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Current Status and Improvement strategies of Chinese Contemporary Design: A Visualisation Research Based on CiteSpace

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ABSTRACT

The development of design relates to many areas of the country's economy and people's lives. To understand the current research of modern design in China and analyse future development trends, the published paper about China modern design in Web of Science Core Collection (WOSCC) database and China National Knowledge Infrastructure (CNKI) were investigate by visualised analysis use CiteSpace software. The following aspects between international work and Chinese work are compared in the present study, including publication quantity, national collaboration network, disciplinary type network, author analysis, and evolution of hotspots. The results show that the number of international literatures on Chinese modern design exceeds that of in China and with an increasing trend both. Although the nations collaborations in CNKI is inferior to that of in WOSCC, China is the most influential compared with other countries, which indict many studies are published in non-Chinese journals, result a truth that it is not conducive to the dissemination of design research between scholars and Chinese designers. For disciplinary distribution and core author, the international research teams are more diverse and widespread, while domestic networks are relatively concentrated with significant differences in research focuses. Chinese design researcher needs to strengthen communication and cooperation between different disciplines either domestic or international, which is an effective means for the advancement of design in international researchers. As for research hotspots and trends, international researchers focus on the development directions of design with digitalisation, intelligence, and virtualization, while domestic researchers continue to research the historical roots of traditional Chinese culture and reflect on the integration relationship between traditional culture and design. Based on the analyses above mentioned, some suggestions are present for improve the design philosophy and methodology, and ultimate enhance the competitiveness of Chinese design.

Keywords: *Chinese contemporary design; Improvement strategies; CiteSpace; Visualisation research*

1 INTRODUCTION

Life is the basis and source of design, and in turn, design is a necessity of life, which bringing interest to life and satisfying human physiological and psychological needs (Kasser, 2017). Modern design plays an increasing important role in various aspects of people's live (Makeham, 2020), including clothing, housing, transportation, manufacturing, etc. In 2005, the Design Council spent ten years studying 63 companies trading on the FTSE. Figure 1 show the companies that emphasize design (red line) earn more profits than the companies those ignore design (green line), and they outperform the

FTSE100 by 200%. Studies shown a return of $225 for every $100 invested in design fees, in other words, spend on design mean earn profits in future (Ganguly, 2018). A well-designed product can not only show the designer's skills and achievement their personal value, but also a business providing quality service for costumers that make a better world (C. Hein，2014).

Figure 1 Investigation of the impact of design on profitability.

In the history of the world economy, there have been four large-scale industrial transfer, and the fifth is under way. The first "Industrial Revolution" started the era of steam engine instead of handicrafts, which led to a great increase in productivity and made the United Kingdom became "factory of the world". As costs rose, scientific and technological achievements of the Industrial Revolution began transferred outward from the United Kingdom, which named the world's first industrial transfer. France, Germany, and the United States became the main destination of this industrial transfer. Among them, the United States became the biggest beneficiary and led the "second industrial revolution" by the application of electrical appliances (Voskuh, 2016). After the Second World War, Japan and Germany, benefit from the transfer of industries and investment from the United States, greatly accelerated the process of postwar reconstruction and industrialization (Wang, 2017). After a period of rapid economic development, the industrial structure in Japan and Germany has been adjusted and upgraded, so the light industry, including textile industry, export processing industries and other labour-intensive industries move to Hong Kong, Taiwan, Singapore and South Korea, as well as Latin American, which is called the third global industrial transfer. In the 1980s, the labour-intensive industries and low-tech, high-consumption industries transfer to developing countries, this was the fourth global industrial transfer and result China became the world's largest manufacturing country. However, around 2012, low-tech industries which are heavily influenced by cost factors such as labour and land, began to move to Southeast Asian countries such as Vietnam, Cambodia and Indonesia, where labour and land costs and policy concessions are more advantageous, as well as to South Asian countries such as India (Kim, 2021). Subsequently, machinery, automobiles and electronic components and other labour-intensive, export processing industries also followed the transfer. High-end manufacturing began to flow back to developed economies such as the United States, Japan and Europe. The fifth industrial transfer is the trend of world industrial development under the logic of comparative advantage and capital profit-seeking (Pei, 2013).

Economists believe that industrial shift due to cost of technology and/or labour. But an undeniable fact is although the manufacturing technology and labour costs may higher than others, consumers are attracted and profits are gained by Louis Vuitton, a world's leading luxury goods company (Cravino, 2022). This demonstrates the fact that design plays an important role in product and market. Considering

the huge economic volume and complex industrial structure of China, there is still a long way to redeem the industrial transfer and realize industrial upgrade rely on strategic emerging industries. Compared with the industrial technology research and development which is complicated and time-consuming, product design has the characteristics of low cost and quick effect, which can enhance the attractiveness of the products in a short time, provide high quality services for consumers and bring huge profits for the enterprises, such as the world-famous Apple, Tesla, and so on (Qin, 2017). The development of China modern design undergone several stages, including "patterns and aesthetics", "driven by heavy industry", "influenced by European design movements", "learning from Bauhaus" and "integration of art and design" (Cui, 2018). Particularly from 2000 to 2023, Chinese modern design rapid development during this period, and the influence is growing globally. Noteworthy, the human-centred green sustainable design concept of Chinese modern design has been embraced by international designers. However, the research on Chinese modern design was not enough, existing design concepts and methods are lagging the progress of modern technological. There is an urgent need to summarize the concepts of existing design, and then propose improvement strategy, which will ultimately lead to advanced design concepts that benefit for China's industrial development and reduce industrial transfer. Thus, it is significant for China to overview the current design situation and put forward the anticipation for the future design to realize the industrial design upgrading and retain the current industry. Therefore, this study utilizes analyses published papers for quantitative evaluation and visualisation, analysing national collaboration, disciplinary categories, author cooperation, prominent keywords, keyword clustering, timeline visualisation, and keyword highlighting maps to provide new in-sights for future research on Chinese modern design (Wang, 2018).

2 RESEARCH METHODOLOGY

2.1 Data Acquisition

The literature investigated in this study were derived from CNKI and WOSCC （Yao, 2011）. The data in WOS were conducted with the topic" Chinese Modern Design", published from 1 January 2000 to 31 December 2023. A total number of 626 articles were obtained. The domestic literature mainly originates from China National Knowledge Infrastructure (CNKI) databases. The timeframe for the search was set from 1 January 2000 to 31 December 2023. Excluding conference introductions, book reviews, briefs, and similar document types were excluded, a total number of 424 articles were retrieved.

2.2 Analysis Method

Data visualisation software CiteSpace were applied to analysis the articles we collection. The knowledge maps constructed by following steps: First, import literature into CiteSpace; Next, present output interface if parameters were assigned; And then, the key factors about literature can be analysed. Taking keyword cooccurrence maps as an example, the settings mainly include nodes, time slices, thresholds, modelling, pruning, merging, and mapping. The main research objects of the study are international and Chinese publication numbers, disciplines, and authors. Through keyword cooccurrence maps, keyword clustering maps, cluster timeline maps, and literature keyword highlighting maps, it quantitatively analyses and outlines the status, research hotspots, and development trends of Chinese modern design (Lee, 2021).

3 ANALYSES OF PUBLISHED PAPERS

3.1. The trend of Papers Published on Chinese Modern Design

The trend in the number of domestic and international publications. International research on Chinese modern design has been increasing annually since 2000, experiencing a sharp rise in 2018 and peaking in 2022. The trend in domestic research on Chinese modern design initial increasing and then decrease (Gaziulusoy, 2019), with a stable increase from 2000 to 2011 followed by a declining trend

from 2012 to 2023. The number of publications in international and domestic shown an increasing trend, which indict Chinese modern design attract more and more attention.

The result suggests that there is greater international research interest in Chinese modern design. In particular, the international publication has surged since 2020, nearly ten times more than domestic publications. This may be attributed to the heightened international attention to Chinese modern design, especially after China hosted the exhibition "Exploring the Sustainability and Rebirth of Design" in 2019. In contrast, domestic research on Chinese modern design shows slower growth initially and decline subsequently (Kilger, 2004). This may be because Chinese design concepts are solidified. It may be due to designer just focus on historical and cultural of Chinese modern design and they preference to detailed analyses of specific design types rather than broad overviews.

3.2. Analyses of country Collaboration Network

Figure 2 illustrates the collaboration network among countries, the colour of the circles represents the year of publication, corresponding to the colour bar in the bottom left corner of the graph. The size of the circles indicates the quantity of publications, with larger circles representing more publications and smaller circles representing fewer publications. The lines connecting the circles represent collaboration between countries, with more lines indicating closer collaboration and fewer lines indicating less collaboration.

Figure 2 Visual mapping of country cooperation networks.

Figure 2 shows that China has the highest number of publications and the widest range of collaboration with other countries. As shown in Table 1, the countries with significant collaboration in research on Chinese modern design, ranked after China, include the United States, the United Kingdom, South Korea, Canada, France, and Japan.

Table 1 Ten countries with the most papers published (WOSCC)

Country	Frequency	BC	Country	Frequency	BC
China	431	0.85	Australia	15	0.00
United states	40	0.16	Canada	14	0.00
England	22	0.11	France	11	0.02
South Korea	16	0.05	Japan	8	0.01

International research on Chinese modern design is expected to persist in the foreseeable future. Given the current context of scarcity of material resources and energy, Chinese design has been developed with a focus on people-oriented, sustainable development. It represents a dynamic design system. Global industrialization is an inevitable trend in the future. If industrialization can be achieved globally, Chinese design concepts will be more suitable for resource-saving and environmentally friendly design concepts (Fawcett, 2013).

3.3. Analyses of discipline Categories Network

Figure 3(a) and (b) depict the disciplinary distribution of the international literature and CNKI on modern Chinese design, respectively. Figure 3(a) indicates the international research on modern Chinese design covers various fields, including engineering physics, chemistry, botany, materials science, etc. Among them, engineering physics and physics account for 18.9% and 10.5% respectively, indicating that international research mainly focuses on the intersection between engineering physics and physics. It primarily analyses modern Chinese design from a microscopic physics perspective, such as the utilization of materials and resources and processing techniques. It also emphasizes the human-oriented, harmonious, and sustainable development concepts in modern Chinese design. Additionally, computer science, environmental science, and ecology, accounting for 8.9% and 7.4% respectively, concentrate on the informatization, networking, and digitization aspects of modern Chinese design. Thus, international research on modern Chinese design involves a wide range of interdisciplinary and cross disciplinary studies.

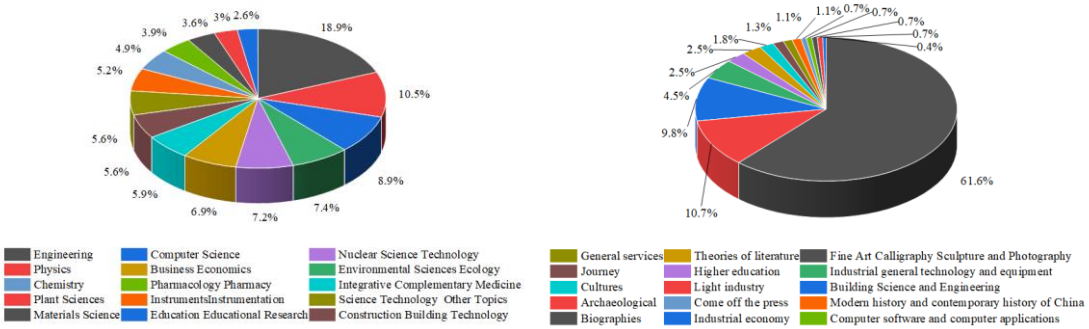

Figure 3 Disciplinary Distribution Chart: (a) WOS and (b) CNKI.

Figure 3(b) illustrates fine arts, calligraphy, sculpture, and photography account for 61.6%, which take a two-thirds share of the total, indicating that these disciplines are the most extensively explored. Ranking second is light industry and handicrafts, accounting for 10.7%, that mainly study the application of traditional Chinese design concepts in modern design. Architecture and engineering follow, accounting for 9.8% of the total disciplines, focusing on the current situation and problems in modern Chinese design, particularly in the manifestation of architecture. For example, the lack of regional characteristics and cultural significance in contemporary Chinese architecture has led to a situation where buildings across various cities resemble "matchbox" structures, lacking historical research context. Additionally, popular disciplines include industrial general technology and equipment and higher education, showing that research on modern Chinese design in China is primarily in the fields of literary theory, culture, travel, general services, modern Chinese history, etc. Research is concentrated in the disciplines of fine arts, calligraphy, sculpture, and photography, focusing mainly on the study of painting, design creativity, and modelling. The interdisciplinary and multidisciplinary aspects of design are relatively weak, indicating a need for strengthening research in these areas in the future (Bordini, 2021).

3.4 Character analysis of paper published in WOSCC

3.4.1 Author Analysis

Core authors are the backbone driving academic innovation and disciplinary development, serving as leaders in academic discourse and guiding academic authority. By studying this academic community, the status and trends of disciplinary development can be understood. Figure 4 depicts the frequency of appearances of core authors and the collaborative relationships between them. Each circle in the graph represents an author, with the size of the circles indicating the frequencies of appearance. The lines connecting circles represent collaboration between authors. Based on the statistics of the number of publications by authors, Table 2 presents the top 10 core authors by publication frequencies. He Yuan, Ma L Z, Gu Long, Li Jin-Yang, and Han S F are the main contributors. They have conducted research on the application of modern Chinese design in virtual digital design from an interdisciplinary perspective. Additionally, Wu Andong, Xu Hu-Shan, Huang Yulu, Liu Kaixuan, and Zhu Chun study material applications in Chinese design from a microscopic perspective.

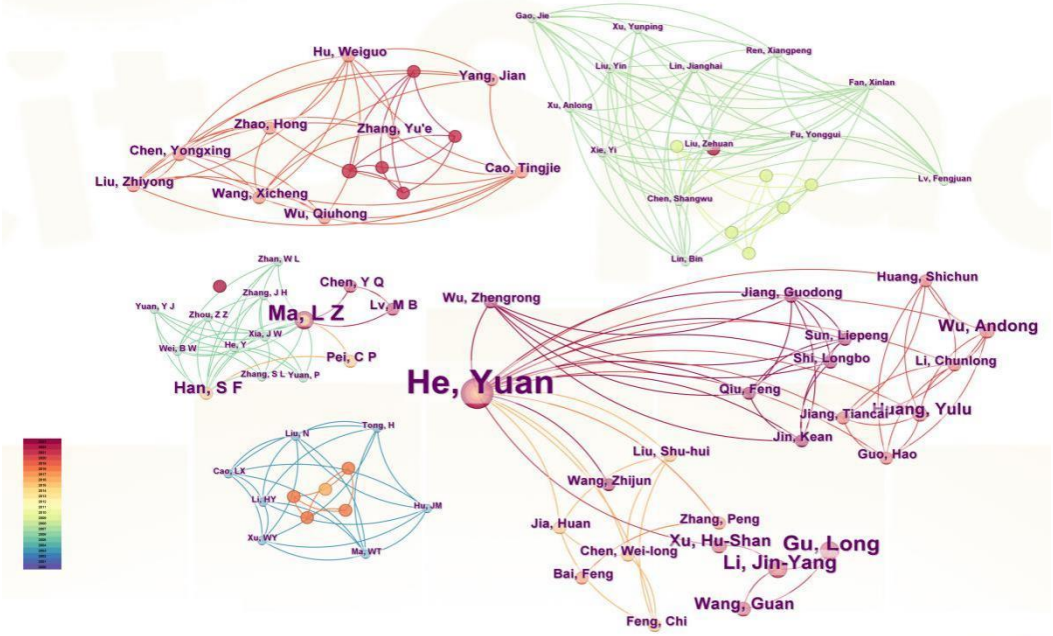

Figure 4 Core author cooccurrence graph.

Table 2 Top 10 authors with the most publications (WOSCC)

number	Frequency	Author's	Serial	Frequency	Author
1	0.02	He, Yuan	6	0.00	Wu,
2	0.00	Ma, L Z	7	0.01	Xu, Hu-
3	0.00	Gu, Long	8	0.00	Huang,
4	0.00	Li, Jin-	9	0.00	Liu,
5	0.00	Han, S F	10	0.00	Zhu, Chun

In summary, international research on modern Chinese design is diverse, which focus on interdisciplinary, cross disciplinary, and multidisciplinary approaches. The main content revolves around virtual digitization and design from a microscopic perspective.

3.4.2 Co-citation Analysis

The keyword and clustering maps are shown in Figure 5(a) and 5(b), the total 10 clusters can be divided into two parts: The first comprises 5 clusters, primarily exploring the macro aspects of the

concepts and visual forms of modern Chinese design. During this stage, the research mainly focuses on general patterns of design presentation, analysing the connections with internationalist design and the similarities in form, colour, and material. The second stage primarily examines the core of design from a microscopic perspective, focusing on enhancing the competitiveness of modern Chinese design internationally and how to make China's internationalization and modernization more regionally, culturally, and individually distinctive. Research expands the design field from the perspectives of diversity, interdisciplinary, and cross disciplinary approaches, integrating design with digitization, intelligence, and virtualisation to better adapt to the processes of industrial globalization (He, 2008).

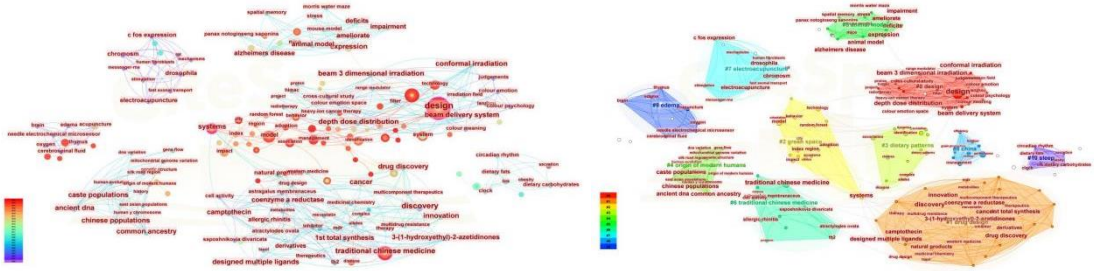

Figure 5a Keyword mapping cooccurrence map of paper published in WOS
Figure 5b Co-citation cluster of paper published in WOS

Table 3 Keyword Frequency and Betweenness Centrality of paper published in WOS

Frequency	BC	Keyword	Frequen	BC	Keyword
0.26	42	design	7	0.05	identificatio
0.06	16	performance	7	0.06	technology
0.15	15	Chinese medicine	7	0.05	managemen
0.03	12	model	7	0.25	systems
0.02	8	system	6	0.04	association

Table 4 Cluster Information of paper published in WOS

Clustering	Keywords	Mean Contour	Average Year
0	26	0.970	2008
1	16	0.922	2018
2	16	0.918	2014
3	14	0.883	2008
4	14	1.000	2007
5	13	0.998	2008
6	13	0.950	2009
7	11	1.000	2006
8	10	1.000	2002
9	8	1.000	2020
10	7	1.000	2003

3.4.3 Timeline Visualisation

Figure 6 represent the timeline visualisation graph, which integrates keyword clustering from January 2000 to December 2023. From the graph, it is observed that there is a total of 9 clusters, providing a clear depiction of the time span covered by the keywords. For example, in the early stages, the emergence of biomimetic form design concepts focused on studying the influence of "replication" designs from traditional Chinese artifacts on modern design. This included aspects such as shape replication—demonstrating replication techniques of early artifact carriers, and pattern replication—designing visual patterns replicated from early artifact decorations. In later years, particularly in recent

years, there has been the emergence of green space design. This aspect primarily focuses on human-centred green sustainable design (Buh, 2009). From the graph, it's evident that this design concept will continue to be studied more in-depth in the future.

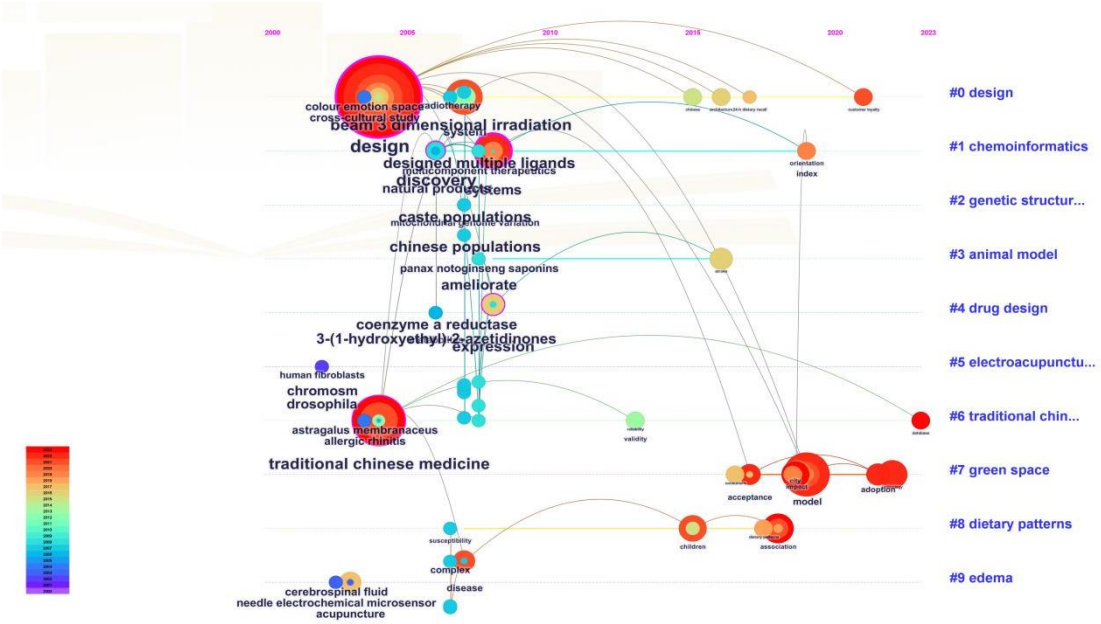

Figure 6 Time visualisation mapping of paper published in WOS.

3.5 Character analysis of paper published in CNKI

3.5.1 Author Analysis

This text discusses the core contributors in the field of modern design research in China, as depicted in a co-authorship network map, where the number of publications exceeds two (Table 5). Yang Junyan, as the first author, corresponding author, and coauthor, has established a network of collaboration with Qin Shiwen and Zhang Fangyuan, contributing significantly to the field of modern design research in China. Their group focuses mainly on the theory and methodology of digital urban design, making notable contributions in areas such as digital cities, heterogeneous big data, and AI for cities. They have developed equitable planning methods, addressing key aspects of sustainable and resilient urban planning, and have worked on promoting community health and intergenerational social interactions in urban development. Another team, led by Minglan from Nanhua University, with Yao Zhiqi, Liu Jinshu, and others, focuses on exploring the historical origins of traditional culture and its inheritance and continuation to the present day. They argue that ancient cultures and art forms remain vibrant and have influenced modern design through new expressions of traditional culture and art.

The overall analysis indicates that there are few research teams in the field in China, the teams are small and the research focus among them is wide. These teams mostly have a macroscopic perspective, with key research areas including digital design, artificial intelligence, and the representation of traditional cultural history in design.

Table 5 Core authors of paper published in CNKI.

Frequency	Author	Frequency	Author
4	Yang Junyan	2	Xiaomo Wang
4	Qin Shiwen	2	Lu Xiaoyun
3	Lv Pintian	2	He Feng
3	Zhou Bo	2	Li Xu
2	Mei Yingxue	2	Cao Xiaoou
2	Li Yan	2	Hangzhou

3.5.2 Co-citation Analysis

We conducted a visualisation analysis of Chinee literature from the CNKI database from 2006 to 2021. We formed clusters of keywords, such as spatial design, traditional culture, design, tradition, and culture, as shown in Figures 7 (a) and (b). Figure 7(c) illustrates a subset of the visualisation of Chinese modern design in the overseas CNKI database. Due to incomplete information, such as references, abstracts, introductions, and authors in the overseas CNKI database, the retrieved data is relatively limited and is included in the Chinese domestic database. Therefore, Figure 7(c) is presented for display purposes only and is not subject to detailed analysis.

Figure 7(a) and (b) shows that the development of modern Chinese design has been influenced by the failure to catch up with the three industrial revolutions. This has left Chinese design at a crossroads between imitation and innovation, resulting in three main features of the current state of modern Chinese design: 1. imitation of internationalist design; 2. the predominance of nonhistorical art and technology integration; and 3. overlooking the subtleties of design content, despite design consistently focusing on human-centred and green sustainable design principles. Therefore, modern Chinese design is driven more by market forces than ideology. In future design endeavours, China will intensify research on traditional culture, enhance the concept of Chinese–Western design integration, pioneer localized designs suitable for China, and carve out a place on the global design stage.

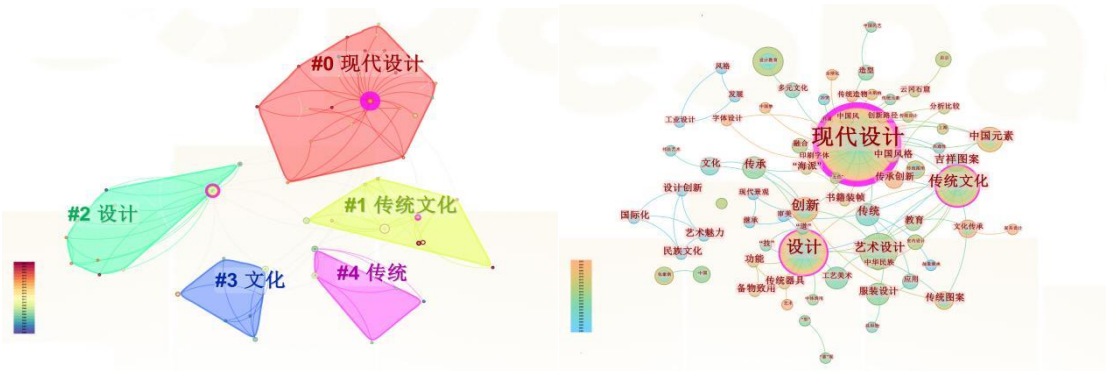

Figure 7(a) China co-citation cluster and **(b)** Keyword mapping cooccurrence map.

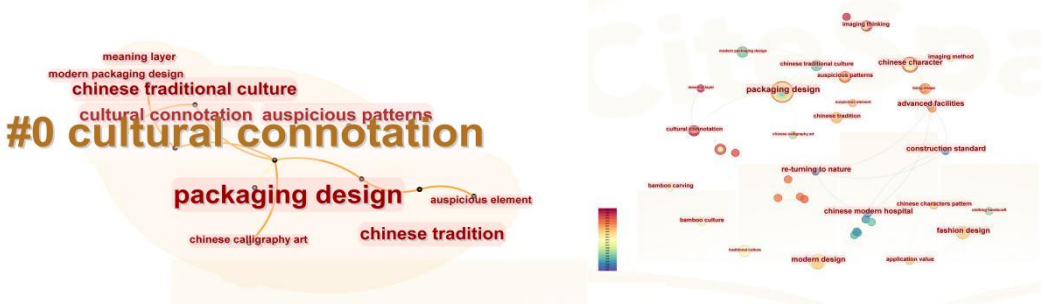

Figure 7 (c) China Knowledge Network Overseas Database co-citation cluster and **(d)** Keyword mapping cooccurrence map.

3.5.3 Timeline Visualisation

Temporal clustering of Chinese literature, revealing five key keyword clusters: "Modern Design", "Design," "Traditional Culture," "Culture," and "Tradition." These clusters are divided into two periods: 2000–2005 and 2006–2023. During the 2000–2005 period, research primarily focused on the appearance of design, such as imitating international styles, with the aim of modernizing design. The resulting design effects were modern and high-tech, exhibiting a homogenized appearance across cities but failing to integrate traditional elements. From 2006 to 2023, there was a shift toward excavating traditional culture and moving toward a fusion of Chinese and Western approaches. However, this period saw an oversight in the exploration of cultural historical origins and the misuse of cultural symbols. Additionally, Chinese culture oscillated between Chinese and Western influences in later designs, resulting in designs that failed to adequately reflect cultural and regional meanings. This has led to modern designs lacking cultural and regional characteristics. Therefore, China will continue to delve deeply into the historical origins of traditional culture, seeking to carve out a design path with distinctive Chinese characteristics and secure a place on the global design stage (Chen, 2018).

3.6 Comparison of Keyword Bursts

Keyword analysis can reveal the hotspots and trends within a field of study, showing the keywords that appear more frequently at certain stages, which helps predict the development trends of that field. As shown in Figure 8(a), based on the emergence of certain keywords, international modern design research in China mainly focuses on human-centred and green, sustainable design philosophies, along with research into virtual, intelligent, and digital aspects of design (Zhang, 2006). The intensity of these emerging keywords suggests that digital and virtual design will continue to be a key area of research in the future. Figure 9(b) divides the research into three periods based on the concentration of the highlighted keywords: 2000–2006, 2007–020, and 2021–2023. The rationale for these time periods is as follows: the 2000–2006 period marks the initial stage of modern design development in China, focusing on how traditional Chinese culture can be applied in design and comparing ancient Chinese and Western designs. The 2007–2020 period represents a phase of rapid development in various fields of modern design and dramatic changes in politics, economy, culture in China. Cities burgeoned with skyscrapers, which further propelled design innovation that focused on the external macro-expression of design in various applications. During the 2021–2023 period, Chinese modern design began to explore the historical roots of traditional Chinese culture, further promoting the localization of Chinese design. Thus, in the future, modern design in China will continue to explore in-depth the historical roots of traditional Chinese culture.

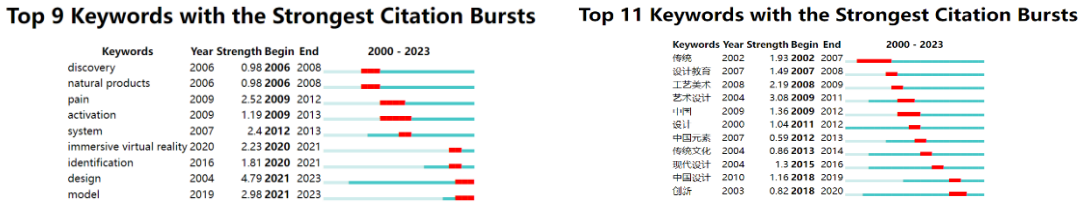

Figure 8 Evolution of the most cited keywords: **(a)** WOS databases and **(b)** CNKI databases.

4. RESULTS AND DISCUSSION

This article employs bibliometric methods and utilizes CiteSpace software to analyse literature related to " Chinese modern design" from the Web of Science and CNKI databases, covering the period from 1 January 2000 to 31 December 2023. The basic situation, current state, and existing issues of Chinese modern design research both domestical and international are analysis, leading the following conclusions:

(1) The number of international publications on modern design in China far exceed domestic publications. Looking at publication trends, domestic publications grew faster than international publications from 2000 to 2011. However, starting in 2012, the number of international publications began to surpass domestic production, with the latter showing a year-on-year decrease. International publications peaked in 2022, reaching dozens of times the number of domestic publications. In 2023, there was an increase in domestic publications, but the gap with international publications remained significant. The focus of these publications has evolved in two directions: virtual digital design and tangible design. Overall, the quantity of research on modern design in China, both domestically and internationally, is expected to continue growing in the future.

(2) Looking at the national collaboration network in the field of modern design research in China, China ranks first in the number of publications among many countries and has a high impact and the widest collaboration network. However, there exist differences in the focus of domestic and international journals. International researcher emphasis the relationship between science, technology, and design, while domestical researcher focus on the application of traditional culture in design.

(3) In terms of the disciplinary distribution of research in Chinese modern design, international studies are closely linked with engineering, physics, chemistry, and plant sciences, indicating a broad scope of interdisciplinary and transdisciplinary research. In contrast, domestic research on modern design is more closely associated with the disciplines of fine arts, calligraphy, sculpture, and photography, with less emphasis on interdisciplinary and transdisciplinary fields.

(4) Regarding the core authors in the field of modern design in China, there are many branches of research internationally, with a primary focus on interdisciplinary and cross disciplinary research and diverse areas. The main content focuses on virtual digitalisation and considers design from a microscopic perspective. Domestically, there are fewer research branches and teams, with smaller team sizes. The scope is broad, but the focus varies, predominantly considering design from a macroscopic perspective. The main areas of research include digital design, artificial intelligence, and new manifestations of traditional cultural heritage in design.

(5) Hotspots and trends analysis: Internationally, the research hotspots in modern design studies related to China focus on the development directions of design toward digitalisation, intelligence, and virtualization. This orientation aims to better adapt to the process of industrial globalization and to realize design philosophies that are human-centred and sustainable. The hotspots in domestic modern design research indicate that future modern design efforts in China will continue to explore in-depth the historical roots of traditional Chinese culture.

It can be seen from above result, the main shortage of Chinese modern design is relatively singular research field, limited collaboration within domestic national networks, and significant differences in research focuses. The main problems on Chinese modern design research are listed as follow:

(1) Domestic designers in China do not give sufficient attention to the description of Chinese modern design, focusing more on analysing the cultural and technical aspects of traditional design. For example, most of the content often focuses on designs from traditional periods.

(2) The transition from traditional to modern design in China occurred in a short period, without sufficient consideration of localized design. At that time, there was more wholesale acceptance and imitation of international modern design concepts, lacking localization.

(3) Chinese design fails to effectively achieve the transition, inheritance and integration between classical and modern cultures. The main reason for these issues is the lack of a quantitative compendium and organization of the development process of Chinese modern design by researchers. Therefore, this study utilizes CiteSpace for quantitative evaluation and visualisation, analysing national collaboration, disciplinary categories, author cooperation, prominent keywords, keyword clustering, timeline

visualisation, and keyword highlighting maps to provide new insights for future research on the development of Chinese modern design.

This study reviews the development of modern design in China, systematically analyses its research trends, institutions, etc., and points out the deficiencies that exist in Chinese design. Literature review method overcomes the limitations of time and space and allows for analysis and investigation the design situations over time. Design involves with multi-discipline and industrial fields, dissertation research is just a tip of the iceberg in the field of design, and it is a hard work to uncover the veils, and multiple perspectives recognize Chinese design by single means. In addition, the purpose of theoretical research is to better guide design and thus produce products that meet consumer needs; therefore, some market investigate may is necessary. To better understand the current state of design in China, compensating the drawback of literature review in the lack of representatives in sampling and comprehensive information, multiple research methods, such as questionnaire survey method, expert survey method, and interview survey method will be carried out in subsequent research.

5 SUGGESTIONS FOR IMPROVEMENT IN CHINESE MODERN DESIGN

5.1 Building up the character based on culture

Design, as a human activity, is inextricably linked to culture, which influences not just the designer but also the consumer's identification with the result. One of the most noticeable is the influence of regional culture, which emphasizes the unique design styles of other countries (regions). Furthermore, customers are more likely to embrace things that are consistent with their cultural identities. Japan is well-known in the international design community for its emphasis on both traditional culture and modern innovation. Examples include the influence of traditional kimono, tea ceremony, flower arrangement, and other cultural systems. This influence is not only reflected in artwork and cultural activities, but also incorporated into architecture, furniture, and food and beverage, making it one of the unique features of Japanese design. Based on traditional culture, Japanese design also focuses on the integration of modern and innovative elements. Technological elements are one of the important aspects. Whether it is electronic products, automobiles, architecture, or fashion, they all have a strong sense of technology. The integration of this sense of technology not only makes the products more modern in design but also reflects the innovative spirit of Japan (Corsini, 2019).

Combining traditional culture with modern design not only provides aesthetic pleasure, but it also contributes positively to the preservation and transmission of traditional culture. Creating a brand image based on one's own characteristics helps to build a reputation and word-of-mouth for the business. Establishing a favourable brand image helps the firm be recognized and recommended by consumers, resulting in long-term development and growth. As a result, it is critical to consider the cultural attributes of consumers and design when designing products, to establish the product's design culture, enhance user viscosity, and preserve the enterprise's long-term stable development.

5.2 Human-centred design

Product design aims to give better services to people. Human-centred design refers to the use of human behaviour, physiological structure, psychological situation, and way of thinking in the original design of the basic functions and performance of the product on optimisation, so that the user's experience is convenient, comfortable, meets people's physiological needs, and pursues the spirit. Human-centred design follows the following process: address the core underlying issues, not just the presentation; continually test and refine the proposed designs to ensure that they truly meet the concerns of the target population; collaborate with and, where possible, support the platform's design by giving full consideration to each individual's articulation of the object image, and reach a common perception

or purpose-seeking bias is the direction of the endeavour, and realization the philosophy of human-centred design.

Design is a combination of art and technology, the current consumer market is becoming more mature, the brand, service, packaging, advertising and image design put forward higher requirements. With the transformation of the concept of mass consumption, design emphasises more on "human-oriented" individual experience and humanisation. Design plays an irreplaceable and important role in industrial production, network communication and high-end luxury goods. Human-oriented design can add convenience and enjoyment to life, so that everyone can feel the happiness brought by design. Contemporary Chinese design should put the balance between commercial and public welfare in the first place, learn from the world's advanced design concepts, to realize the "human-oriented" design concept to practice the social responsibility of designers, produce products that can improve human life, and make more people accept and like Chinese goods.

5.3 Combine with advanced scientific and technological development

The progress of science and technology will promote the progress of productivity, the introduction of advanced technical means into the design field can promote the rapid development of the design industry. Changes in design tools will promote the renewal of design forms, and the role of digital media has become more significant. Computer design not only brings new modelling language and expression, but the computer also constructs the object and the characteristics of image processing, so that the work created by the computer shows a new style, opening a new field of design communication. With the continuous development of Artificial Intelligence (AI) technology, the field of design has also begun to be affected and improved. For large amounts of repetitive and regular work, designing with AI can replace part of the human work and reduce labour costs, prove efficiency and produce excellent designs. In addition, based on a large amount of data and algorithmic predictions, AI can provide designers with accurate advice and guidance, automatically adjusting design elements and improving the quality of the design to produce better designs.

Designing with AI technology can combine the creativity of human designers with AI's ability to analysed and predict data. In addition, developing technologies such as deep learning and reinforcement learning, AI can gradually learn and mimic human creativity and imagination, providing designers with more sources of inspiration. Based on big data and according to the personalized needs and preferences of service recipients, AI can quickly provide customized design solutions, making the design closer to people's hearts and meeting the needs of different groups of people. AI may not be able to completely replace human designers, but with the continuous development of technology, AI will work with designers to promote the progress and development of design. Therefore, vigorously developing the application of AI technology in design can bring more opportunities for Chinese design and manufacturing in the future.

6 CONCLUSIONS

This study analyses domestic and international literature on modern design in China from 2000 to 2023 using CiteSpace for a visual investigation into the volume of literature published, national collaboration networks, disciplinary networks, author analysis, and current research status and hotspots in the field of modern design in China. The findings reveal that the number of domestic and international publications will continue to increase, with international publications expected to exceed those of China for a considerable period. In the national collaboration network, China ranks first in terms of international influence and has extensive cooperation with various countries. Regarding disciplinary distribution, international research on modern design in China is diverse, with prominence in interdisciplinary and cross disciplinary fields, whereas domestic research is more concentrated in specific disciplines and weaker in interdisciplinary areas. From the perspective of core authors, many branches of international research focus on modern design in China, mainly centred on virtual

digitalisation and micro-level design thinking. In contrast, domestic research teams are fewer, smaller, and have a broad but varied focus, primarily adopting a macroscopic perspective. In terms of research hotspots and trends, international researchers focus on design's development direction in relation to digitalisation, intelligence, and virtualization. Domestic researchers' hotspots will continue to explore the historical roots of traditional Chinese culture, considering the integration of traditional culture and design. In addition, to improve Chinese design, some suggestions are present according to the deficiencies in Chinese design, which may also provide some reference and thoughts for design research in other countries.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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