

Innovative Applications of Majiayao Pottery Patterns in Cultural and Creative Product Design Within the Framework of Iconology

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Abstract: This paper focuses on the application of Majiayao pottery patterns in cultural and creative product design. Currently, most academics focus on the archaeological and historical layers of painted pottery and pay insufficient attention to the application of painted pottery patterns in cultural and creative design. Therefore, this study aims to explore how the innovative design of colored pottery patterns in Majiayao can promote the dissemination of colored pottery culture. Using a systematic literature review method, the study collected 21 published papers related to the cultural and creative applications of painted pottery patterns in Majiayao during the period of 2011-2025 through the Web of Science and Google Scholar Academic Search databases. The study found that Majiayao pottery patterns have rich cultural connotations and market potential in the design of cultural and creative products, and that cultural inheritance and innovation can be effectively achieved through the combination of iconographic interpretation and modern design methods.

Keywords: Colored Pottery Culture; Pattern Design; Majiayao Colored Pottery; Cultural and Creative Products; Iconography

1. Introduction

The study of Majiayao painted pottery is of great significance for understanding the origin and development of Chinese civilization. As an expression of material culture in the Neolithic era, colored pottery is a material carrier of production and life experience in primitive society, and contains rich cultural connotations and historical value. As an important part of cultural heritage, Majiayao colored pottery demonstrates the wisdom and creativity of ancient people with its unique artistic value.

However, in the context of modern cultural creation development, the application of Majiayao colored pottery pattern innovation design in cultural creation has not been fully explored, and less attention has been paid to its practical application in pattern innovation design cultural creation. Moreover, the design of painted pottery patterns more often stays only in the simple copy pattern to make cultural and creative products, although it can let people better identify the pattern of painted pottery, it lacks innovativeness and cannot effectively attract consumers to buy. This study shows that there is a need to explore the innovative method of combining cultural elements with modern pattern design to ensure cultural heritage and effective dissemination. By analyzing the iconographic elements of Majiayao pottery, this paper proposes an application strategy for the innovative design of Majiayao pottery patterns, hoping to provide new ideas and methods for the innovative development

of cultural and creative products.

Therefore, the core of this paper is to explore the trend of innovative application of Majiayao colored pottery patterns in the design of cultural and creative products from the perspective of iconography between 2011 and 2025. It discusses the impact of the application of innovative design of Majiayao colored pottery patterns in cultural and creative products on the dissemination of colored pottery culture and explores the potential of innovative design of patterns in enhancing the cultural connotation and market attractiveness of Majiayao colored pottery. And answer the following research questions:

RQ: Can the innovative design of Majiayao colored pottery patterns in cultural and creative products effectively promote the dissemination of colored pottery culture?

2. Literature Review

This review integrates the key findings of the literature. There are six articles on the semiotic interpretation of Majiayao patterns, five articles on the behavioral analysis of cultural and creative users, seven articles on interdisciplinary methodological research and finally three articles on the exploration of sustainable design.

Majiayao colored pottery patterns with water ripples, swirl patterns and bird patterns are visual expressions of the nature worship of prehistoric ancestors. The water wave pattern embodies reverence and reliance on water resources, while the bird pattern embodies fertility worship and totem worship [1]. Fifteen of the 21 texts emphasize the "sacredness" of the motifs. Analyzed from the perspective of iconography, the evolution of these motifs from the figurative to the abstract reflects the cognitive enhancement of the ancestors from natural observation to conceptual symbols [2]. The Majiayao patterns form a unique visual order through the rotationally symmetrical swirls and continuous water ripples. From the perspective of iconography, this compositional method implies the forefathers' knowledge of the laws of the universe [3].

Among them, eight articles based on consumer research concluded that there are three major problems with the current Majiayao cultural and creative products, the first is that most of the products directly copy the pattern of the colored pottery, and the lack of some innovative pattern design, which leads to the design of cultural and creative products facing the problem of serious homogenization [4]. Secondly, some cultural and creative products only focus on the appearance of being good-looking, but neglect the most important practicality, as cultural and creative products, the daily necessities category cultural and creative accounted for less than 30% [5]. The last is that most people do not know enough about the cultural connotation of the colorful pottery patterns to better understand the connotation of the cultural creations, so they cannot effectively spread the colorful pottery culture.

The application of the LeNet image classification algorithm can provide new ideas for pattern innovation: the algorithm clusters the styles of more than a thousand pieces of painted pottery patterns and identifies highly accepted patterns, such as abstract bird patterns and geometrized water ripples. The algorithm shows that pattern complexity is negatively correlated with consumer purchase intention, $R=-0.63$ [8]. The cross-section of consumer data from all the literature shows that the core factors affecting consumers' purchase of cultural creations are 35% for utility, 28% for price and 20% for fun [6]. Daily necessities in cultural creations, including tableware, stationery, clothing, food packaging, etc., are popular categories, and their use in products that are frequently need to be used in daily life can better disseminate the culture of colorful pottery.

3. Methodology

In this study, the literature review was explored in depth using the thematic analysis method and the thematic analysis software ATLAS.ti9 was used to perform the analysis operation, which was first put into practice by Zairul (2020). According to Clarke and Braun's (2013) theory, thematic analysis involves mining patterns and constructing themes based on a careful reading of the literature. Thus, the qualitative research steps are to explore patterns and then construct themes, in order to gain insights into the direction of the innovative application of Majiayao colored pottery patterns in the field of cultural and creative product design. The purpose of this study is to analyse the findings of the study and make recommendations for the subsequent exploration of the innovative application of Majiayao pottery patterns in the design of cultural and creative products.

The literature for this study was extracted from the Google Scholar Academic Search database, and the following guidelines were followed:

- 1) In the keyword filtering criteria, the filtering range was set to cover all fields.
- 2) The keyword combinations were "Majiayao pottery culture" with "patterned creative products" or "patterned innovative design" and "consumers' willingness to purchase' Purchase intention".
- 3) The genre of literature focuses on academic papers and conference papers.
- 4) The publication year is 2011-2025.
- 5) The theme of the literature is closely related to the innovative application of Majiayao pottery patterns in the design of cultural and creative products.

The literature search was executed in Web of Science, Sci-hub and Google Scholar Academic Search. Initially, 5 records were identified through Web of Science, then 8 records through Sci-hub and finally 20 records through Google Scholar Academic Search, totaling 33 records. However, it was found that there were duplicate records, and some of the duplicates were incomplete, some of them only had the abstract part, and 4 duplicate records were removed for the first time. After that, 8 records were removed again because some of the documents were discussed from the raw materials and shapes of colored pottery, and did not mention patterns or cultural and creative product design. Meanwhile, after applying the inclusion criteria, 21 records were finally identified for subsequent research. These records could be further categorized and analyzed by source and other information to clarify the overall picture of the literature involved in the study. They were uploaded to Atlas.ti9 as the primary file, and each paper was then categorized into 1) Author; 2) Issue number; 3) Journal, 4) Publisher, 5) Volume and 6) Year of publication. By doing this, articles could be analyzed according to the year of publication as well as the pattern of discussion according to the year. The total number of articles in the final file in Atlas.ti9 was eventually determined to be 21 documents (Figure.1).

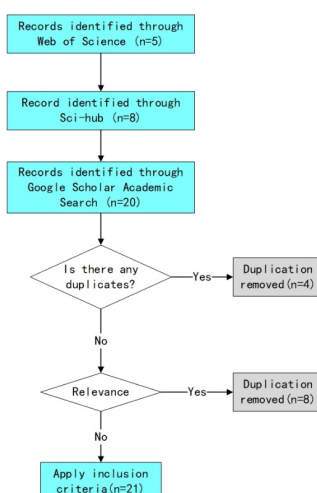


Figure 1: Inclusion and exclusion criteria in topic comments.

4. Results and Discussion

The key findings of the thematic review are presented in this section. Quantitative and qualitative analyses were conducted to assess the 21 articles selected to answer the research questions.

4.1. Quantitative Findings

The results of this study cover both quantitative and qualitative aspects. In terms of quantitative analysis, after sorting out 21 original documents, a word cloud was generated (Figure 2). In this word cloud, the largest words represent the highest frequency of their appearance in the articles, that is, the size of the words is positively correlated with their frequency of occurrence in the articles, such as pottery, design, paint, cultural, majiayao, product, etc. As mentioned earlier, this study focuses on the innovative application trend of the patterns of Majiayao painted pottery in the design of cultural and creative products. To a certain extent, the word cloud can reflect the analysis of word frequency, publication year, research location, source publication, theme, etc. The prominent positions of words such as pottery, design, paint, cultural, majiayao, and product in the word cloud confirm their frequent occurrence in the article. As mentioned earlier, the core of this article revolves around cultural and creative products related to Majiayao-painted pottery patterns. This word cloud presents the key terms of the topic. The statistics show that pottery appears 1,717 times, vessel 1,750 times, design 1,502 times, paint 1,618 times, cultural 1,411 times, majiayao 519 times, product 1,057 times, culture 866 times, and creative 638 times.

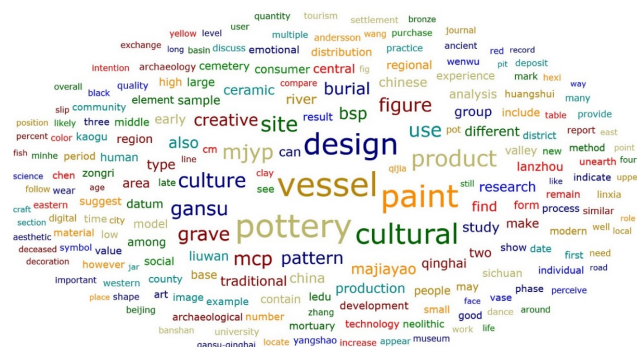


Figure 2: Word cloud on word frequencies from 21 documents.

Figure 3 shows the number of related publications from 2011 to 2025. There were no publications in 2013-2014, 2016-2017, and 2023. The data for each year are as follows: 1 publication each in 2011, 2012, 2015, 2018, and 2025. In 2019, there were 2 publications, marking the initial growth in research, possibly related to the nascent policies for the cultural and creative industries. In 2020, there were 3 publications. Driven by policies, research on intangible cultural heritage and cultural creativity heated up, and the patterns of Majiayao pottery began to attract attention. In 2021 and 2022, there were 4 publications each, the highest number of publications in these two years, reflecting the continuous impact of supportive policies for the cultural and creative industries. Scholars focused on the innovative application of patterns, such as product design and cultural IP development. In 2024, there were 3 publications, a decrease in quantity, with research shifting towards in-depth topics such as the digitalisation of patterns and the exploration of cultural value, emphasising quality over quantity. After 2019, domestic policies such as the "14th Five-Year Plan for Cultural Development" promoting the "activation of intangible cultural heritage" and "empowerment through cultural creativity" have driven research on the integration of traditional patterns and modern design. As a symbol of the Yellow River culture, the patterns of Majiayao pottery have attracted scholars to explore their cultural and creative value, which is reflected in the 4 publications in 2021-2022, demonstrating a research boom under policy incentives. Despite the impact of the COVID-19 pandemic on the cultural and tourism industry in 2020, it has led to a digital transformation in cultural creativity research, such as virtual pattern design and online cultural and creative products.

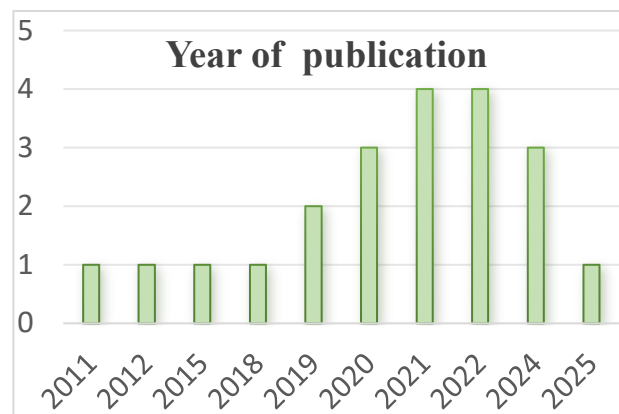


Figure 3: Year of publication.

Figure 4 presents the publication of literature in 17 journals from 2011 to 2025, covering fields such as archaeology, design, science and technology, and communication, reflecting the interdisciplinary nature of the research. There are 13 single journals, accounting for 76%, such as World Scientific Research Journal (2022), Washington University Open Scholarship (2011), etc., reflecting the multidisciplinary dispersion of research. It involves fields such as archaeology, design, and neuroscience. To reflect this theme, interdisciplinary knowledge integration is required, such as the combination of pattern archaeology research and modern design theory [7]. Three double-article journals, E3S Web of Conferences (2020-2021, 2 articles), focus on sustainable design and digital transformation, such as the application of green materials and digital twin technology of patterns, which are in line with the dual carbon goals and the trend of digital cultural and creative industries [10]. ATLANTIS PRESS (2018-2019, 2 articles), covering cultural communication and design practices,

such as the visual presentation of patterns in cultural and tourism products, cross-media communication strategies, and building a "culture-design" bridge. *Art and Design Review* (2021-2022, 2 articles), delving deeply into art design theory, the translation of the formal beauty of patterns and modern design language, such as the integration of minimalism and traditional patterns [11].

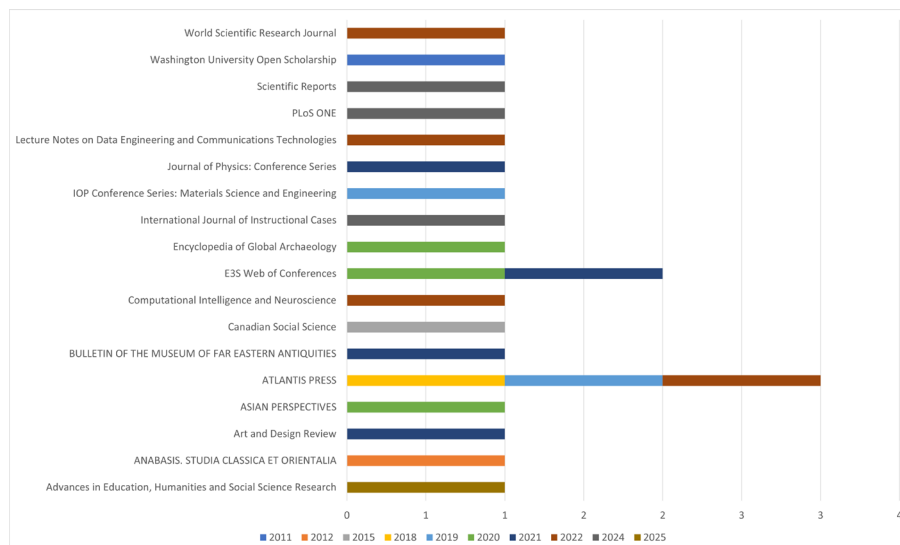


Figure 4: Number of Articles Per Periodical.

As shown in Table 1, of the 21 pieces of literature counted related to the innovative application of Majiayao colored pottery patterns in cultural and creative product design, China accounts for the highest proportion in terms of country distribution, with 18 pieces, the United States and the United Kingdom each have two pieces, and Canada, Germany and Sweden each have one piece. The high number of Chinese literatures mainly stems from the fact that Majiayao colored pottery, as a unique Chinese cultural heritage, has a pattern with high artistic, historical and cultural values. Chinese scholars have rich research resources and fieldwork opportunities, which enable them to deeply excavate the connotation and application potential of Majiayao colored pottery patterns [12]. Scholars from the United States, the United Kingdom, and other countries focus on this field, probably because Majiayao colored pottery patterns have unique iconographic significance and cross-cultural communication value, which can provide new inspiration and materials for global cultural and creative product design.

Table 1: Country Year.

	2011	2012	2015	2018	2019	2020	2021	2022	2024	2025	Sum
America						1					2
Britain						2					2
Canada						1					1
China		1	1	1	2	2	3	4	3	1	18
Germany							1				1
Sweden						1					1
Sum	1	1	1	1	2	7	4	4	3	1	25

As shown in Figure 5, 21 relevant literatures from 2011 to 2025 are classified and statistically analyzed by three themes. Overall, the distribution of literature on the three themes reflects the gradual deepening of academic research on the innovative application of Majiayao painted pottery patterns in the design of cultural and creative products, from basic cultural and pattern analysis to practical design application, and then to technological integration and innovation. Moreover, the research enthusiasm has shown an upward trend in recent years. This provides sufficient literature basis and research context support for the paper to explore the innovative application of Majiayao painted pottery patterns in cultural and creative product design from the perspective of iconography. It also indicates that the research in this field has diversified perspectives and continuously expanding depth, highlighting that the research value and application potential of Majiayao painted pottery patterns in contemporary cultural and creative design are constantly being explored and valued [12].

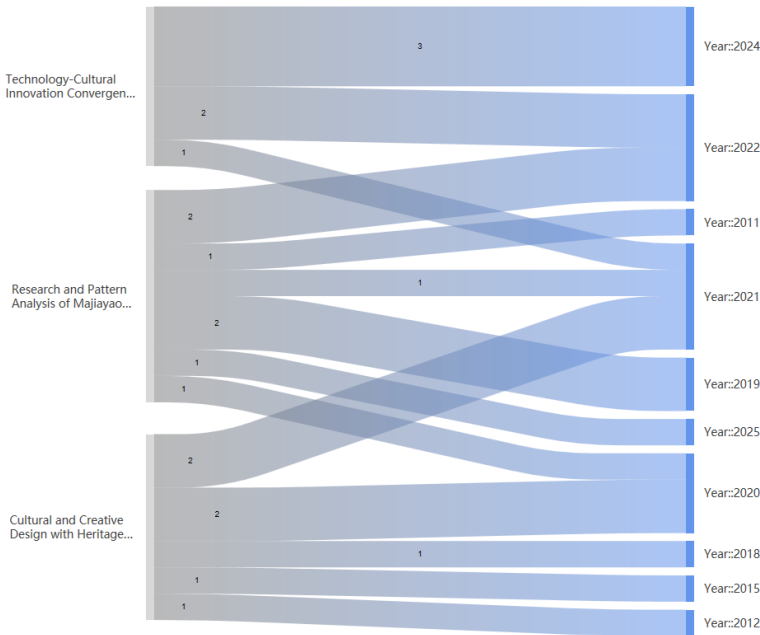


Figure 5: Types of Issues Discussed in the Literature.

Table 2 statistically analyses the distribution of authors and topics of 21 literatures. There are a total of 10 authors under the theme of "Innovative Application Design of Cultural Creativity and Heritage", 10 authors under the theme of "Research on Majiayao Painted Pottery Culture and Pattern Analysis", and 8 authors under the theme of "Research on the Integration of Science and Technology and Cultural Innovation". From the perspective of author distribution, the number of authors involved in this research field is relatively large, and most of the author focuses on a specific topic for research, indicating that different researchers have different focuses in different directions in this field. For example, in the theme of "Innovative Application Design of Cultural Creativity and Heritage", authors such as Andrew Womack[15] and Anke Hein [21] respectively explored from different perspectives how to combine the patterns of Majiayao painted pottery with modern cultural and creative design[21]; In the theme of "Research on Majiayao Painted Pottery Culture and Pattern Analysis", authors such as Dai Yongli [10] and Evgenia Dammer [21] focus on the in-depth analysis of Majiayao painted pottery culture and the study of pattern characteristics. In the theme of "Research

on the Integration of Science and Technology - Culture Innovation", authors such as Hou Yajing [4] and Huan Limin [20] focus on the application of technological means in this field. This reflects that the academic research on the patterns of Majiayao-painted pottery presents the characteristics of multiple perspectives and dimensions.

Table 2: Topic Author.

	Cultural and Creative Design with Heritage Innovation Applications	Research and Pattern Analysis of Majiayao Painted Pottery Culture	Technology-Cultural Innovation Convergence Studies	Sum
Andrew Womack [15]	✓			1
Anke Hein [21]	✓			1
Dai, Yongli [10]			✓	1
Evgenia Dammer [21]	✓			1
Hongxia, Zhao [11]			✓	1
Hou, Yajing [4]	✓			1
Huan, Limin [20]		✓		1
Hung, Ling-Yu [12]		✓		1
Jianye, Han [7]	✓			1
Li, Ren [14]			✓	1
Li, Yangyang [18]		✓		1
Liang, Jing [9]			✓	1
Liu, Lili [11]			✓	1
Lu, Shan [1]		✓		1
Ole Stilborg [21]	✓			1
Shu, Wei [13]		✓		1
Sun, Fuliang [13]		✓		1
Wang, Chunbin [14]			✓	1
Wang, Chunxia [2]	✓			1
Wang, Hui		✓		1

[15]				
Wang, Lifu [3]		✓		1
Wang, Nan [8]			✓	1
Womack, Andrew [21]		✓		1
Wu, Qing [19]	✓			1
Wu, Yinglu [6]	✓			1
Yao, Yubo [16]			✓	1
Zhang, Jun [5]	✓			1
Zhu, Yuqiang [17]		✓		1
Sum	10	10	8	28

4.2 Qualitative Results

In order to make the study more rigorous and in-depth, the 21 related documents were coded three times successively. Three core themes were finally identified, which intertwined, penetrated and integrated, fully highlighting the complexity and systemic nature of the study (Figure 6).

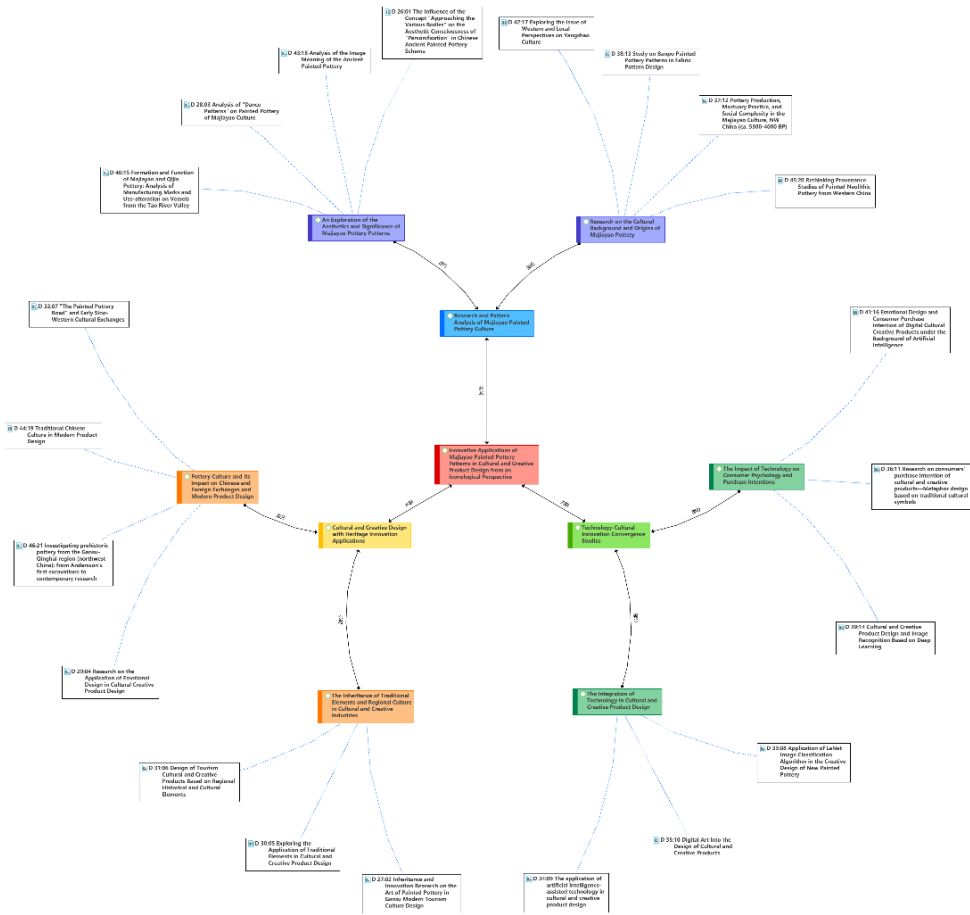


Figure 6: Qualitative Thematic Analysis Master Chart.

4.2.1 Theme 1: Analysis of Majiayao Fajitas Culture and Patterns

The theme of "Analysis of Majiayao Painted Pottery Culture and Patterns" is divided into two

subheadings: "Patterns and Functions of Majiayao Painted Pottery" and "Background and Origin of Majiayao Painted Pottery Culture" (Figure 7).

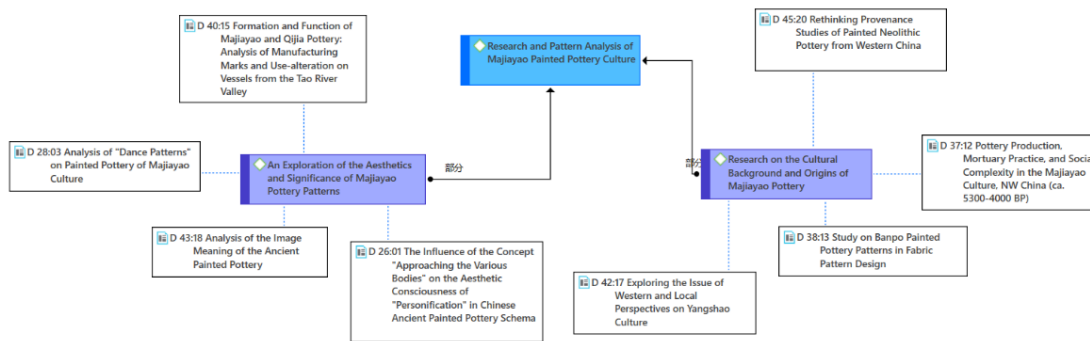


Figure 7: Majiayao Colored Pottery Culture and Pattern Analysis.

4.2.1.1 Patterns and Functions of Majiayao Painted Pottery

From the perspective of iconography, the research and pattern analysis achievements of numerous scholars on the Majiayao painted pottery culture have jointly established the foundation for exploring the aesthetics and significance of the patterns on Majiayao painted pottery, as well as its cultural background and origin. From the perspective of pattern aesthetics and the exploration of meaning, The Influence of the Concept of "Approaching the Various Bodies" on the Aesthetic Consciousness of "Personification" in "Chinese Ancient Painted Pottery Schema" deeply analyzes the formation of the "personification" aesthetic consciousness in the patterns of ancient painted pottery, providing a useful perspective for understanding the aesthetic connotations contained in the patterns of Majiayao painted pottery [1]. "Analysis of the Image Meaning of the Ancient Painted Pottery" focuses on the interpretation of the image meaning of the patterns, enabling us to gain insights into the cultural codes and spiritual symbols hidden behind the patterns of Majiayao painted pottery from an iconographic perspective. It is understood that these patterns are not merely simple decorations, but carry the rich expressions of the ancients towards nature, life and beliefs [18].

4.2.1.2 The Cultural Background and Origin of Majiayao Painted Pottery

In the field of cultural background and origin research, "Exploring the Issue of Western and Local Perspectives on Yangshao Culture" provides a powerful reference for tracing the origin of Majiayao painted pottery culture. Due to the intricate connections between the Majiayao Culture and the Yangshao Culture, etc., research on the Yangshao culture is conducive to clarifying the cultural context in which the Majiayao painted pottery culture is located and its development trajectory in the inheritance of local culture and the integration of foreign cultures, and further exploring the evolution and integration characteristics of the Majiayao painted pottery patterns under different cultural background s[17]. These research results complement and verify each other, laying a solid theoretical foundation for in-depth exploration of the innovative application of Majiayao painted pottery patterns in the design of cultural and creative products. They enable us to draw inspiration from multiple dimensions, such as the aesthetic value and cultural connotation of Majiayao painted pottery patterns, and promote their new luster in the field of cultural and creative product design.

4.2.2 Theme 2: Cultural and Creative Design and Innovative Application of Cultural Inheritance

Cultural and creative design and cultural inheritance, innovation and application are subdivided

into two subheadings: "Inheritance and Innovation of Cultural Symbols" and "Modern Application of Traditional Elements" (Figure 8).

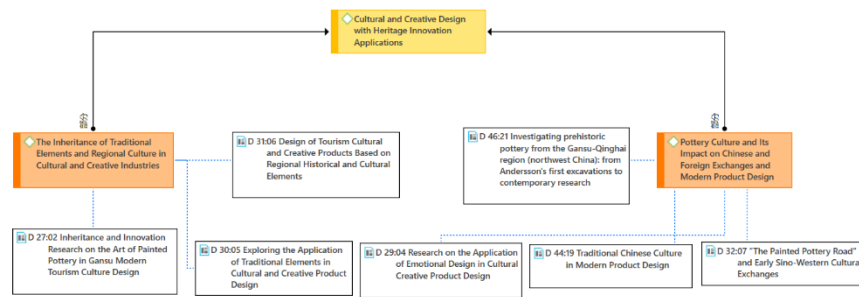


Figure 8: Innovative Application of Cultural and Creative Design and Cultural Inheritance.

4.2.2.1 Inheritance and Innovation of Cultural Symbols

In the field of cultural and creative design, the exploration of innovative applications of heritage has become an important trend. Many researchers have delved deeply into related topics of cultural and creative design and the innovative application of cultural inheritance. "Exploring the Application of Traditional Elements in Cultural and Creative Product Design" [5] and "Design of Tourism Two documents, "Cultural and Creative Products Based on Regional Historical and Cultural Elements"[6], focus on the inheritance of traditional elements and regional culture in the design of cultural and creative products. Emphasizing the exploration of regional cultural elements and ingeniously integrating traditional elements into the design of modern cultural and creative products can not only endow the products with profound cultural connotations but also enhance their cultural appeal and market competitiveness.

4.2.2.2 Modern Application of Traditional Elements

"The Painted Pottery Road and Early Sino-Western Cultural Exchanges" [7] starts from the perspective of cultural exchange and explores the important role of painted pottery culture in early Sino-foreign exchanges. It provides a historical basis for the international dissemination and modern design application of the painted pottery patterns of Majiayao. Inheritance and Innovation Research on the Art of Painted Pottery in Gansu Modern Tourism Culture "Design" [2] conducts an in-depth study on the inheritance and innovation of painted pottery art in modern tourism cultural design in Gansu region, revealing the unique value and innovative path of painted pottery culture in the design of regional tourism cultural and creative products. These research achievements provide theoretical support for the innovative application of Majiayao painted pottery patterns in the design of cultural and creative products from different dimensions, promoting the inheritance and innovative development of traditional painted pottery culture in the modern design field.

4.2.3 Theme 3: Innovation in the Integration of Technology and Cultural Creativity

Theme Three: The Integration and Innovation of Technology and Cultural and Creative Industries is further subdivided into two subheadings: "The Integrated Application of Technology in the Design of Cultural and Creative Products" and "The Impact of Technology on Consumer Psychology and Purchase Intention" (Figure 9).

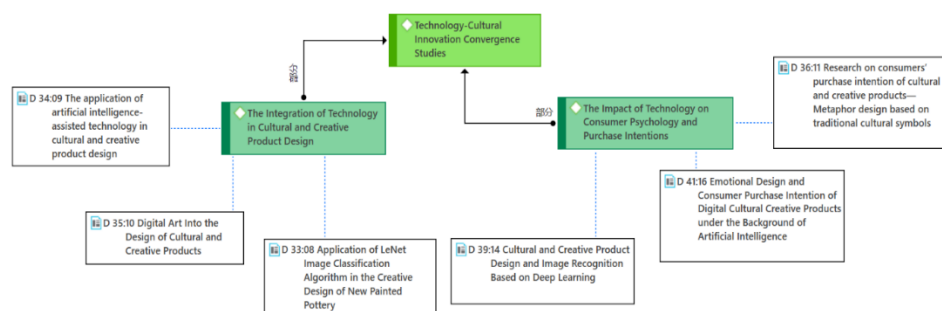


Figure 9: The Integration and Innovation of Technology and Cultural Creativity.

4.2.3.1 The Integrated Application of Technology in the Design of Cultural and Creative Products

The literature on the innovative research of the integration of technology and cultural creativity provides new ideas and methods for the innovative application of Majiayao painted pottery patterns in the design of cultural and creative products. "Application of LeNet Image Classification Algorithm in the Creative Design of New Painted Pottery" [8] and "Cultural and Creative Product Design and Image Recognition Based on Deep Learning" [14] explores the application of image classification algorithms and deep learning technologies in the recognition of painted pottery patterns and the design of cultural and creative products. Provide technical support for the precise extraction and application of patterns on Majiayao painted pottery. The application of artificial intelligence-assisted technology in cultural and creative Products design" [9] emphasizes the potential of artificial intelligence-assisted technology in the design of cultural and creative products, which can achieve innovative combinations of patterns and design optimization.

4.2.3.2 The impact of Technology on Consumers' Psychology and Purchase Intention

Besides, Research on consumers' purchase intention of cultural and creative products - Metaphor design based on traditional "cultural symbols" [11] and "Emotional Design and Consumer Purchase Intention of Digital Cultural Creative Products under the "Background of Artificial Intelligence" [16] focuses on the impact of technological application on consumers' psychology and purchase intention, indicating that metaphorical design based on traditional symbols and emotional design in the context of artificial intelligence can effectively stimulate consumers' purchase intention. These studies complement each other and jointly reveal the integrated application value of technology in the design of Majiayao painted pottery pattern cultural and creative products and its positive impact on consumer psychology, promoting a dual improvement in design innovation and market acceptance of cultural and creative products.

5. Conclusion

This paper reviews 21 articles related to the innovative application of Majiayao painted pottery patterns in the design of cultural and creative products during the period from 2011 to 2025 through the thematic analysis method. The data is analyzed using Atlas.ti9 software and the results answer the research questions of this paper. That is, whether the innovative design of the patterns on Majiayao painted pottery can effectively promote the dissemination of painted pottery culture in cultural and creative products. Qualitative analysis has identified three core themes that interweave with each other, jointly constructing the theoretical framework for the innovative application of Majiayao painted pottery patterns in the design of cultural and creative products, and deeply

exploring their potential and value in cultural dissemination, design innovation, and enhancing market appeal.

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