticity.

4.2.2 Collaborative Prompt Development

Participant observation indicated that prompt development was a collaborative, iterative process among artisans, the researcher, and AI tools. Rather than using generic prompts, artisans drew on their expertise in Pattachitra motifs, mythology, color palettes, and composition to refine them. This approach enabled the translation of traditional artisanal knowledge into computational instructions while preserving cultural authenticity.

Neeranjana Das, a male artisan, said, "Initially, I was unsure how to formulate the prompt. We deliberated on the story, motifs, borders, and colors, then, with the help of the researcher and the two design students, provided instructions. With each AI-generated image, we revised the prompt until it captured our Pattachitra style. The process felt like teaching the AI about our tradition."

Table 7: Collaborative Prompt Development

How did you develop prompts for generating AI designs? What role did your traditional knowledge play in creating AI prompts?		
TRANSCRIPTS	CODE / SUB THEMES	FREQUENCIES (n=20)
"We discussed the story, motifs, borders and colors."	Collaborative prompt development	14
"I didn't know what to write at first."	Prompt learning process	15
"We changed the prompt until it reflected our style."	Iterative prompt refinement	12
"It felt like we were teaching the AI our tradition."	Translation of artisanal knowledge into AI	14

Analysis: The findings provided that, the prompt development emerged through collaboration among artisans, the researcher, and AI. Consistent with Participatory Design (Sanders & Stappers, 2008), artisans actively shaped AI outputs by contributing their cultural knowledge. This process transformed tacit artisanal expertise into computational instructions, illustrating real Human-AI co-creation rather than passive technology use.

Implications: The data show that effective Human-AI co-creation depends on collaborative prompt development that embeds artisans' cultural knowledge within AI-generated outputs. Rather than replacing creativity, prompt engineering becomes a mechanism for preserving authenticity as it expands design possibilities. This principle forms a key component of the proposed Human-AI Co-Creation Model for the Pattachitra craft ecosystem.

4.2.3 Human Interpretation of AI-Generated Designs

Observations of participants' work and group communication showed that artisans critically appraised AI-generated designs rather than accepting them unconditionally. Each piece was evaluated for cultural authenticity, mythological accuracy, composition, and adherence to traditional Pattachitra aesthetics. AI-generated images were regarded as design inspiration that required human interpretation and revision beforehand.

Jyotiranjana Nayak, a male artisan, said, "Some AI-generated designs showed considerable creativity, though they did not consistently adhere to our traditional style. We systematically examined motifs, borders, colors, and narrative elements before determining their suitability. We incorporated valuable concepts, corrected inaccuracies, and tried to modify the designs to ensure they were appropriate for Pattachitra."

Table 8: Human Interpretation of AI-Generated Designs

What did you think about the designs generated by AI? How did you decide whether an AI-generated design was suitable for Pattachitra?		
TRANSCRIPTS	CODE / SUB-THEMES	FREQUENCIES (n=20)
"Some AI-generated designs were very creative."	Appreciation of AI creativity	13
"They did not always follow our traditional style."	Recognition of AI limitations	18
"We looked at the motifs, borders, colors and stories."	Evaluation of cultural authenticity	16
"We adapted the designs for Pattachitra."	Human interpretation and adaptation	14

Analysis: The study revealed that artisans effectively reflected and refined AI-generated designs to their cultural understanding. Instead of replacing creativity, AI supported idea generation as artisans maintained authenticity and artisanal quality. This is consistent with participatory design (Sanders & Stappers, 2008), noting that the co-creation process revolves around human expertise.

Implications: The findings demonstrate that AI-generated designs necessitate human cultural interpretation to maintain authenticity and relevance. Consequently, Human-AI co-creation should assign artisans the roles of evaluators and decision-makers, enabling them to refine computational outputs through the application of traditional knowledge. This approach reinforces the proposed Human-AI Co-Creation Model by achieving a balance between technological innovation and the preservation of cultural heritage.

4.2.4 Challenges Encountered During Human-AI Collaboration

Observations and workshop discussions revealed multiple challenges during the human-AI co-creation process. Artisans encountered challenges with prompt formulation, low digital capability, language barriers, and AI-produced outputs in the process that were sometimes not culturally appropriate. These challenges emphasized the need for facilitation, learning iteration, and ongoing human feedback in creating design collaboratively.

Sobhagya Ranjan Nayak, male artisan, "*The biggest challenge was explaining our ideas to the AI. Sometimes the generated images did not show the correct motifs, colors, or mythological details. We had to change the prompts several times and discuss the results together before we obtained a design that was close to Pattachitra style.*"

Table 9: Challenges Encountered During Human-AI Collaboration

TRANSCRIPT	CODE / SUB-THEME	FREQUENCY (N = 20)
"It was difficult to explain our ideas to the AI."	Difficulty in prompt formulation	18
"The images did not show the correct style of pattachitra."	AI limitations in cultural interpretation	19
"We changed the prompts several times and we discussed the results together."	Iterative refinement and Collaborative problem-solving	13
"The designs were close to Pattachitra style."	Human validation of AI outputs	16

Analysis: The findings demonstrate that Human-AI collaboration is an iterative process that requires continuous human guidance and cultural interpretation. Consistent with Participatory Design (Sanders & Stappers, 2008), artisans addressed technical and cultural limitations through collaborative refinement of prompts and critical evaluation, ensuring that AI-generated designs aligned with the artisanal conventions of Pattachitra.

Implications: The findings indicate that successful Human-AI co-creation requires facilitator support, iterative prompt development, and active artisan participation. AI should be implemented as a collaborative design tool, guided by human expertise. Addressing digital, linguistic, and cultural challenges can improve technology adoption while safeguarding the authenticity of traditional craft practices.

4.3 Results of the Post-Workshop Interview

This section reports the findings from post-workshop interviews conducted after the Human-AI Co-creation Workshop with Pattachitra artisans in Raghurajpur. The interviews investigated artisans' experiences with generative AI tools, specifically ChatGPT and Midjourney, and examined their perceptions of AI-assisted design, creativity, cultural authenticity, and the potential future role of AI in Pattachitra. The findings are organized into two themes: (1) artisans' responses to AI-generated designs and (2) the perceived influence of AI on Pattachitra design outcomes. Collectively, these findings address Research Question 1 and 2 by demonstrating how artisans experienced Human-AI co-creation and interpreted AI's contribution to design innovation while maintaining the cultural identity of Pattachitra.

4.3.1 Artisan Responses Towards AI-Generated Designs

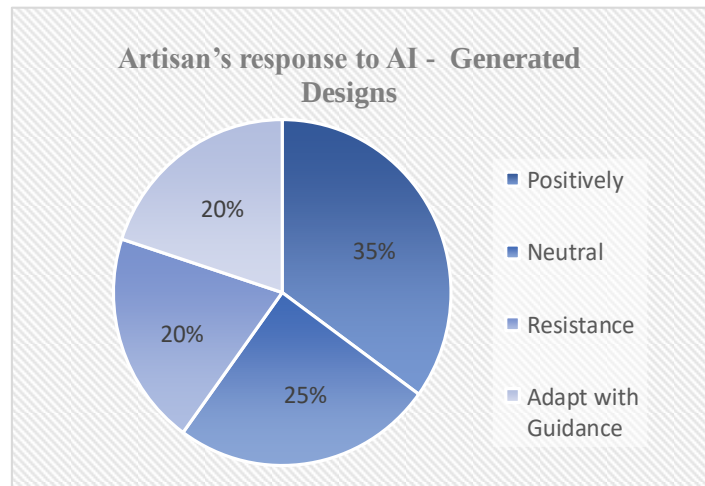


Fig .4. Artisan's Response to AI-Generated Designs using ChatGPT and Midjourney

The participatory workshop revealed varying levels of engagement with Human-AI co-creation among the artisans (Figure 4). Based on observation, workshop interactions, and post-workshop interviews, artisans' responses were categorized into four groups. About 35% responded positively, expressing curiosity and enthusiasm towards AI-assisted design exploration. These participants actively engaged with AI-generated concepts and saw the technology as a useful source of creative inspiration. Around 20% showed an adaptive response, initially needing guidance from researchers and students but gradually becoming more confident using AI during the workshop. Another 25% remained neutral, preferring to observe before forming an opinion, while 20% were reluctant to engage with AI, preferring traditional design methods and expressing concerns about technology's influence on cultural heritage. These findings indicate varying technological readiness among artisans and highlight the importance of collaborative facilitation during Human-AI co-creation.

4.3.2 Perceived Influence of AI on Pattachitra Design Outcomes

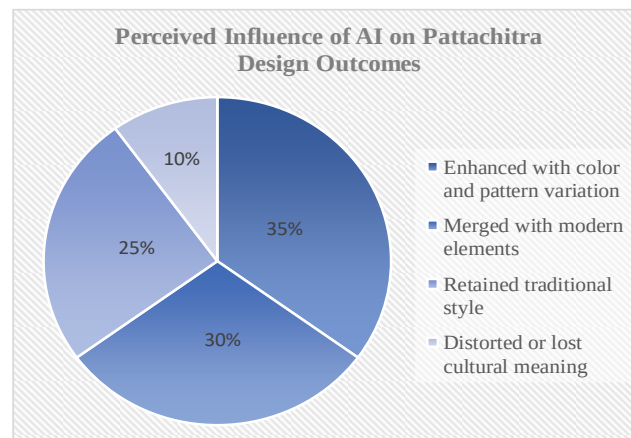


Fig .5. Perceived Influence of AI (using ChatGPT and Midjourney)

Artisans reported varied perceptions of artificial intelligence's influence on the visual characteristics of Pattachitra designs (Figure 5). Approximately 35% indicated that AI enhanced traditional designs by introducing novel color combinations, pattern variations, and alternative visual compositions while preserving the craft's core essence. An additional 30% stated that AI enabled the integration of contemporary elements into traditional motifs, resulting in hybrid designs that addressed evolving consumer preferences and expanded market opportunities. Conversely, 25% noted that AI-generated concepts generally preserved traditional aesthetics and required only minor refinements before implementation. In contrast, 10% expressed concerns that certain AI-generated outputs distorted traditional motifs or failed to acknowledge the symbolic and cultural significance inherent in Pattachitra, underscoring the need for human expertise and cultural judgment in evaluating and refining AI-assisted designs.

V. PROPOSED HUMAN-AI CO-CREATION MODEL FOR PATTACHITRA ECOSYSTEM

5.1 Development of Conceptual Human-AI Co-Creation Model for Pattachitra Ecosystem

The Human-AI Co-Creation Model demonstrates the integration of Artificial Intelligence into the Pattachitra ecosystem through a participatory, artisan-centered framework. Initially, AI serves as a creative support tool by assisting artisans in idea generation, motif exploration, and visualization of alternative design concepts. Artisans then evaluate these AI-generated outputs for cultural authenticity, applying traditional knowledge to validate and refine the designs. Human creativity remains central throughout, as artisans maintain responsibility for selecting, modifying, and manually executing the final artwork, thereby preserving creative ownership and authorship. The model also emphasizes that successful adoption relies on digital transformation readiness, including digital literacy, facilitation, and willingness to engage with new technologies. Collectively, these processes foster sustainable Human-AI co-creation, leading to contemporary product innovation, preservation of cultural identity, enhanced market relevance, artisan empowerment, and improved livelihood opportunities.

5.2 Proposed Human-AI Co-Creation Model for Pattachitra Ecosystem

Qualitative findings from interviews, participant observations, and the Human-AI co-creation workshop revealed five interrelated themes that characterize artisans' experiences of integrating Artificial Intelligence into the Pattachitra design process.

AI served as a creative support tool: First, AI served as a creative support tool, enabling artisans to expand idea generation, explore multiple design alternatives more efficiently, and accelerate concept development. Despite these advantages, artisans consistently retained control over final design decisions, using AI-generated outputs as sources of inspiration rather than as substitutes for their creative expertise.

Necessity of preserving cultural authenticity: Second, the findings underscored the necessity of preserving cultural authenticity. Although AI effectively generated novel visual concepts, it lacked the contextual understanding of symbolic meanings, narratives, and cultural conventions inherent in Pattachitra. As a result, human interpretation and refinement were essential to ensure that AI-assisted designs remained culturally appropriate and faithful to tradition.

Human inventiveness remained central: Third, the study demonstrated that human inventiveness remained central throughout the co-creation process. While AI generated alternative motifs, patterns, and compositions, artisans exercised aesthetic judgment by selecting, modifying, and manually painting the final designs, thereby retaining creative ownership and authorship.

Readiness for digital transformation: Fourth, the findings highlighted varying levels of readiness for digital transformation among participants. Younger artisans generally exhibited greater enthusiasm and confidence in experimenting with AI technologies, whereas older artisans required additional facilitation and direct guidance. These differences suggest that computer literacy significantly influenced artisans' willingness to adopt AI-assisted design practices.

Human-AI Co-creation as a Sustainable Design Strategy: Finally, the study identified Human-AI co-creation as a sustainable design strategy for the Pattachitra ecosystem. AI facilitated the development of contemporary product concepts while safeguarding the heritage identity of the craft, enabling artisans to respond more effectively to evolving consumer preferences and to identify new market opportunities without compromising cultural heritage.

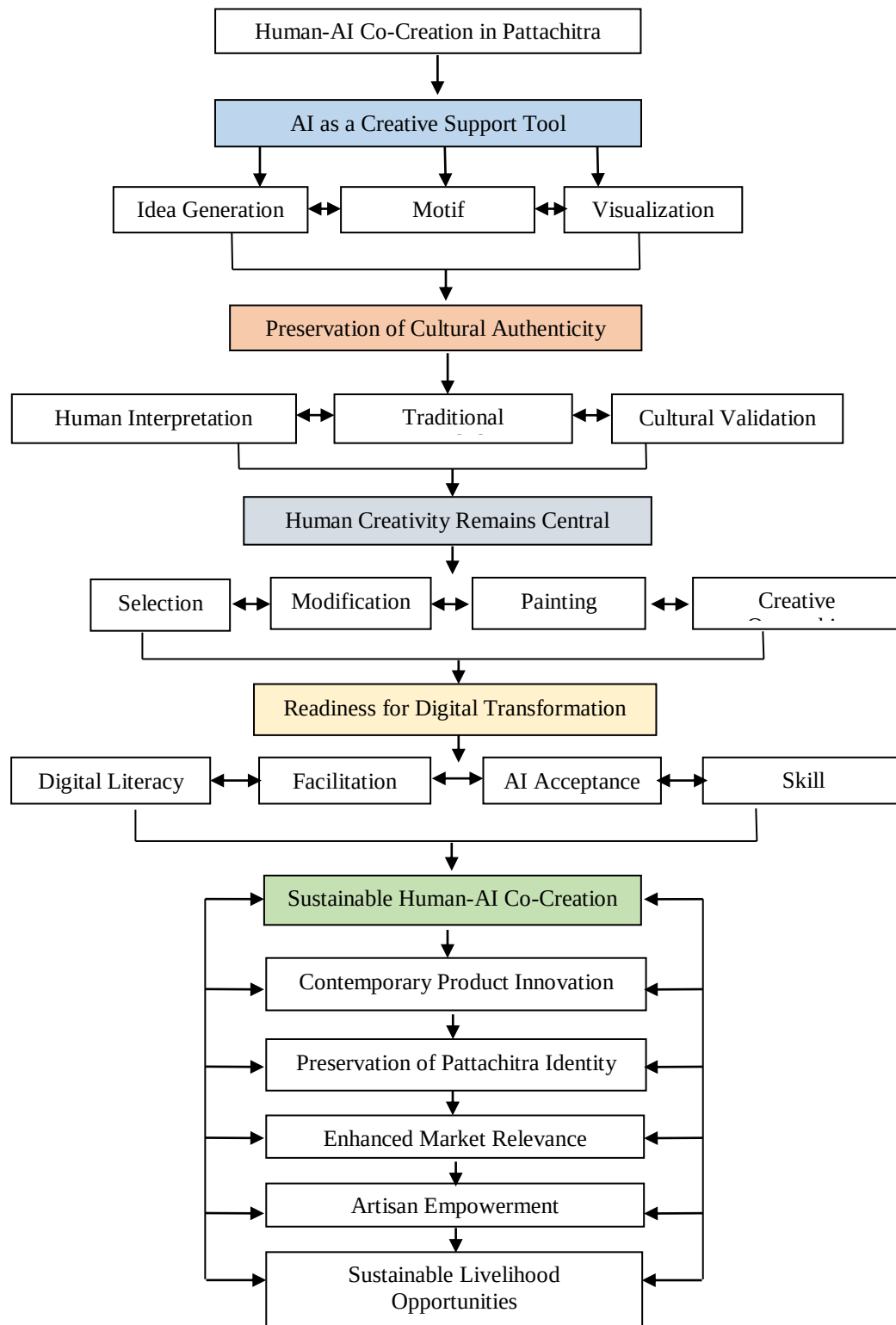


Fig 6. Human-AI Co-Creation Model for Sustainable Design Innovation in the Pattachitra Ecosystem

5.3 Human - AI Co-Creation Designs made during Workshop



Fig 7. Human-AI Co-Creation Lamp Design

Prompt given by the artisan and researcher, using ChatGPT: “Edit the attached image of a (lamp shade) by incorporating Pattachitra-style (Lord Jagannath) artwork with vibrant colors, cinematic lighting, surreal tones, and high contrast. The final output should reflect a modern aesthetic while celebrating and promoting the traditional Pattachitra art form in a contemporary context”

Discussion: The prompt developed during the Human-AI co-creation workshop demonstrates that Artificial Intelligence can function as a collaborative design tool rather than as an autonomous creator. By directing the AI to modify an existing lampshade design with Pattachitra-style Lord Jagannath artwork, and by incorporating vibrant colors, cinematic lighting, surreal tones, high contrast, and a contemporary aesthetic, the prompt integrated traditional cultural elements with modern visual preferences. The cultural content and creative direction were derived from the artisans' expertise in Pattachitra iconography, while AI enabled rapid visualization of alternative design possibilities. The resulting concepts served as exploratory prototypes, which artisans subsequently evaluated, refined, and adapted in accordance with traditional artistic conventions. This process supports the study's central finding that Human-AI co-creation augments, rather than replaces, artisanal creativity by fostering innovation within culturally appropriate boundaries. Furthermore, it demonstrates that participatory AI-assisted design can facilitate the development of contemporary lifestyle products while maintaining the symbolic, aesthetic, and cultural identity of the Pattachitra tradition.

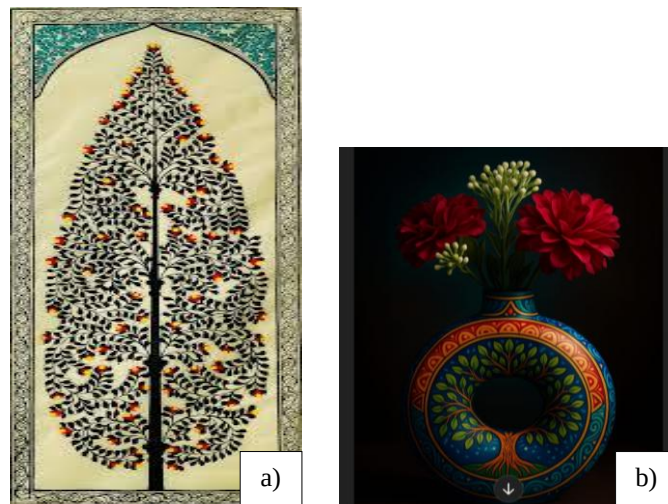


Fig 8. a) Original Pattachitra Painting , b) Human-AI Co-Creation Flower Vase Design

Prompt given by the artisan and researcher, using ChatGPT: “Edit the attached image of a (flower vase) by incorporating Pattachitra-style (Tree of Life) artwork with vibrant colors, cinematic lighting, surreal tones, and high contrast. The final output should reflect a modern aesthetic while celebrating and promoting the traditional Pattachitra art form in a contemporary context”

Discussion: Figure 8b) depicts the Human-AI co-creation process, wherein a traditional Pattachitra Tree of Life motif, originally painted on tussar silk was adapted for a contemporary flower vase design through AI-assisted image generation. The AI, guided by specific prompts, produced modern visual interpretations that incorporated vibrant colors, high contrast, and contemporary styling while maintaining the traditional motif. These AI-generated concepts served as design explorations, which the artisan subsequently evaluated, refined, and validated to guarantee cultural genuineness and fidelity to the authentic artwork. This case demonstrates that AI can function as a creative support tool, facilitating contemporary product innovation whilst preserving the artistic identity and cultural meaning of Pattachitra.

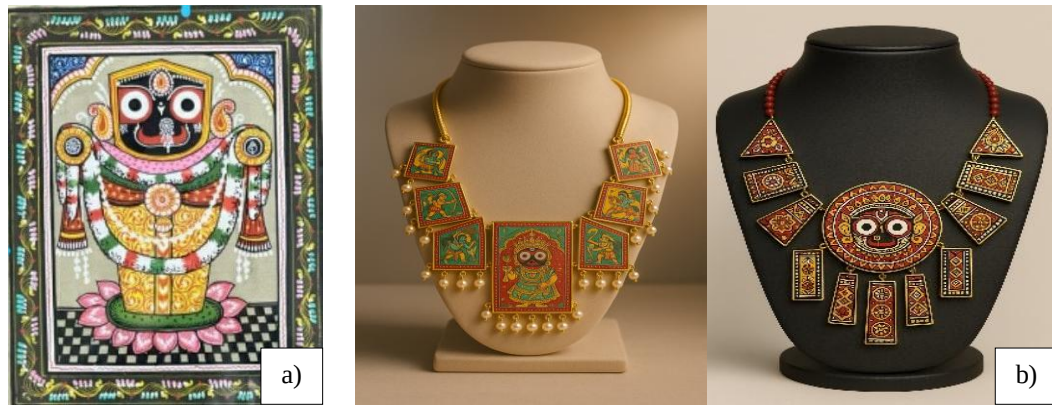


Fig 9. a) Original Pattachitra Painting b) Human-AI Co-Creation Jewellery Design

Prompt given by the artisan and researcher, using ChatGPT: “Edit the attached image of a (necklace) by incorporating Pattachitra-style (Lord Jagannath) artwork with vibrant colors, cinematic lighting, surreal tones, and high contrast. The final output should reflect a modern aesthetic while celebrating and promoting the traditional Pattachitra art form in a contemporary context”

Discussion: Figure 9b). depicts the Human-AI co-creation process, wherein the traditional Lord Jagannath motif from Pattachitra was adapted for a contemporary necklace design. In response to the prompt, artificial intelligence generated modern visual interpretations that integrated vibrant colors and contemporary aesthetics with traditional iconography. The AI-generated concepts provided exploratory design alternatives, which artisans subsequently evaluated, refined, and validated using their cultural knowledge and artistic expertise. This process demonstrates that artificial intelligence serves as a creative support tool, facilitating contemporary product innovation while maintaining the authenticity, symbolism, and cultural identity of the Pattachitra tradition.

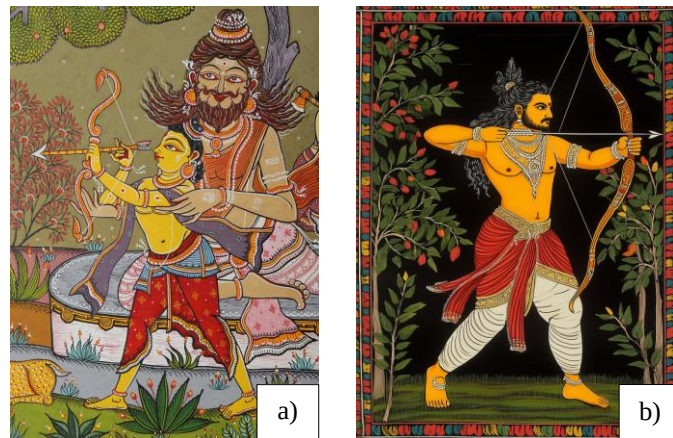


Fig 10. a) Original Pattachitra painting b) Human-AI Co-Creation representation of Lord Rama

Prompt given by the artisan and researcher, using Midjourney – “Imagine / A vibrant 2D Pattachitra painting of an Odisha painting depicting the god Rama, holding his bow and arrow in one hand while standing on grassy ground with trees behind him. The background is a dark black with colorful border patterns around it. He has yellow skin, wearing red over white pants and boots, looking focused as he's about to shoot an arrow at something off-screen. flat drawing style, His expression conveys determination or focus, side profile with elongated eyes. while green leaves frame both sides of his figure. --ar 43:64 --no depth --s 250 --v 6.1”

Discussion: Figure 10b). illustrates the application of Midjourney to generate a contemporary digital interpretation of the traditional Pattachitra depiction of Lord Rama using a detailed text prompt. The artificial intelligence system translated the prompt into a visually rich composition by incorporating characteristic Pattachitra elements, including bold outlines, elongated eyes, decorative borders, a flat visual style, and vibrant colors. While the generated image closely reflected the intended aesthetic, its cultural accuracy and symbolic representation required validation by artisans. This case demonstrates that artificial intelligence can rapidly visualize traditional themes and facilitate creative exploration. However, artisans remain responsible for evaluating, refining, and ensuring the cultural authenticity of the final design, thereby reinforcing the Human-AI co-creation approach proposed in this study.

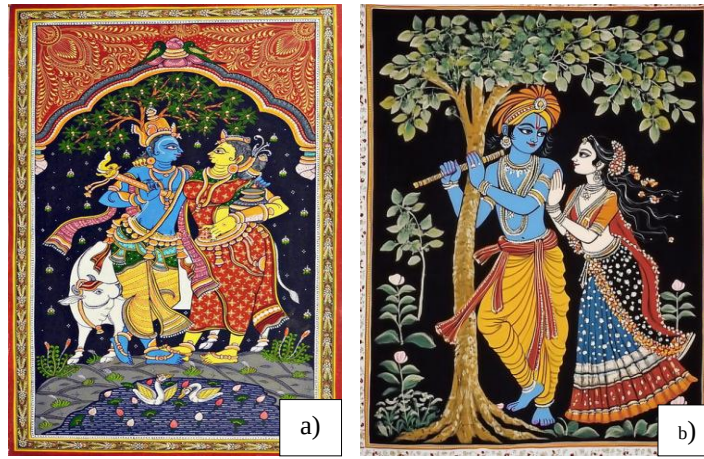


Fig 11. a) Original Pattachitra painting b) Human-AI Co-Creation representation of Lord Krishna and Radha

Prompt given by the artisan and researcher, using Midjourney – “ *Imagine / <https://s.mj.run/kUdQrkX4SQE> + 2D Pattachitra painting style, traditional hand-painted look, An Indian miniature painting of Lord Krishna with his blue-skinned with fair skinned wife under a tree, on black cotton fabric with a white border. Odisha Pattachitra art style, fine brush detailing, 2D flat style --ar 4:5 --no depth*”

Discussion: Figure 11b) demonstrates the use of Midjourney to generate a digital interpretation of a traditional Pattachitra composition depicting Lord Krishna and Radha, utilizing both image-reference and text-based prompts. The artificial intelligence system incorporated key stylistic features of Odisha Pattachitra, such as the two-dimensional flat composition, intricate brushwork, decorative borders, and the traditional colour palette. Although the generated image effectively captured the intended aesthetic, artisans were essential in evaluating its cultural symbolism, iconographic accuracy, and conformity to established artistic conventions. This case indicates that artificial intelligence can facilitate rapid design visualization and creative exploration, but artisanal expertise remains indispensable for maintaining the authenticity and cultural integrity of the Pattachitra tradition.

5.4 Contribution and Implications

Theoretical Contribution: This study advances the emerging literature on Human-AI co-creation in traditional crafts by demonstrating the ways in which AI can complement artisanal creativity within a participatory design framework. It broadens current discussions on participatory design, craft sustainability, and human-AI collaboration by showing how computational intelligence can facilitate innovation while maintaining the cultural authenticity of Pattachitra.

Practical Implications: The findings indicate that AI-assisted workshops utilizing ChatGPT and Midjourney enabled artisans to develop contemporary product ideas inspired by traditional Pattachitra motifs. The results suggest that digital literacy programs, AI training, and participatory design interventions can foster product diversification, innovation, and market relevance while preserving craft heritage.

Policy Implications: The study underscores the necessity for policy support to facilitate the responsible integration of AI into the traditional craft sector. Government agencies, craft development organizations, and design institutions are encouraged to invest in digital infrastructure, AI capacity building, and collaborative innovation programs to strengthen the sustainability, competitiveness, and global visibility of heritage crafts such as Pattachitra.

VI. LIMITATIONS AND FUTURE DIRECTIONS

Given that this workshop constituted an initial exploratory intervention, additional workshops and extended engagement are required to assess the sustained impact of Human-AI co-creation within the Pattachitra ecosystem. The limited duration also constrained the comprehensive development and testing of product prototypes. Collaborations with local manufacturers in future initiatives may facilitate the transformation of AI-assisted concepts into market-ready products.

A primary limitation is that AI-generated designs did not accurately replicate the intricate visual language and craftsmanship characteristic of authentic Pattachitra paintings. Instead, these outputs functioned as creative references, providing inspiration for new motifs, compositions, color palettes, and product applications. To maintain the authenticity of Pattachitra, AI-generated concepts should not be directly printed onto products. Instead, artisans should manually recreate these concepts using traditional hand-painting techniques, thereby ensuring that final prototypes preserve the original artistic style, cultural significance, and craftsmanship. Overall, the findings indicate that AI is most effective as an ideation and collaborative design tool, with artisans maintaining creative control and safeguarding the cultural integrity of their craft.

VII. CONCLUSION

The findings indicate that Human-AI co-creation fosters innovation within the Pattachitra craft ecosystem while maintaining artisanal expertise. Although artisans demonstrated varying degrees of acceptance toward Artificial Intelligence, the participatory workshop revealed that AI is most effective as a collaborative ideation tool when informed by traditional knowledge and Participatory Design principles. AI supported motif exploration, colour experimentation, product visualization, and design ideation, while artisans maintained creative control by interpreting, refining, and manually painting the final designs. These

results suggest that successful AI integration relies on preserving creative authorship, cultural authenticity, and ongoing artisan engagement. Rather than supplanting traditional craftsmanship, AI augments the tacit knowledge, aesthetic judgment, and cultural expertise of artisans. The proposed Human-AI Co-Creation Model provides a sustainable framework that balances technological innovation with heritage preservation, facilitating the development of contemporary Pattachitra products that address changing consumer preferences while protecting the craft's traditional identity.

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