Balancing Heritage and Innovation: A Study on Traditional Craftsmanship and Technological Integration in Design Curricula

Chiranjeevi Reddy Gudimetla, Priya Darshini Gopal and Rajesh Kumar Gajam

Abstract

The research explores the integration of traditional craftsmanship with modern technology in design education. Technology's rapid evolution presents opportunities and challenges for educators seeking to balance cultural heritage with innovation. The study aims to evaluate the current integration of traditional craftsmanship and modern technology in design education in India, focusing on identifying key challenges and opportunities educators encounter when teaching these diverse skills. The objectives are to evaluate this integration, identify obstacles and possibilities in integrating traditional crafts with modern technologies in the curriculum, and make curriculum development recommendations. Quantitative and qualitative data were collected to meet study objectives. A survey was administered to 65 seventh-semester students enrolled in NIFT Accessory Design, Textile Design, and Fashion Design programs. In addition, 15 senior faculty members with over 10 years of experience, 15 alumni with about five years, and 15 senior industry executives with over 15 years were interviewed in-depth. The research demonstrates the significance of traditional workmanship and a mounting need for technology integration in the curriculum. Despite giving importance to traditional craft skills, just 21 percent of students rate instruction as outstanding. Conversely, only 8 percent of students feel highly proficient in modern technology. To bridge the gap between academic preparation and industry expectations, alumni and industry professionals emphasize a curriculum that blends conventional skills with contemporary practices. Senior faculty members stress the need for a unified curriculum that promotes creativity, technical skill, and cultural knowledge. The study culminates in the development of the CRAFTECH framework. This holistic and future-oriented model integrates strategic themes, focus areas, and curriculum directions to effectively address evolving challenges in design education. The study indicates that design education must adapt to a rapidly evolving industry to prepare students for both traditional and modern

design challenges. This balanced approach is necessary to prepare future designers for a globalized and technology-driven industry.

Keywords: Traditional craftsmanship, modern technology, fashion education, curriculum development, craft-tech integration

Introduction

Design education is undergoing a profound transformation through evolving technological advancements that are reshaping creative practices and pedagogical priorities. The integration of digital tools such as CAD software and AI-based platforms to AR/VR has expanded the possibilities in the design landscape. However, this technological evolution presents critical questions about the position of traditional craftsmanship, especially in regions with rich artisanal legacies like India. While global institutions are embracing interdisciplinary, tech-driven curricula, the need to balance innovation with cultural continuity has become more urgent.

The long-standing legacy of Indian crafts, such as handloom weaving, metal casting, and folk art, embodies sustainable, community-based practices and indigenous knowledge systems. Nevertheless, these practices often remain disconnected from mainstream design education, which tends to mirror Western pedagogical models. The literature review explores how global and Indian institutions are responding to the challenge of integrating traditional and digital approaches. It examines case studies, identifies systemic gaps, and highlights emerging hybrid models that demonstrate the potential of co-creation, interdisciplinary methods, and context-driven curricula. The review sets the foundation for rethinking how design education can evolve meaningfully and inclusively.

Global shifts in design education: integrating technology and tradition

The rapid growth of technology has significantly influenced the way design is taught and practiced. It has created opportunities and challenges in blending traditional craft skills with digital tools. Integrating technology into design education expands creative possibilities but also reshapes pedagogical strategies. In this context, 'technology' refers to a spectrum of digital tools and systems, such as CAD software, AI-based design platforms, virtual and augmented reality, IoT, and digital fabrication techniques like 3D printing and laser cutting (Jenny et al., 2022). 'Technological integration' thus implies more than mere inclusion but pedagogically driven applications that complement traditional design processes (Riikonen, Seitamaa-Hakkarainen and Hakkarainen, 2020). Rather than serving as add-ons, these tools must be purposefully rooted within curricula to enhance, not replace, the depth and value of traditional design practices. This

necessitates thoughtful integration where digital proficiency and material sensitivity are cultivated in tandem, supporting a more holistic and future-oriented design education.

In visual art education, Asare et al. (2023) blend traditional and digital art techniques; while traditional methods enhance tactile skills and emotional connections, digital techniques offer greater convenience and efficiency. These are initiatives to integrate craft and technology with examples like Tamara Anna Efrat's "Encoded Craft" merges embroidery with algorithmic coding and 3D printing, showing how digital methods can recontextualize heritage. Ma and Wang (2022) reveal the potential of 5G technology in revitalizing traditional metal crafts. Institutions like the University of the Arts London encourage exploration of smart textiles and material innovation alongside traditional processes, fostering sustainability and socially engaged design. Wang and Li (2022) note that advanced technologies like CAD, AI, and 3D printing boost students' creativity and digital literacy. Kazlacheva et al. (2018) emphasize the benefits of AR/VR in fashion education, enhancing visualization and interactivity. H&M's Metaverse Design Story, developed with the Institute of Digital Fashion, exemplifies digital fashion's immersive potential. Karakul (2022) supports the role of virtual learning environments in preserving craftsmanship while fostering innovation.

Marshall (2008) suggests a hybrid curriculum combining tradition and technology to meet the needs of evolving creative sectors. The Rhode Island School of Design (RISD) established the Computation, Technology, and Culture (CTC) department in 2025, integrating studio learning with emerging tech, an interdisciplinary approach, and ethically grounded design education. The Royal College of Art (RCA) has transformed from a traditional arts school to a leader in STEAM (Science, Technology, Engineering, Art, and Mathematics)-based, interdisciplinary design education.

Gaps and global parallels

India's centuries-old craft heritage, shaped over time, reflects its vast cultural, social, and historical diversity. Crafts like Banarasi silk, Kanjivaram sarees, Madhubani painting, Pashmina weaving, Dhokra metalwork, and Bidriware exemplify sustainable, community-driven practices based on indigenous knowledge systems. Unlike the West, where traditional crafts often remain confined to museums, Indian crafts thrive through intergenerational transmission within artisan communities (Economic Times, 2025). Despite its craft-rich heritage, Indian design education remains largely influenced by Western pedagogies, often marginalizing indigenous knowledge systems. Educators argue for a shift beyond Eurocentric models to include local expertise and community-driven practices (Bahl, 2024).

The key concern is limited collaboration between academic institutions and the craft sector. Indian students seldom encounter models that integrate traditional craftsmanship with modern design thinking. Japan, by contrast, offers integrated models like "Craft × Tech," which merges heritage with innovation and connects education with industry (Swissnex, 2025). Although India is witnessing the rise of hybrid initiatives as isolated examples, such as digital archives of Uttarakhand's crafts, these remain underfunded and lack institutional support (Chaudhary et al., 2024) compared to Japan's coordinated efforts.

In the 21st century, there are emerging pedagogical models that emphasize blending traditional knowledge, sustainable practices, and multi-dimensional learning. Narasimhan and Mahajan (2023) advocate for co-creation in pedagogy, blending traditional crafts with sustainable practices. Xi, Ma and Ou (2024) demonstrate successful integration of academic research and industry collaboration through a micro-major in interaction design. Sood and Sharma (2023) underscore hands-on learning to promote sustainability and cultural integrity. Jha (2022) promotes rhizomatic learning in online craft education, enabling exploration of themes like indigenous knowledge, cultural appropriation, and sustainability, advocating for an inclusive, multidimensional learning approach. Meyer and Norman (2020) call for a paradigm shift from skill-based to systems-thinking design education. Reviewing institutions like RISD, Parsons, RCA, and SCAD, they conclude that most curricula remain overly discipline-specific with limited emphasis on collaboration and human-centered design. Addressing this gap is essential for equipping students to face the complex, socially and environmentally entangled challenges of the 21st century.

Educators now face the challenge of preserving craft traditions while preparing students for tech-centric industries (Risatti, 2007; Walker, Evans and Mullagh, 2019). Reddy (2014) emphasizes the necessity of synthesizing art, technology, and management in fashion education. Innovative curricular models must ensure adaptability while maintaining cultural depth. Reddy (2023) observes that Indian educators often prioritize efficiency over creativity, demonstrating the importance of rethinking pedagogical approaches. In contrast, Massachusetts Institute of Technology's Art, Culture and Technology (ACT) program fosters experimentation, critical theory, research-driven practice, contextual inquiry, and interdisciplinary practice, thus inspiring creativity in both students and faculty.

Infrastructural disparities and lack of funding hinder progress. While global institutions adopt AI, VR, and digital tools, many Indian design schools, especially in rural regions, lack access to these technologies (Economic Times, 2025). The fact points out the importance of investments and curricular reforms that enable equitable technological integration.

Research Objectives

Based on the literature review, there is a clear need for a balanced integration of traditional craftsmanship and modern technology within design education curricula. Identifying the key challenges and opportunities in achieving this integration is essential for developing effective, future-ready educational models. Strategic and evidence-based recommendations are crucial to guide curricula reforms that foster both cultural continuity and technological adaptability.

This research aims to assess the current integration of traditional craftsmanship and modern technology in Indian design education, identify key challenges educators face, and explore opportunities for enhancing this integration. The study recommends a curriculum model that balances craft and technology inputs in design education.

Research Methodology

To meet the objectives of the study, both quantitative and qualitative data were gathered. Quantitative data were collected through a survey administered to 65 students from the Accessory Design (22), Textile Design (21), and Fashion Design (22) departments at NIFT. Out of all the NIFT campuses, one was selected through convenience sampling. Within this chosen campus, a purposive sampling strategy was applied to select a relevant student cohort. Subsequently, a census approach was used to survey all willing and available students from that specific cohort, which comprised approximately 95 students. All participants were in their seventh semester and had completed an 8-week industry internship.

A comprehensive closed-ended questionnaire was employed to understand the perceptions of design students regarding the integration of traditional crafts and modern technology in their education. Each question was framed using a categorical scale, predominantly utilizing five-point Likert-scale options. 15 multiple-choice questions made up the questionnaire, which was designed to gather answers in several key thematic areas that were in line with the study's overarching goals. These included opinions about traditional craft education, exposure to contemporary technology, curriculum balance, skill readiness, and industry relevance. A pilot study with five participants was conducted to assess the items' coherence, relevance, and intelligibility. The necessary modifications were made in response to the feedback to enhance the instrument's general validity and usability.

In-depth interviews were conducted with 15 senior faculty members from the three design departments at NIFT. These members were chosen for their over 10 years of

academic experience, involvement in curriculum reviews and development, and their blend of theoretical and practical design expertise. Interviews were also held with 15 alumni, each with approximately five years of professional experience, to explore their transition from academic knowledge to professional practice. Additionally, 15 senior industry professionals, including designers, manufacturers, and other senior management stakeholders with over 15 years of experience, were interviewed. These in-depth interview questions are intended to identify areas where the curriculum needs to be enhanced, understand skill gaps among recent graduates, and evaluate how well the institution mixes traditional craftsmanship with modern technical skills.

Quantitative analysis involved descriptive statistical techniques to identify patterns in students' exposure to both traditional and technological skills. Initially, a correlation analysis was conducted to examine the relationship among Accessory Design, Textile Design, and Fashion Design students. The results are presented using stacked bar and doughnut charts.

Qualitative data were analyzed through thematic analysis of interview transcripts to uncover major themes. An inductive thematic analysis was used to examine the qualitative data, allowing codes and themes to emerge naturally from participant interviews. The study followed Braun and Clarke's (2006) six-phase process: becoming familiar with the data, manually creating initial codes, identifying recurring themes, repeatedly reviewing themes, defining and naming them, and finalizing the report. Initially, 247 codes were identified in the transcripts. After cleaning and combining similar codes, the number was reduced to 128 unique codes, which were further refined to 92. These codes were then organized into a master list of 55, which were grouped into six main themes. All coding and categorizing operations were performed manually to preserve contextual sensitivity and promote a profound connection with the data. To augment the credibility and reliability of the thematic structures, stringent validation procedures were implemented, including peer debriefing sessions for the critical review of coding frameworks and thematic interpretations by fellow researchers, as well as member checking, in which select participants were consulted to verify the accuracy and relevance of the identified themes. Reflexive journaling and comprehensive audit trails were upheld during the analysis process to record analytical conclusions, ensuring openness and consistency in theme development.

Results and Discussion

This section presents the findings of the integration of traditional crafts and modern technology in design education. The subsections cover a correlation analysis of student

perceptions across disciplines, followed by an exploration of student, alumni, industry, and faculty perspectives. Each subsection offers insights into the current state of education and the evolving needs of the industry.

Correlation analysis of students' perceptions of traditional craft and modern technology integration across academic disciplines

A Spearman's rank-order correlation analysis was done to measure the strength and direction of association between the responses of the Accessory Design (AD), Textile Design (TD), and Fashion Design (FD) student groups across all educational metrics. These metrics included both traditional craft-related views (like how well students are taught, how important they think the subject is, and how much focus is put on it in classes) and modern technology-related views (like exposure, proficiency, training opportunities, and industry demand).

The correlation results indicated strong positive links between AD and TD (0.83), AD and FD (0.89), and TD and FD (0.93). This shows that, even though there were some small differences, there was a strong pattern in how the three groups ranked the value and suitability of traditional and technological inputs in design education. These findings indicate a high level of consistency in the rankings of responses across these groups. Accordingly, all groups' data were combined for further analysis. A descriptive statistical analysis was then performed to provide a detailed summary of the collective perspectives.

Students' perceptions of the integration of traditional craft and modern technology in design education

The descriptive statistical analysis of student perceptions related to Traditional Craft Skills (TCS) and Modern Technological Skills (MTS) is shown in Figure 1 as a stacked bar chart. These skills involve creating objects by hand, often using traditional techniques and materials, and they are a vital part of cultural heritage. Modern Technological Skills (MTS) encompass a broad range of areas, including software proficiency, user experience (UX) and user interface (UI) design, digital marketing, and emerging technologies like artificial intelligence (AI) and virtual/augmented reality (VR/AR). The findings reveal a strong appreciation for traditional craftsmanship, with 97 percent acknowledging its importance in education. Despite this, only 21 percent of the students rated the quality of instruction in traditional crafts as very positive, suggesting a need for improved curriculum focus in this domain.

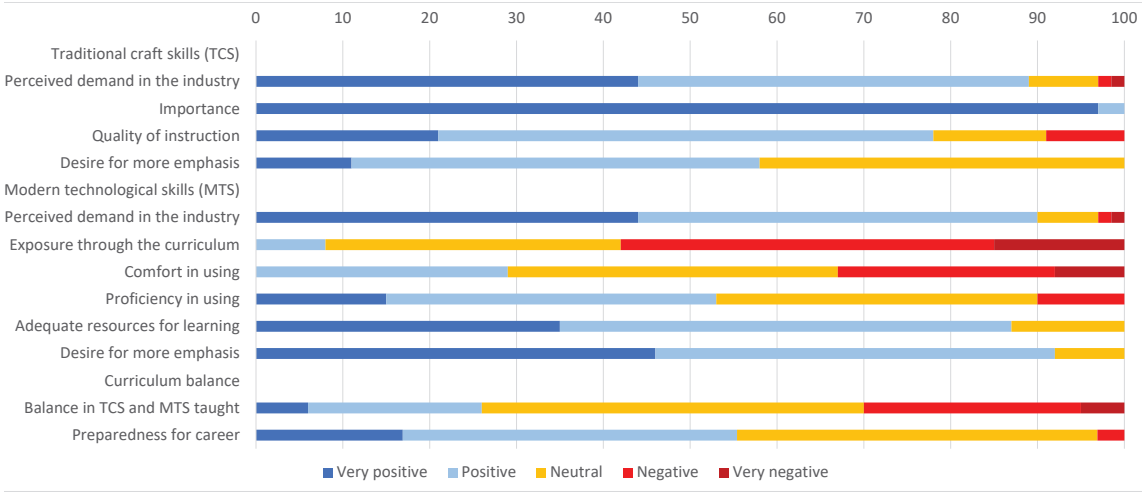

Figure 1: Perceptions of students on the integration of traditional craft and modern technology in the curriculum

The survey results indicate that students have conflicting opinions about contemporary technologies. While 67 percent of respondents expressed comfort in using digital tools, only 8 percent rated technology exposure in the curriculum as very positive, and a meager 15 percent confirmed actual proficiency. Additionally, 46 percent of the students expressed more emphasis on building technological skills through the curriculum, and just 35 percent were very satisfied with the learning resources available in the institute. These findings imply that, although students are typically at ease using technology, there is a disparity in their knowledge and the availability of sophisticated resources. Furthermore, 90 percent of students acknowledged the growing need for technology abilities in the industry, and 89 percent of students believed there is also a substantial demand for traditional artisan skills. This emphasizes the growing importance of both craft and technological proficiency in design education. The survey points to the need for better institutional support in advanced technology training and regular curriculum updates and pedagogy enhancements that balance traditional and modern skills, ensuring alignment with educational goals and industry demands.

Alumni perspectives on traditional crafts and modern technology in design education

The alumni pointed out the vital role of traditional craftsmanship in design education, particularly in fostering a deep understanding of materials and cultural heritage. As one alumna expressed, “Traditional craftsmanship skills are crucial, but the market is changing, and so are people’s preferences. We must adapt by blending traditional methods with

modern design trends." This perspective underscores the need to evolve traditional practices while maintaining their core values, emphasizing that while traditional skills are the bedrock of design education, they must be dynamic to remain relevant.

The alumni recognized the importance of AI, 2D and 3D CAD, IoT, AR, and VR on modern design processes and stressed their integration. A graduate said, "Modern technology, such as CAD and computer design tools, is becoming indispensable." One said, "Because of modern technology, traditional people are also moving into the modern world, speeding up their work without losing their craft." These comments point out that there must be a balanced approach that uses technology without undermining traditional crafts. Another alumna said, "Updated technologies are essential for traditional crafts to stay relevant, but not at the cost of losing authenticity."

A recurring theme among alumni was the need to address the gap between academic training and industry demands. They advocated for incorporating more industry-focused projects and practical experiences into the curriculum to bridge this gap effectively. An alumna emphasized, "Innovation and practical application should be at the forefront." Another alumnus noted, "By introducing practical skills like digital marketing and social media marketing, we can better prepare students for the industry." Another alumnus emphasized, "Focusing on the 7Ps of marketing and SWOT analysis will help designers better understand the industry."

Additionally, alumni stressed the importance of enhancing technological proficiency alongside traditional skills. They recommended the development of dedicated modules on emerging technologies and increased hands-on experience with these tools. One alumna suggested, "The current education system does not adequately prepare students for careers in design. There is a need for curriculum improvements." Another alumna added, "We need more focused training on new technologies to ensure we are not only skilled in traditional methods but also adept at using cutting-edge tools." This highlights the need for a curriculum that prepares students for current and future industry challenges, ensuring they can navigate both worlds successfully. Overall, the alumni emphasized the need for a balanced design education that combines traditional skills with modern technology, showing how the industry is changing while still honoring cultural traditions.

Industry perspectives on traditional crafts and modern technology in design education

The industry experts consistently affirmed the enduring significance of traditional craftsmanship in design education. They emphasized its crucial role in developing a profound understanding of materials, processes, aesthetics, values, empathy, social

design, and sustainability. This comprehensive knowledge will not only aid in creating meaningful and impactful designs but also foster each student's unique style and creative expression. While modern technologies are crucial for precision and repetitive tasks to maintain consistency, traditional crafts hold equal significance for their distinctive imperfections, skilled craftsmanship, and natural qualities. As one expert highlighted, "Traditional craftsmanship remains vital; it provides a foundational knowledge that modern technology can enhance. The key is to blend these elements to stay relevant in our rapidly evolving industry."

The industry experts increasingly acknowledged the role of modern technology in design education. Modern technologies are transforming creative processes and enhancing efficiency. As one expert remarked, "Technology allows us to enhance traditional crafts, making them more accessible and relevant in today's market. It's not just about efficiency; it's about expanding the possibilities of what can be done with traditional techniques." However, there was a consensus that technology should complement, not overshadow, traditional skills.

A significant concern among experts was the existing gap between academic training and industry requirements. They advocated for incorporating more industry-focused projects, hands-on experiences, and professional skills into the curriculum. As one expert noted, "To effectively prepare students, we must bridge the gap between academic theory and industry practice by embedding real-world projects and essential professional skills into the curriculum." This insight shows how important it is to prepare students to manage both traditional and modern parts of the design industry, using thoughtful leadership and taking responsibility for it.

The industry also stressed the importance of a curriculum that adapts to its diverse needs. Fast fashion prioritizes technology and cost-efficiency, while high fashion values craftsmanship, necessitating a nuanced approach. One expert suggested, "Integrating elements such as research culture, sustainability, and brand positioning into the curriculum is essential for equipping students to navigate the complexities of today's design industry." This recommendation aims to create a curriculum that balances technological innovation with a strong appreciation for traditional craftsmanship.

Academia's perspectives on traditional crafts and modern technology in design education

The senior faculty members emphasized the significance of traditional craftsmanship in design education, not only for its technical skills but also for fostering cultural identity

and aesthetic value. As one faculty member noted, “Traditional craftsmanship is not just about technique; it’s a key to understanding cultural narratives and aesthetic values. We must ensure these skills are seamlessly integrated into our modern design practices.” This lays the premise for the importance of preserving traditional crafts as fundamental to design learning, offering comprehensive perspectives on materials, textures, traditional wisdom, and human-centered design.

Concerns were expressed regarding the existing curriculum’s fragmentation, which frequently teaches contemporary technologies and traditional crafts separately. The necessity for a more unified strategy that crosses this gap was emphasized by the faculty. “We have a problem with curriculum organization since traditional and modern components are frequently handled as distinct things. To create designers who are skilled in both fields, a more integrated approach is required,” said a senior faculty member.

To improve students’ employability and flexibility in various industry contexts, faculty members supported curricula that incorporated future-ready skills. For both present-day use and future prediction, modern technology is essential. One professor claimed that precision and creativity require the integration of CAD, 3D printing, and virtual reality. The faculty recognized the continuous difficulties in establishing smooth cooperation between craft clusters and contemporary infrastructures when creating and executing the curriculum, notwithstanding the obvious benefits. “Creating a curriculum that effectively combines traditional and modern skills is essential, but it requires overcoming significant challenges and resistance from various stakeholders,” a different professor stated.

Stakeholder acceptance and readiness are key factors in successful integration. Traditional crafts may not resonate with students, particularly those from urban regions. Although they frequently require extra training to adjust, craftspeople are typically receptive to new technologies. Effective integration requires addressing these issues and allocating sufficient resources. “We must address the disconnect some students feel towards traditional crafts and ensure that artisans are equipped with the necessary training to embrace new technologies,” emphasized a senior faculty member. Only then would it be possible to successfully incorporate both modern and traditional features into design education.

Overall, the consensus among senior faculty was clear: a curriculum that effectively integrates traditional craftsmanship with modern technology preserves cultural heritage and equips students with the skills needed to thrive in a rapidly evolving design landscape. “The balance between age-old craftsmanship and modern technology in design education is often leaning towards advanced technology. While technology is

essential, neglecting our heritage and traditional skills can lead to a lack of depth and understanding of fundamental design thinking," observed one faculty member, stressing the importance of maintaining this balance.

Categorization and thematic synthesis of findings

The interview transcripts and student survey responses were reviewed repeatedly to gain thorough familiarity with the data. Initial codes were generated manually and iteratively using key phrases and sentiments expressed by the participants. These codes were then clustered into six key themes aligned with the study's objectives: Traditional Craft Value, Modern Technology Adoption, Curriculum Balance, Craft-Tech Integration, Academia–Industry Linkage, and Educational Recommendations. Most of the participants mentioned that traditional crafts carry deep emotional and cultural meaning. One participant regarded it as "the soul of the design industry," while another quoted, "Traditional craftsmanship carries the stories and techniques passed through generations." These insights collectively led to the identification of the first theme, "Traditional Craft Value." The second theme, Modern Technology, was articulated through participants' recognition of the increasing relevance of digital tools such as AI, CAD, and 3D printing in contemporary design practice. One participant emphasized this shift, stating, "AI-based tools are essential in today's design processes." Participants suggested context-sensitive knowledge gap solutions, stating "technologies with language multiversality and audio-visuals to support artisan understanding" and "training the next generation of artisans who can later teach their elders." The third theme, Curriculum Balance, emerged from concerns raised by participants about the disproportionate emphasis on modern tools in design education. While modern technology is evolving and crucial, several participants pointed out the equally important exposure to traditional craft practices. The fourth theme, Craft-Tech Integration, emerged from discussions on bridging traditional and modern practices. Professionals shared ideas to make design education more practical, with many suggesting "more live projects with industries," "industry-alumni interactions," and "international sessions to prepare students for global design standards." The fifth and sixth themes, Academia–Industry Linkage and Educational Recommendations, emerged from these discussions, emphasizing the need to align education with professional requirements.

A thematic comparison of stakeholder perspectives

Analyzing viewpoints from all stakeholder groups is crucial to fully comprehending how traditional crafts and contemporary technologies are integrated into design

education. A comparative overview of the opinions obtained from senior academics, industry professionals, alumni, and students across the six key themes derived from the qualitative interviews is shown in Table 1.

Table 1: Distinguished and critical insights from different stakeholders across key themes

Key Theme	Students	Alumni	Industry Professionals	Senior Faculty
Traditional Craft Value	Strongly acknowledge the relevance and express a strong desire for in-depth understanding and proper orientation.	Emphasize the foundational value of traditional craftsmanship but recognize the need for its integration with modern skills.	Value traditional crafts but stress the need for a hybrid approach that blends them with modern technologies.	Concerned about the fragmentation between traditional crafts and modern technology in the current curriculum.
Modern Technology Adoption	Express a strong desire for more advanced and frequent training in contemporary technologies.	Recognize the transformative impact of modern technologies and their growing influence in supporting craft design.	Highlight the critical role of technologies like AI and CAD and stress the importance of integrating them into education.	Stress the importance of using modern technologies to complement, rather than replace, traditional skills.
Curriculum Balance	Seek a more integrated curriculum that includes both modern technology and traditional crafts, emphasizing the latest design technologies.	Advocate for a balanced curriculum incorporating both traditional methods and modern technological skills.	Recommend curriculum updates to include practical skills and technologies essential for industry relevance.	Emphasize the need for continuous updates to curriculum and pedagogy to integrate traditional crafts with modern technology, addressing stakeholder resistance to change.

Craft-Tech Integration	Show a stronger preference for modern technology, viewing traditional skills as secondary.	Support a balanced approach where modern technology enhances rather than replaces traditional craftsmanship.	Emphasize the importance of a hybrid model integrating both traditional skills and modern technology.	Promote a well-rounded curriculum that uses an interdisciplinary approach to incorporate both contemporary technologies and traditional crafts.
Academia–Industry Linkage	Highlight a gap in practical application and industry readiness, with a need for more real-world experience.	Identify a disconnect between theoretical knowledge and practical industry application, suggesting more hands-on experience.	Note the need for more industry-focused projects and professional skill development in education, with emphasis on innovation and sustainability.	Identify a lack of practical application and emphasize the importance of real-world exposure and industry partnerships.
Educational Recommendations	Call for expanded resources and training opportunities in modern technologies.	Suggest curriculum improvements to include practical, commercial, and business skills.	Suggest adding research emphasis, hands-on learning, emerging technology, and thought leadership to the curriculum.	Propose integrating entrepreneurship capabilities and enhancing infrastructure to support curriculum integration.

Strategic framework development: translating thematic insights into the CRAFTECH model

Following the analysis of the six core themes, eight focal areas were identified to correspond with contemporary curriculum demands and developments. The transformation of six core themes into eight focal areas is grounded in both literature and practice. Traditional craft value evolved into the focal area of heritage, reflecting

the integration of indigenous knowledge systems and hybrid curricula that strengthen authenticity in design education (Venkatesan, 2017; Bahl, 2024). Modern technology adaptation was reframed as a mindset shift, supported by frameworks such as TPACK and design thinking, which emphasize the need to blend creativity with digital competence (Mishra and Koehler, 2006; Bereczki and Kárpáti, 2021). Curriculum balance translated to pedagogy, anchored in experiential learning and reflective practice that position learning as both constructivist and situated (Piaget, 1973; Lave and Wenger, 1991). The theme of craft-tech integration was divided into digital tools and technological resources. The first strand relates to digitally mediated craft practices and computational design methods (Thompson, 2015; Efrat, 2023), while the second highlights infrastructure such as Fab Labs and makerspaces that enable experimental design practice (Kwon and Lee, 2023; Massachusetts Institute of Technology, 2024). Academia–industry linkage was coined as industry collaboration, drawing on models that emphasize knowledge transfer and co-creation between institutions and professional practice (Xi, Zhang and Liu, 2024; Luo and Huang, 2023). Finally, educational recommendations were separated into evaluation and social impact. The evaluation dimension aligns with constructive alignment and design-specific assessment frameworks (Meyer and Norman, 2020; Reddy, 2023), while social impact reflects a responsibility towards sustainability and ethical design, resonating with design for social innovation and co-creation approaches (Papanek, 2016; Narasimhan and Mahajan, 2023).

Consequently, the rearticulated topic areas were evidence-based and appropriate for curriculum framework development through the integration of primary and secondary data sources. To facilitate the retention and utilization of these eight critical areas by educators and curriculum developers, they were amalgamated into CRAFTECH at the core. The following abbreviations are used in this study: C for Contextual Craft Integration, R for Rhizomatic and Reflective Learning, A for Applied Technological Competence, F for Fusion Studios, T for Transdisciplinary Thinking, E for Experiential Industry Alignment, C for Community Co-Creation Labs, and H for Holistic Assessment. The CRAFTECH framework integrates traditional and contemporary perspectives to facilitate the development of curricula. It interprets the evolving requirements of design education and directs the creation of instructional initiatives. Finally, a radial structure was used to visually represent the eight themes, ensuring each one held equal importance and remained interconnected. The proposed CRAFTECH framework, as shown in Figure 2, highlights the core strategic themes that address challenges through holistic, future-oriented interventions. From the core to the periphery, it displays acronyms, strategic themes, focus areas, and curriculum suggestions.

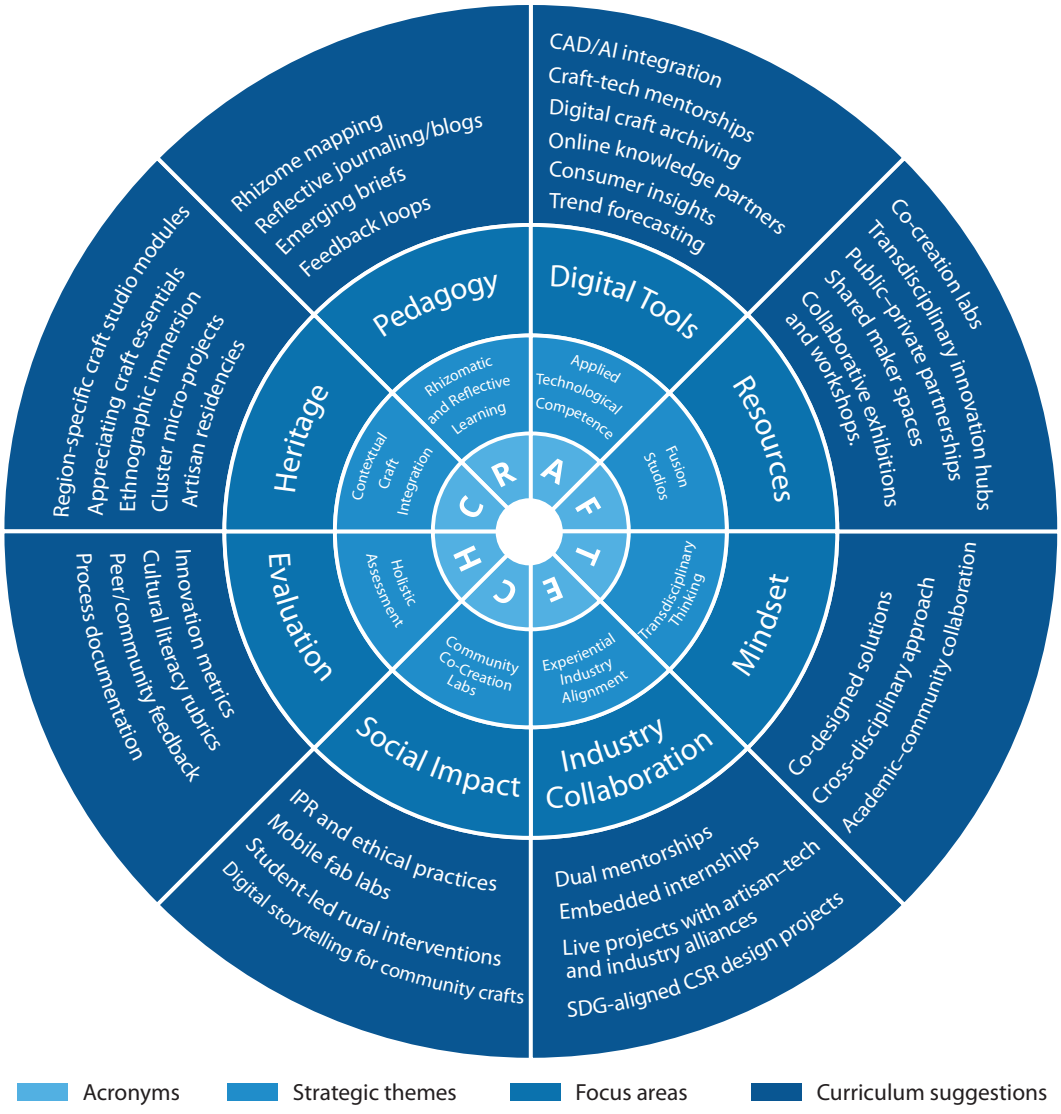

Figure 2: CRAFTECH framework

Conclusion

The integration of traditional craftsmanship and modern technology in design education is vital yet presents significant challenges. Despite 97 percent of students acknowledging the value of traditional skills, only 21 percent deemed the training in this domain adequate. Thus, there is a need felt for a curriculum that introduces effective pedagogical tools to enhance students' comprehension about traditional crafts. Further, just 8 percent of students stated that their exposure to digital tools is very satisfactory, indicating a lacuna in this domain. The results indicate a need for enhanced training and advanced-level resources because they show a gap in both proficiency and access to cutting-edge technologies.

All stakeholder groups, namely students, alumni, industry professionals, and academicians, recognized the significance of reconciling traditional craft values with technological progress, but their emphasis differed according to their roles and experiences. Students and alumni favored enhanced integration and practical experience, while industry experts and senior professors emphasized the necessity for strategic alignment with changing markets and evolving trends. These complex perspectives highlight the need for a dynamic, stakeholder-responsive curriculum that addresses disparities and promotes comprehensive development in design education.

This study resulted in the creation of the CRAFTECH Framework—a research-based, future-oriented approach that integrates traditional craft principles with modern technological skills. In conclusion, the research highlighted key concerns such as the fragmentation between traditional and modern technology, a lack of contextual relevance, limited technological exposure and resources, siloed learning, training opportunities in business and commercial skills, limited industry exposure, and a, paucity of pedagogical flexibility to integrate emerging tools with traditional practices. Addressing these gaps will be crucial for preparing students to meet the evolving demands of the design industry effectively.

Acknowledgment

The authors express their sincere gratitude to the faculty members of NIFT across various campuses for their valuable insights and support throughout this research. Special thanks are extended to the seventh-semester students, alumni, and industry professionals from the apparel, textile, and accessory fields who participated in the surveys and interviews, providing invaluable perspectives. The authors also acknowledge the senior subject experts who validated the findings at different stages, as well as their colleagues for their guidance and encouragement.

The authors used ChatGPT-4o to improve language clarity and readability, and to support comprehension of the data and emerging findings, without altering the originality or interpretation of the research content. The authors take full responsibility for the content of this article.

References

Asare, S., Walden, P., Aniagyei, E.D. and Emmanuel, M.K., 2023. A comparative study of traditional art techniques versus digital art techniques in the context of college visual art education. *American Journal of Arts, Social and Humanity Studies*, 3(1), pp.21–34. [Online] Available at:

<https://ajpojournals.org/journals/index.php/ajashs/article/view/1556> [Accessed 27 August 2024].

Bahl, D., 2024. Integration of craft and graphic design to create a new Indian aesthetic: a pedagogical experiment. *NIFT Journal of Fashion*, 3, pp.87–106. . [Online] Available at: <https://nift.ac.in/sites/default/files/2024-05/ejournal/volume-3/Article_5_DB.pdf> [Accessed 29 June 2025].

Bereczki, E.O. and Kárpáti, A., 2021. Technology-enhanced creativity: A multiple case study of digital technology-integration expert teachers' beliefs and practices. *Thinking Skills and Creativity*, [e-journal] 39, p.100791. https://doi.org/10.1016/j.tsc.2021.100791.

Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, [e-journal] 3(2), pp.77-101. https://doi.org/10.1191/1478088706qp063oa.

Chaudhary, N., Raj, M., Bhattacharjee, R., Srivastava, A., Sah, R. and Badoni, P.,2024. AipanVR: A virtual reality experience for preserving Uttarakhand's traditional art form. *arXiv preprint*. [pdf] Available at: < https://arxiv.org/pdf/2404.12643> [Accessed 16 October 2025].

Economic Times, 2025. India's design education: bridging the gap between tradition and modern innovation. *Economic Times (Education),* 29 January. [online] Available at: <https://education.economictimes.indiatimes.com/news/higher-education/indias-design-education-bridging-the-gap-between-tradition-and-modern-innovation/117682486> [Accessed 29 June 2025].

Efrat, T.A., 2023. Encoded craft: tradition meets technology in contemporary textiles. *Craft Research Journal*, 11(2), pp.78–95.

H&M and Institute of Digital Fashion, 2022. The Metaverse Design Story. [online] Available at: <https://www2.hm.com/en_in/life/culture/inside-h-m/metaverse-design-story.html?srsltid=AfmBOor2ZYX9CemCPEeavC2hBsJS3x2pp-9P_ZkHAV7PiTFtkyzGFt3T>[Accessed 30 June 2025].

Jenny, D., Mayer, H., Aejmelaeus-Lindström, P., Gramazio, F. and Kohler, M., 2022. A pedagogy of digital materiality: integrated design and robotic fabrication projects of the master of advanced studies in architecture and digital fabrication. *Architecture, Structures and Construction*, [e-journal] 2, pp.649–660. https://doi.org/10.1007/s44150-022-00040-1.

Jha, B., 2022. Crafts education and rhizomatic learning during COVID-19. *NIFT Journal of Fashion*, 1, pp.245–254. [online] Available at: <https://nift.ac.in/sites/default/files/2024-05/ejournal/volume-1/Article_14_BJ.pdf> [Accessed 29 June 2024].

Karakul, Ö., 2022. Traditional craftsmanship in architecture, conservation, and technology. In: Oksala, T., Orel, T., Mutanen, A., Friman, M., Lamberg, J. and Hintsa, M. eds. *Craft, technology, and design*. Hämeenlinna: Häme University of Applied Sciences, pp.132–148.

Kazlacheva, Z., Stoykova, V., Georgieva, K. and Ilieva, J., 2018. Application of innovative technologies in fashion design education. *IOP Conference Series: Materials Science and Engineering*, 5-7 September, Lesvos: Greece 459(1), https://doi.org/10.1088/1757-899X/459/1/012080.

Kwon, H. and Lee, D., 2023. Meta-analysis on effects of using 3D printing in South Korea K-12 classrooms. *Education and Information Technologies*, [e-journal] 28(9), pp.11733–11758.https://doi.org/10.1007/s10639-023-11644-5.

Lave, J. and Wenger, E., 1991. *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Luo, X. and Huang, Y., 2023. Research on the cultivation of craftsmanship spirit among higher vocational college students and integration of industry and education. *World Journal of Educational Research*, [e-journal] 10(6), pp.33–47. 10.22158/wjer.v10n6p33.

Ma, S. and Wang, H., 2022. Cultural and creative product design method based on the fusion of 5G technology and traditional metal craftsmanship. *Wireless Communications and Mobile Computing*, [e-journal] 2022(1), https://doi.org/10.1155/2022/5634582.

Marshall, J.J., 2008. *An exploration of hybrid art and design practice using computer-based design and fabrication tools*. PhD. Robert Gordon University, Aberdeen.

Massachusetts Institute of Technology (MIT), 2024. Art, Culture and Technology (ACT). [online] Available at: <https://act.mit.edu> [Accessed 30 June 2025].

Meyer, M.W. and Norman, D., 2020. Changing design education for the 21st century. *She Ji: The Journal of Design, Economics, and Innovation,* [e-journal]6(1) pp-13-49. https://doi.org/10.1016/j.sheji.2019.12.002.

Mishra, P. and Koehler, M.J., 2006. Technological Pedagogical Content Knowledge (TPACK): A framework for teacher knowledge. *Teachers College Record*, 108(6), pp.1017–1054.

Narasimhan, U. and Mahajan, S., 2023. Textiles crafts and co-creation as a strategy for sustainable design pedagogy. *NIFT Journal of Fashion*, 2, pp.157–159. [online] Available at: <https://nift.ac.in/sites/default/files/2024-05/ejournal/volume-2/Article_9_UN.pdf> [Accessed 4 June 2024].

Papanek, V., 2016. *Design for the real world: human ecology and social change*. London: Thames & Hudson.

Piaget, J., 1973. *To understand is to invent: the future of education*. New York: Viking Press.

Reddy, G.C., 2014. Current realities and emerging trends of fashion education in India: A comprehensive study on undergraduate programmes at NIFT, Hyderabad. In: *Reflections 2014: International Conference on Fashion, Retail and Management*. 9-11 January, Hyderabad: National Institute of Fashion Technology.

Reddy, G.C., 2023. Inculcating creativity: a study on the creative abilities of educators in the field of design. In: *The Paris Conference on Education 2023, Official Conference Proceedings*. 15-19 June, Paris: Maison de la Chimie.

Rhode Island School of Design (RISD), 2025. Computation, Technology and Culture (CTC) Department Overview. [online] Available at: <https://www.risd.edu/academics/ctc> [Accessed 30 June 2025].

Riikonen, S., Seitamaa-Hakkarainen, P. and Hakkarainen, K., 2020. Bringing maker practices to school: tracing discursive and materially mediated aspects of student teams' collaborative making processes. *International Journal of Computer-Supported Collaborative Learning*, 15(3), pp.319–349.

Risatti, H., 2007. *A theory of craft: Function and aesthetic expression*. Chapel Hill: The University of North Carolina Press.

Royal College of Art (RCA), 2024. About the RCA: Vision and Strategy. [online] Available at: <https://www.rca.ac.uk> [Accessed 30 June 2025].

Sood, R.K. and Sharma, A., 2023. Sustainability in fashion and textiles education: a classroom project approach. *NIFT Journal of Fashion*, 2, pp.163–179. [online] Available at: <https://nift.ac.in/sites/default/files/2024-05/ejournal/volume-2/Article_10_RS.pdf>

Swissnex, 2025. *Reimagining traditional crafts with cutting-edge technology*. Swissnex in Japan [online]. Available at: <https://swissnex.org/japan/event/reimagining-traditional-crafts-with-cutting-edge-technology/> [Accessed 29 June 2025].

Thompson, R., 2015. Digital craftsmanship: The intersection of technology and tradition in design education. *Design Issues*, 31(4), pp.42–55.

University of the Arts London (UAL), 2024. *BA (Hons) Textile Design*. [online] Available at: <https://www.arts.ac.uk/subjects/textiles-and-materials/undergraduate/ba-hons-textile-design-csm>[Accessed 30 June 2025].

Venkatesan, S., 2017. Reviving the roots: Integrating traditional crafts with modern design education in India. *International Journal of Art & Design Education*, 36(1), pp.78–88.

Walker, S., Evans, M. and Mullagh, L., 2019. Traditional maker practices and sustainable futures: the implications of expertise. *The Design Journal*, 22(sup1), p.835-848.

Wang, B. and Li, P., 2022. Digital creativity in STEM education: the impact of digital tools and pedagogical learning models on the students' creative thinking skills development. *Interactive Learning Environments*, [e-journal] 32(6), pp.2633-2646. https://doi.org/10.1080/10494820.2022.2155839.

Xi, X., Ma, Y. and Ou, X.,2024. *Research and practice of design education through "embodied co-creation between university and enterprise"*. In: Proceedings of Asia Design and Innovation Conference, 5–6 December 2024, Shanghai, China. Beijing: Beijing University of Posts & Telecommunications.

Xi, Y., Zhang, H. and Liu, M., 2024. University-enterprise collaboration in design education: a micro-major model integrating interdisciplinary learning. *Asia-Pacific Journal of Design Innovation*, 8(1), pp.45–60.

About the authors

Chiranjeevi Reddy Gudimetla is a seasoned academic and industry professional with over 30 years of experience, including 6 years in industry and extensive academic tenure. He is a professor in the Department of Fashion and Lifestyle Accessories at National Institute of Fashion Technology, Hyderabad, and has served two terms as Chairperson. Dr. Reddy holds a doctoral degree in design education and has a strong academic foundation. His expertise spans lifestyle accessory design, design pedagogy, curriculum development, interdisciplinary student assessment, and handicraft design. He is a design advisory council member for T-Works, Telangana State Government. He also serves on the selection committee for state awards for Telangana Handicrafts Development Corporation Ltd. A prolific contributor to international conferences and workshops, he has also led faculty development programs to enhance design education. His industry roles include positions in research and engineering, and he is a motivational speaker and media contributor.

gudimetla.reddy@nift.ac.in

Priya Darshini Gopal is Assistant Professor in the Department of Textile Design at NIFT Hyderabad. She has 12 years of experience in both industry and academia, having worked at Zeba Pvt. Ltd., Arvind Mills, and the Development Commissioner of Handicrafts. At Arvind, she participated in international textile exhibitions such as Premier Vision (Paris) and Denim by Premiere Vision (Barcelona). She received the Best Couturier Award in 2018 for her fabric collections for brands like Levi's, GAP, H&M, AEO, A&F, CK, and Zara. She holds an MA in Textiles from Chelsea College of Art and Design, where her project on contemporizing Indian traditional motifs through textile print techniques was showcased at the Battersea Affordable Art Fair, London. She also won a global motif design competition organized by Fabindia, exhibited at the Alchemy festival in London. Her research focuses on the amalgamation of technology, crafts, and sustainability in textiles.

priyadarshini.gopal@nift.ac.in

Rajesh Kumar Gajam is Associate Professor in the Department of Textile Design at NIFT Hyderabad, with 27 years of experience in industry and academia. He has been with NIFT since 2001. A postgraduate from Madurai Kamaraj University, he is currently pursuing a PhD from Banasthali Vidyapeeth. He worked for four years in Bengaluru as a Computer-Aided Textile Design (CAD) professional. His interests include Textile CAD, Graphic Design, Animation, and Visual Craft Clusters. He presented a paper on "The Need for Modernization in the Textile Industry in India through CAD" at a seminar in 2016. Kumar has served as the Craft Cluster Initiative Coordinator (2009-12) and headed the Textile Design department at NIFT Mumbai (2014-15) and Hyderabad (2016-19). He has coordinated various projects, including Tex-Styles India 2003 and the IPR Project Odisha. He has also developed course curricula and conducted training programs for NIFT faculty in Textile CAD.

rajesh.gajam@nift.ac.in