Academic Journal of Management and Social Sciences
ISSN: 2958-4396 | Vol. 14, No. 2, 2026

Empowerment Mechanism and Practice Path of AI-Assisted Industrial Design for Local Products Under the Background of Rural Revitalization

Bangguo Xiong [1], Shaoqiu Ma [1], Zhijian Xiao [1], Jin Chen [2]

[1] Zhejiang DongFang Polytechnic, Wenzhou, Zhejiang, 325000, China
[2] Zhejiang Nanfang Nippon Printing Co., Ltd., Wenzhou, Zhejiang, 325000, China

Abstract: In the advancement of the rural revitalization strategy, local products serve as the core carrier for activating rural economic vitality and inheriting regional culture. Their industrial transformation and high-quality development are key drivers for industrial revitalization. However, most current local products face prominent challenges such as homogenized industrial design, insufficient transformation of regional culture, low production efficiency, and weak brand recognition, making it difficult to achieve the value leap from "local specialties" to "high-quality commodities". The explosive development of AI technology provides a new solution, accurately empowering their industrial design through three core mechanisms: creativity generation, efficiency improvement, and value addition. To promote the implementation of AI, it is necessary to build a hierarchical platform, establish a "technology + local" collaborative system, advance the integration of the entire industrial chain, and improve the guarantee system to avoid risks. The creative integration of AI and traditional local crafts can effectively enhance the cultural and economic value of products, injecting lasting momentum into rural industrial revitalization.

Keywords: Artificial Intelligence; Local Products; Industrial Design; Rural Revitalization; Empowerment Mechanism; Practice Path; Value Enhancement.

1. Introduction

With the in-depth advancement of the rural revitalization strategy, local products have become the core carrier for activating rural economic vitality and inheriting regional culture. However, most current local products face problems such as severe homogenization in industrial design, insufficient cultural transformation, and low production efficiency, making it difficult to achieve the leap from "local specialties" to "high-quality commodities". The explosive development of artificial intelligence technology has injected new vitality into the industrial design of local products. Through multi-dimensional empowerment such as creativity generation, production optimization, and brand building, it promotes local products to break through development bottlenecks. This paper will deeply analyze the empowerment mechanism of AI-assisted industrial design for local products and explore feasible practice paths, providing reference for the high-quality development of rural industries. [1]

2. Core Empowerment Mechanisms of AI-Assisted Industrial Design for Local Products

The empowerment of AI on the industrial design of local products is not a simple technical superposition in a single link, but a full-chain penetration throughout design, production, cultural inheritance, and market connection. Its core mechanisms are reflected in three dimensions: creativity stimulation, efficiency improvement, and value addition. [2]

1. Creativity Generation Mechanism: Breaking Homogenization and Activating Cultural Expression

The core competitiveness of local products lies in the regional culture and ecological characteristics they carry. However, in the traditional design model, designers are often limited by personal experience and find it difficult to fully explore and transform diverse local cultural elements. AI builds massive databases through machine learning algorithms, providing solid support for creativity generation. [3]

On one hand, AI can systematically learn cultural resources such as regional intangible cultural heritage (ICH) techniques and folk symbols, quickly extract core elements, and conduct modular reorganization. As shown in the following table, different regional cultural resources have achieved innovative transformation with the help of AI:

Table 1. Different regional cultural resources have achieved innovative transformation with the help of AI

Region	Core Cultural Resources	AI Transformation Methods	Application Achievements
Guizhou	Miao Embroidery Totem Patterns	Building pattern databases and AIGC "text-to-image"	Generating embroidery patterns that meet modern aesthetics, applied in clothing and home products
Hebei	Paper-Cutting Composition Rules	Element decomposition and reorganization algorithms	Designing packaging and cultural and creative products with both traditional charm and modern sense
Zhejiang	Starry Sky Culture in Changhong Township	Integration modeling of cultural elements and product design	"A Box of Green Mountains Changhong Gifts" souvenir packaging, in line with contemporary aesthetics

On the other hand, AI can capture fashion trends based on consumer market data, combining local elements with modern aesthetics, effectively solving the problem of identical designs of local products. [4]

2. Efficiency Improvement Mechanism: Optimizing Design Processes and Reducing Production Losses

Traditional industrial design of local products has problems such as long cycles, high costs, and high trial-and-error risks. In particular, small workshops and farmers can hardly bear the costs of professional design and production trial-and-error. AI achieves dual improvement in design and production efficiency through process reengineering. In the design link, AI simplifies complex design processes. For example, the Yixing Gongchun AI-assisted design software can quickly generate purple clay teapot design drawings, freeing designers from repetitive drawing work to focus on polishing cultural connotations. The software has generated more than 400,000 arts and crafts design drawings, helping practitioners complete the creation of over 380 finished products. In the production link, the combination of AI with 3D printing and intelligent production equipment achieves a balance between personalized customization and large-scale production. After introducing AI technology, a ceramic enterprise in Zhangjiakou increased its production efficiency by nearly 40% and reduced the defective rate by more than 60%. It completed automated quality inspection through computer vision technology, ensuring the consistency of traditional craft products. This synergistic effect of "design acceleration + production quality improvement" has greatly lowered the threshold for the industrialization of local products.

3. Value Addition Mechanism: Connecting Supply and Demand and Strengthening Brand Empowerment

Local products often fall into the predicament of "bumper harvest but low income" due to low brand recognition and vague market positioning. AI realizes the value leap of products by accurately connecting supply and demand and building characteristic brands. On the demand side, AI analyzes consumer preferences through user portrait systems to reversely guide design optimization. For example, Alimama platform uses AI keyword analysis to guide brands using Xinjiang long-staple cotton as raw materials to launch cool-feeling, heat-generating and other series of products, accurately matching consumer needs in different seasons. On the brand side, AI can help build exclusive cultural IPs and tell local stories through digital modeling, virtual display and other methods. At the same time, AI generates high-quality marketing materials, such as automatically generating product copy and pictures, reducing brand promotion costs. For example, Sika Coffee achieved precise delivery through AI traffic analysis, transforming from low-cost raw material export to a Tmall best-selling brand with a market penetration rate of 45%. This full-link value empowerment from design to marketing promotes local products to achieve the leap from practical value to brand value.

3. Practice Paths of AI-Assisted Industrial Design for Local Products

The implementation of AI technology in the industrial design of local products needs to combine the actual resource conditions of rural areas, balance technical feasibility and industrial adaptability, and build practice paths from infrastructure construction, collaborative innovation, industrial integration and other aspects.

1. Building a Hierarchical AI Design Platform to Lower the Threshold of Technology Application

Due to the uneven distribution of technical resources in rural areas, it is necessary to build a differentiated AI design support system for different subjects. For small-scale farmers and handicraft workshops, lightweight open-source AI tools can be promoted, and easy-to-operate mobile applications can be developed to support uploading local elements to quickly generate basic design schemes, such as simplified pattern generation tools and packaging template libraries. For local leading enterprises, they are encouraged to cooperate with technology companies to develop exclusive industrial large models, such as the Gongchun AIGC-assisted design software developed for the purple clay industry in Yixing and the Miao Embroidery AI Creative Platform of Guizhou Wushui Yuntai, building a full-process system covering design, production and quality inspection. At the same time, relying on public cloud platforms such as Alibaba Cloud and Tencent Cloud, a shared local cultural database is established to integrate materials such as ICH techniques, folk symbols and ecological resources from various places, which can be freely used by designers and farmers, breaking the limitation of scattered cultural resources.

2. Constructing a "Technology + Local" Collaborative Design System to Gather Joint Forces

The effective application of AI technology is inseparable from the in-depth combination of professional forces and rural reality, so it is necessary to build a collaborative innovation mechanism with multi-party participation. On one hand, promote the pairing cooperation between university research teams and villages. For example, the practice group of Zhejiang Ocean University went deep into Changhong Township, Kaihua County, explored the industrial characteristics such as clear-water fish and ancient oil pressing through field research, and completed the design of the "A Box of Green Mountains · Changhong Gifts" series of packaging using AI platforms. This "research + technology + implementation" model ensures that the design scheme is in line with production reality. On the other hand, carry out AI design skill training in rural areas, offering simple operation courses for farmers and craftsmen to enable ordinary practitioners to master basic skills such as command input and design modification. The AI platform of Wushui Yuntai provides intelligent assistance for embroiderers, which can automatically convert physical objects into embroidable drawings by taking photos, greatly reducing the threshold for innovation. In addition, open up communication channels for designers, ICH inheritors and e-commerce practitioners, forming a joint creation model of "AI tools + professional design + local experience".

3. Promoting the In-depth Integration of Design and the Entire Industrial Chain to Extend the Value Chain

AI-assisted industrial design for local products needs to break through the limitations of a single link and achieve full-chain integration with production, marketing and supply chain. On the production side, connect AI design schemes with intelligent production equipment. For example, 3D printing technology realizes large-scale customization of complex local crafts, and technologies such as intelligent irrigation and automated baking ensure the stability of raw material quality. On the marketing side, promote design achievements through AI digital human live streaming,

virtual reality display and other methods. During the Harvest Festival, Taotian Group launched digital human live streaming, driving the sales of agricultural products to increase by 35 times year-on-year, making the design highlights of local products intuitively presented to consumers. On the supply chain side, optimize production and sales matching through AI data analysis. For example, Sika Coffee reversely optimized the supply chain with AI, purchasing coffee beans at a price higher than the market average, which not only encouraged coffee farmers to improve quality but also ensured the stable supply of raw materials. This full-chain integration model allows design value to run through the entire process of local products from the field to the shelf.

4. Improving the Guarantee System to Avoid Risks of Technology Application

The promotion of AI in rural areas needs to address potential problems such as technical adaptation and cultural distortion, so it is necessary to build a multi-level guarantee system. At the policy level, local governments can set up special support funds to support the construction of rural AI design platforms and technological transformation, and provide tax incentives or subsidies for local enterprises introducing AI technology. At the standard level, formulate norms for the digital collection of local cultural elements to avoid the distortion of cultural symbols and the loss of connotations in the process of AI transformation, ensuring that the design is both innovative and retains its essence. At the intellectual property level, establish a protection mechanism for local design achievements, recording the AI design process and copyright ownership through blockchain technology to protect the legitimate rights and interests of farmers and designers. At the same time, encourage industry associations to formulate AI design application guidelines, guiding the rational development of technology and avoiding the resurgence of design homogenization caused by over-reliance on technology.

4. Conclusion

The transformation brought by AI technology to the industrial design of local products is essentially the creative integration of science and technology with local culture, and an inevitable choice for rural industrial upgrading in the digital age. Through three core mechanisms of creativity stimulation, efficiency improvement and value addition, it accurately solves the prominent problems in the industrialization process of traditional local products, such as design homogenization, high production threshold and weak brand empowerment. The practice paths such as building a hierarchical AI design platform, "technology + local" collaborative innovation, and in-depth integration of design and the entire industrial chain provide feasible and adaptable implementation plans for technology landing. From Guizhou Miao embroidery entering the international fashion stage with the help of AI pattern generation technology, to Yixing purple clay rejuvenating traditional crafts through intelligent design software, and to Zhejiang Changhong Township's agricultural products opening up the market with AI packaging design, many vivid cases have fully proved that AI is by no means a "substitute" for traditional local crafts, but a "translator" for decoding, transforming and disseminating local culture, and a "booster" for promoting the marketization and branding of local products. In the future, with the continuous iteration of large model technology, the continuous improvement of rural digital infrastructure, and the gradual maturity of the multi-party collaborative application ecosystem of government, enterprises and universities, AI will further deeply penetrate the entire chain of design, production and marketing of local products, promoting the dual improvement of the cultural and economic value of products, injecting stronger and more lasting momentum into rural industrial revitalization, enabling more local products hidden in remote rural areas to break through regional limitations and enter the broad public, and truly transforming the cultural heritage carrying thousands of years of context into a prosperous industry that drives farmers' income increase and empowers rural development.

Acknowledgments

Horizontal Project: Research on the Empowerment Path of Artificial Intelligence-Assisted Industrial Design for Local Products Under the Background of Rural Revitalization (ZJDF-HX2025030)

The Second Batch of Teaching Reform Projects for Higher Vocational Education in Zhejiang Province during the "14th Five-Year Plan" Period: Research and Practice on New-Quality Teaching Reform of Art Design Professional Group Empowered by AIGC in Vocational Colleges (jg20240290)

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