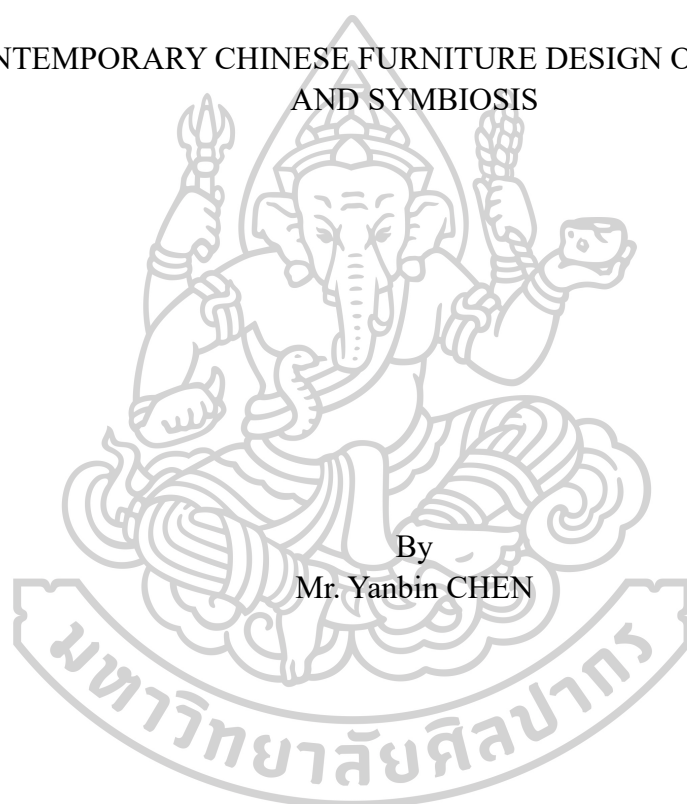




THE CONTEMPORARY CHINESE FURNITURE DESIGN OF INTERGRATION
AND SYMBIOSIS



A Thesis Submitted in Partial Fulfillment of the Requirements
for Doctor of Philosophy DESIGN
Silpakorn University
Academic Year 2023
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การพึ่งพาและการผสมผสานกันของการออกแบบเฟอร์นิเจอร์ร่วมสมัยของจีน



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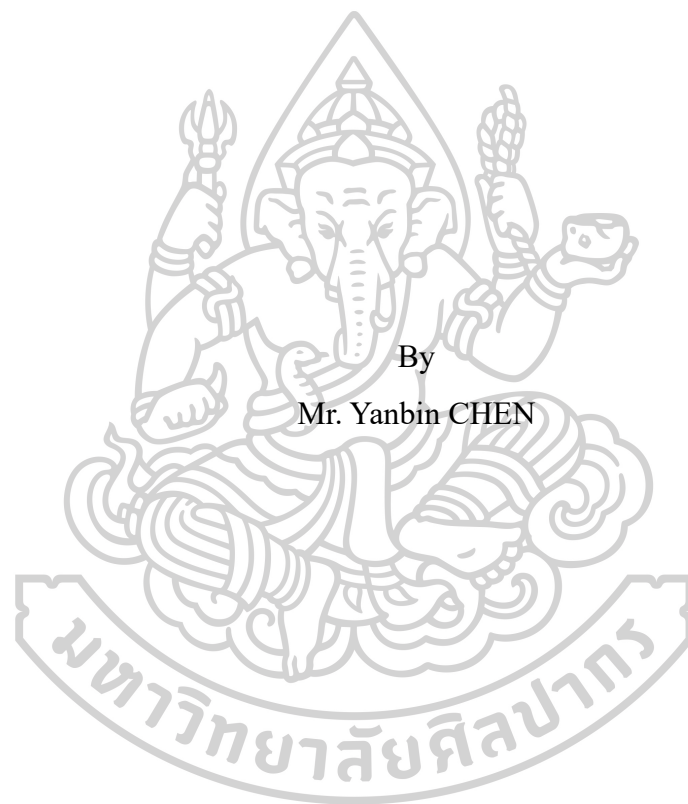
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ลิขสิทธิ์ของมหาวิทยาลัยศิลปากร



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Title The contemporary Chinese furniture design of Intergration and symbiosis
By Mr. Yanbin CHEN
Field of Study DESIGN
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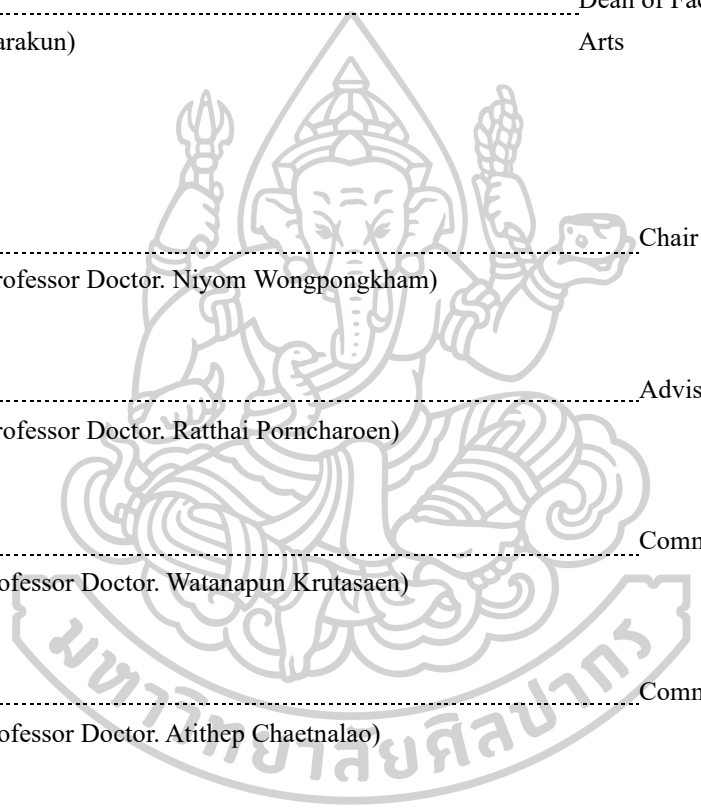
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Contemporary Chinese furniture is an integral part of the Chinese furniture industry. Therefore, studying contemporary Chinese furniture is significant in promoting the development of the Chinese furniture industry, the inheritance and development of Chinese culture, and the integration of art and design. However, as for contemporary Chinese furniture's current design and research, there are still issues, such as the need for systematic research, and innovation, blurring points in practical applications. The design concept of contemporary Chinese furniture mainly concentrates on the inheritance and improvement of "Chinese elements", simplification and deformation of decorative accessories, etc., focusing on the beauty of the product's appearance, ignoring the product's practicality, and no actual use of consumers. In this context, It introduces the concept of integration and symbiosis. It is based on the Chinese Ming-style furniture Essence, The study of advanced data to create design needs. Then perform product development and prototype production in the design stage. First of all, in the stage of data research, in the stage of creating design needs, this study analyzed the social background, artistic style, and cultural ideas of Chinese Ming-style furniture at that time based on the discussion and induction of the literature and data analysis. The design essence of furniture, especially culture, modelling, ergonomics, functions, materials, and structures. The time division, research summary of contemporary Chinese furniture, and the basis for transforming and integrating subsequent modern product design. It also studies and summarizes the new materials of contemporary furniture, the design principle of furniture products, the proportion of furniture consumer users, and the manufacturing system and methods to create contemporary Chinese furniture that meets consumer needs. She was followed by the design and data based on the early research and data and the product development and prototype production during the design stage. Step 1 is to create a design guide 1 based on a keyword summary. Design Guidelines 2 is the problem of summarizing the existing problems in the experimental stage, improving the design method, and re-innovate the design. Finally, based on the three product prototypes of Design Guide 2, 7 experts and target consumers in different fields choose suitable and best products and research methods for in-depth design. Finally, the data of the target consumers are studied by the data collected from the exhibition. As a design researcher, research on target consumer satisfaction is essential for our work. According to the condition of the target consumer group, a total of 180 questionnaires were collected this time. The questionnaire survey is divided into four levels: product quality, product function, product production and sales, product innovation, and obtaining the average satisfaction, standard deviation and attention. Based on the discussion and analysis of the above levels, summarize the design method of contemporary furniture fusion and symbiosis so that the new Chinese furniture can integrate a variety of thinking at the design level so that the design products are more in line with the development of natural laws, and more in line with social needs. Providing corresponding references for specific design practices aligns more with human use.

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TABLE OF CONTENTS

	Page
ABSTRACT.....	D
ACKNOWLEDGEMENTS.....	E
TABLE OF CONTENTS.....	F
LIST OF TABLES.....	K
LIST OF FIGURES.....	L
CHAPTER 1.....	1
INTRODUCTION.....	1
1.1 Research background and importance.....	1
1.2 Research hypothesis.....	4
1.3 Research Objectives.....	4
1.4 Study framework.....	5
1.5 Research Scope.....	5
1.5.1 Content range.....	6
1.5.2 Design phase.....	6
1.5.3 Satisfaction Research Procedure.....	7
1.6 Study the definition of the term.....	7
1.6.1 Contemporary Chinese Furniture.....	7
1.6.2 Ming Dynasty furniture.....	7
1.6.3 Fusion and symbiosis.....	8
1.7 The benefits of research.....	8
CHAPTER 2.....	10
REVIEW OF LITERATURE.....	10
2.1 Cultural background of traditional Chinese furniture.....	10

2.1.1 Overview of Ming-style furniture.....	12
2.1.1.1 Definition of Ming-style furniture	12
2.1.1.2 Design ideas of Ming-style furniture	14
2.1.1.3 The characteristic elements of Ming-style furniture.....	19
2.1.2 Overview of contemporary Chinese furniture	43
2.1.2.1 The historical process of contemporary Chinese furniture	44
2.1.2.2 The innovative trend of contemporary Chinese furniture.....	50
2.1.3 Mixing contemporary Chinese furniture and Ming style furniture.....	52
2.2 Symbiosis under the trend of new materials of contemporary furniture	56
2.2.1 Research Status of Contemporary Furniture Materials.....	56
2.2.2 Characteristics of Contemporary Materials	60
2.2.3 The trend of contemporary materials	63
2.3 Principles of furniture product design.....	64
2.4 Consumer Data Research.....	69
2.4.1 Proportion of furniture users	69
2.4.2 Residential status of the consumer.....	75
2.5 Wood Furniture manufacturing systems and methods.....	78
2.6 Related research.....	86
2.6.1 The author Jing Nan mentioned in the thesis "Research on Chinese Modern Furniture from the Perspective of Inheritance of Design Principles"	87
2.6.2 The author Ye Lu mentioned in the thesis "Inheritance and	87
innovation of Chinese modern furniture design"	87
2.6.3 The author Yu Dehua mentioned in the thesis "Study on the.....	88
Art Style of Ming Style Furniture"	88
2.6.4 The author Yao yang mentioned in the thesis "Research on.....	88
Ming-style furniture"	88

2.6.5 The author Xu Jifeng mentioned in the thesis "Research on89 Harmonious Design System of Modern Chinese Furniture"89	89
2.7 summary.....90	90
CHAPTER 391	91
RESEARCH METHOD.....91	91
3.1 Study data to create design requirements.....91	91
3.1.1 Population and sample91	91
3.1.2 How to create tools91	91
3.1.3 Tools used in research91	91
3.1.4 Method of collecting data92	92
3.1.5 data analysis methods92	92
3.2 Stage of design Product development and prototyping.93	93
3.2.1 Population and sample93	93
3.2.2 How to create tools94	94
3.2.3 Tools used in research95	95
3.2.4 Method of collecting data95	95
3.2.5 data analysis methods95	95
3.3 A study of the satisfaction of the target group of consumers.95	95
3.3.1 Population and sample95	95
3.3.2 How to create tools96	96
3.3.3 Tools used in research96	96
3.3.4 Method of collecting data97	97
3.3.5 data analysis methods97	97
CHAPTER 498	98
RESEARCH RESULTS.....98	98
4.1 Study furniture during the Ming Dynasty and study related backgrounds to create requirements that meet the needs of consumers.....98	98

4.1.1 Literature and Internet search results and analysis summary of Chinese Ming Dynasty furniture and contemporary Chinese furniture.....	98
4.1.1.1 Analysis from the cultural perspective.....	102
4.1.1.2 Analysis from the perspective of ergonomics.....	104
4.1.1.3 Case transformation analysis of modeling perspective.....	104
4.1.1.4 Case transformation analysis from material perspective.	106
4.1.1.5 Case transformation analysis from functional perspective.	108
4.1.1.6 Case transformation analysis from structural perspective.	110
4.1.2 Requirements Research and Data Analysis of the Target Sample	112
4.1.3 The results of the data analysis generate the design requirements.	117
4.2 Experimental part design	118
4.2.1 Design Guide 1: Contemporary Chinese Furniture Design of Wood Materials and Contemporary Chinese Furniture Design of Metal Materials	118
4.2.2 Design Guide 2: Design 3 contemporary Ming-style folding chairs mainly made of wood with different craft structures.....	131
4.3 Product Display and Target Consumer Satisfaction Survey	164
CHAPTER 5	170
SUMMARY OF RESEARCH FINDINGS DISCUSSION AND SUGGESTIONS .	170
5.1 Summary of research results.....	170
5.1.1 Study data to create design requirements.....	170
5.1.2 Stage of design Product development and prototyping.	173
5.1.3 A study of the satisfaction of the target group of.....	174
consumers toward the product.	174
5.2 Research results discussion.....	175
5.3 Research Suggestions.....	176
REFERENCES	178
APPENDIX A	182

APPENDIX B190
APPENDIX C199
VITA203



LIST OF TABLES

	Page
Table 1 uses traditional architecture as inspiration for furniture design.....	54
Table 2 Innovative material design for Ming stools	55
Table 3 Innovative design of the function of the Ming stool.....	56
Table 4 2018 SCI included material science journal impact factor ranking ...	60
Table 5 Cultural elements contained in Ming-style furniture	103
Table 6 Comparison of modeling cases between Ming-style furniture and contemporary Chinese furniture.	105
Table 7 Comparison of materials between Ming-style furniture and contemporary Chinese furniture	107
Table 8 Comparison of functional cases between Ming-style furniture and contemporary Chinese furniture	109
Table 9 Comparison of structural cases between Ming-style furniture and contemporary Chinese-style furniture.....	111
Table 10 Summary of Communications with Expert Committee Members.	129
Table 11 Summary of online and offline expert assessment workshops	158
Table 12 Satisfaction data of users for these three schemes	159
Table 13 Production Cost Estimation Chart.....	160
Table 14 Profile of Respondents	166
Table 15 Satisfaction degree of target consumer groups	168

LIST OF FIGURES

	Page
Figure 1 Research framework.....	5
Figure 2 The relationship between Ming-style and Ming Dynasty furniture .	13
Figure 3 Ming -style furniture clock "goose neck" shape application.....	19
Figure 4 Huanghuali, Nanmu, Rosewood, Tieli Wood, commonly used in Ming -style furniture	20
Figure 5 The characteristics of rosewood, chicken wings, and yellow rosewood pattern characteristics commonly used in Ming -style furniture ..	22
Figure 6 Chinese calligraphy and Chinese painting ink line	23
Figure 7 Ming -style furniture official hat chair shape	24
Figure 8 "Horseshoe-style" feet -Ming Rosewood Stool.....	26
Figure 9 Ming furniture backline and dental board sample maps	27
Figure 10 The diversity of Ming -style furniture tenon and tenon	29
Figure 11 edge method.....	31
Figure 12 corner tenon.....	31
Figure 13 corner tenon.....	32
Figure 14 The decoration of Ming -style furniture	34
Figure 15 The decoration of Ming -style furniture	35
Figure 16 The stool foot decoration of the rose chair.....	35
Figure 17 The common stool foot decoration of Ming -style furniture.....	36
Figure 18 The common baffle of Ming -style furniture.....	36
Figure 19 bronze ornaments of Ming -style furniture.....	37
Figure 20 Bronze decoration shape category of Ming -style furniture.....	37
Figure 21 The "S" back in Mingchang chair	38

Figure 22	one thing in the Ming chair, one thing, one environment system ..	39
Figure 23	The scoot stool in Ming -style furniture chair	40
Figure 24	Large scale of Ming -style circle chairs.....	41
Figure 25	"wooden pillow stool" with arc	42
Figure 26	The curve of the armrests such as Ming -style circle chairs.....	42
Figure 27	The sofa in the hall	44
Figure 28	days of Ansmen's TV cabinet	45
Figure 29	The chair of the Federal Group of Guangdong in 1992	46
Figure 30	The partners designed.....	47
Figure 31	The "Pianzhou" designed	48
Figure 32	Fu Junmin's "Ping Ping"	49
Figure 33	Wen Hao's "Bi Life"	50
Figure 34	Keyword search volume	58
Figure 35	changes in new materials literature	58
Figure 36	Retail sales growth rate of furniture in China from 2010 to 2020..	70
Figure 37	The proportion of consumers' age	71
Figure 38	Proportion of furniture consumption in different city scales.....	72
Figure 39	Proportion of residential income in first-tier cities.....	73
Figure 40	How much consumers are willing to spend on furniture.....	74
Figure 41	Per capita living area in first-tier cities (m ²)	76
Figure 42	Per capita living area in first-tier cities (m ²)	77
Figure 43	Number of rooms lived in first-tier cities.....	78
Figure 44	Step 1: Wood cutting	79
Figure 45	Step 2: Retort the plate	80
Figure 46	Step 3: Dry the plates	81
Figure 47	Step 4: Furniture cutting.....	82
Figure 48	Step 5: Furniture making.....	83

Figure 49	Step 5: Furniture making.....	84
Figure 50	Step 6: Furniture carving.....	85
Figure 51	Step 7: Scrape the furniture.....	85
Figure 52	Step 8: Apply the wood paint.....	86
Figure 53	Combing map of furniture keywords in Ming Dynasty.....	100
Figure 54	Keyword combing map of contemporary Chinese furniture.....	102
Figure 55	Ergonomics study of Ming-style furniture.....	104
Figure 56	Consumers' choice of materials.....	113
Figure 57	Chinese brand attention data.....	114
Figure 58	Data on users' attention to furniture usage scenarios.....	115
Figure 59	Per capita living area in first-tier cities in China.....	116
Figure 60	Reference keywords for screening after data statistics.....	117
Figure 61	Frame diagram of designed experiment.....	119
Figure 62	Bar counter design scheme.....	121
Figure 63	Dining table design scheme.....	122
Figure 64	Bar stools, dining chairs design.....	123
Figure 65	Design scheme of dressing table.....	124
Figure 66	Mirror Cabinet Design Scheme.....	125
Figure 67	Bed Design Scheme.....	126
Figure 68	Overall design scheme of bedroom furniture.....	126
Figure 69	Communication with members of the expert committee.....	128
Figure 70	Show products to the expert committee.....	128
Figure 71	Records of online communication with tutors.....	131
Figure 72	Show products to the expert committee.....	133
Figure 73	Scheme 1 shows the effect.....	134
Figure 74	Display effect in two states of scheme 1.....	135
Figure 75	Scheme 1 contraction flow chart.....	135

Figure 76	Scheme 1 contraction flow chart	136
Figure 77	Scheme 1 contraction flow chart	136
Figure 78	Cabinets in two states	137
Figure 79	Cabinets in retracted state.....	138
Figure 80	Cabinets in unfolded state	139
Figure 81	Cabinet attachable supports.....	140
Figure 82	Display effect in two states of scheme 2	141
Figure 83	The internal display effect of scheme 2.....	141
Figure 84	Scheme 2 contraction flow chart.....	142
Figure 85	Scheme 2 contraction flow chart.....	142
Figure 86	Two states of lamps	143
Figure 87	Expanded and retracted support frame in two states	144
Figure 88	Scheme 3 display effect.....	145
Figure 89	The display effect in the two states of Scheme 3	145
Figure 90	The stool display effect of Scheme 3	146
Figure 91	Scheme 3 stool assembly process display	146
Figure 92	Scheme 3 Shrinkage process display.....	147
Figure 93	Effect drawing of scattered seats in plan 3 deployment mode	147
Figure 94	Option 3 cabinet	148
Figure 95	Various modules for cabinets.....	149
Figure 96	Various cabinet placement methods	150
Figure 97	Various cabinet placement methods	150
Figure 98	makeup table function	151
Figure 99	Cabinet attachable supports.....	152
Figure 100	Two modes of lamps.....	153
Figure 101	Removable cabinet at the bottom of the light fixture.....	154
Figure 102	Cabinet with reversible top.....	155

Figure 103	Series furniture for scheme 3.....	156
Figure 104	Online and offline expert assessment seminars.....	157
Figure 105	Selection of expert assessment workshops.....	159
Figure 106	Product Engineering Drawing 1	161
Figure 107	Product Engineering Drawing 2	162
Figure 108	Product Engineering Drawing 3	163
Figure 109	Domestic display of products	165



CHAPTER 1

INTRODUCTION

1.1 Research background and importance

When conducting research, clarifying the background and importance is very important. Researchers need to understand the background and historical background of research issues, understand the specific significance and value of research issues, and effectively carry out research work. In order to ensure that the research findings have a good impact and contribution to the development of society and disciplines, researchers must also pay attention to the actual relevance and worth of research topics in the research process.

From the early 1950s to the present, decades after China's reform and opening up, can be used to track the history of research on contemporary Chinese furniture. In the rapid modernization process in China, people's requirements for the quality of home life have gradually improved, and the requirements for the quality, design, and taste of furniture have gradually improved. Contemporary Chinese furniture design began to get more attention and attention. Chinese furniture producers and designers are now more aware of the demands and trends of the global market as a result of globalization. Additionally, as public awareness of environmental preservation and sustainable development grows, an increasing number of furniture designers are beginning to focus on using environmentally friendly materials and the sustainable development design principle. However, in the past development, contemporary Chinese furniture design has exposed some problems that could be improved. It mainly includes the lack of innovation capabilities, directly copying the design of Ming-style furniture, and lacks multi-dimensional integration of contemporary furniture; product design only focuses on the beauty of the product appearance, ignores the product's practicality, and does not have the actual needs of consumers. With the continuous development of society and technology, China's furniture design fields will continue to develop and innovate. Researchers have begun to have a strong interest in Ming-style furniture because Chinese Ming-style furniture is an essential period in the history of Chinese furniture. Its production process, design style, and materials have reached a high level: history and artistic value.(Chen, 1981)

To advance the growth and legacy of the Chinese furniture industry, boost its competitiveness, and advance the preservation and transmission of cultural heritage, research on modern Chinese furniture and Ming-style furniture is crucial. The Chinese furniture industry is fundamentally based on contemporary Chinese furniture. The production method, design aesthetic, and material choice for contemporary Chinese furniture are all evolving and advancing alongside the quick growth of socioeconomic and economic exchanges and the ongoing deepening of cultural contacts. Therefore, studying contemporary Chinese furniture is significant in promoting the development of the Chinese furniture industry, the inheritance and development of Chinese culture, and the integration of art and design. Specifically, studying contemporary Chinese furniture can help us understand the following.

1) Design innovation and artistic value of contemporary furniture: Contemporary furniture presents diversification and innovation in design style, shape, material use, etc. Studying these new designs and innovations can help us understand the development trend of furniture art and contemporary characteristics. Art can also explore furniture's value and significance as an artwork. (Liang, 2013)

2) The production process and technological innovation of contemporary furniture: With the development of science and technology and the advancement of technology, contemporary furniture's production process and technology are also constantly improving and innovating. Studying these new manufacturing processes and technologies can help us understand modern craftsmanship. The application and innovation of technology can also provide technical support and innovative ideas for furniture manufacturing companies. (Boming, 2022)

3) The relationship between contemporary furniture and environmental protection: Environmental protection and sustainable development are increasingly applied and focused in the design and manufacturing of contemporary furniture. Studying the relationship between contemporary furniture and environmental protection can help us understand the furniture industry. Sustainable development and environmental protection responsibilities can also promote furniture manufacturing enterprises' environmental protection and sustainable development. (Septiani et al., 2022)

4) The relationship between contemporary furniture and cultural inheritance: Contemporary Chinese furniture is an essential part of the inheritance of Chinese culture. Studying the relationship between contemporary furniture and cultural heritage can help us understand the role and significance of

furniture as a cultural carrier. At the same time, it can also promote the inheritance and development of Chinese culture.(Chen & Porncharoen, 2022)

Furniture in the Ming Dynasty in China is an essential period in the history of Chinese furniture. Its production technology, design style, and materials have reached a high level with very high historical and artistic value. Therefore, studying the furniture of the Ming Dynasty in China is of great significance to understanding the in-depth understanding of ancient Chinese furniture production technology and design style, Chinese culture, ancient social life, and the development of furniture art. Specifically, studying the furniture of the Ming Dynasty in China can help us learn and understand the following content.

1) The production process and structure of the Ming Dynasty furniture, the production process of Ming Dynasty furniture is very exquisite, involving the choice, cutting, polishing, and painting of wood. The tenon-and-mortise structure of furniture in the Ming Dynasty also reached its peak. Studying these manufacturing processes and structures can help us understand ancient furniture production's structure and technical level. (Yang, 2002)

2) The design style and aesthetic characteristics of the Ming Dynasty furniture: The design style of the furniture of the Ming Dynasty is mainly straightforward, delicate, and practical. It focuses on the harmony of lines and proportions. Studying these design styles can help us understand ancient furniture's aesthetic characteristics and design concepts. (Ellsworth, 1998)

3) In the Ming Dynasty, furniture materials and material science were both developed. The Ming Dynasty used specific materials for their furniture. There are many expensive types of wood that are commonly utilized, including rosewood, Huanghuali, and chicken wings. Our understanding of the evolution and use of historical furniture materials can be improved by studying these materials.

4) The Ming Dynasty was an important era in Chinese history and left behind a rich cultural legacy. Understanding the social life and cultural history of the Ming Dynasty via the study of its furniture is important for advancing the transmission and advancement of traditional Chinese culture. (Chen, 1981)

In short, studying the furniture of the Ming Dynasty in China is of great significance to promoting the development of furniture art, understanding ancient Chinese culture, and promoting the inheritance and development of traditional Chinese culture.

1.2 Research hypothesis

Based on studying Chinese contemporary furniture design, the comparison of furniture and re-innovation of the Ming Dynasty. Let the target consumers accept the maximum range.

1.3 Research Objectives

- 1.3.1 Study data to create design requirements.
- 1.3.2 Stage of design Product development and prototyping.
- 1.3.3 A study of the satisfaction of the target group of consumers toward the product.



1.4 Study framework

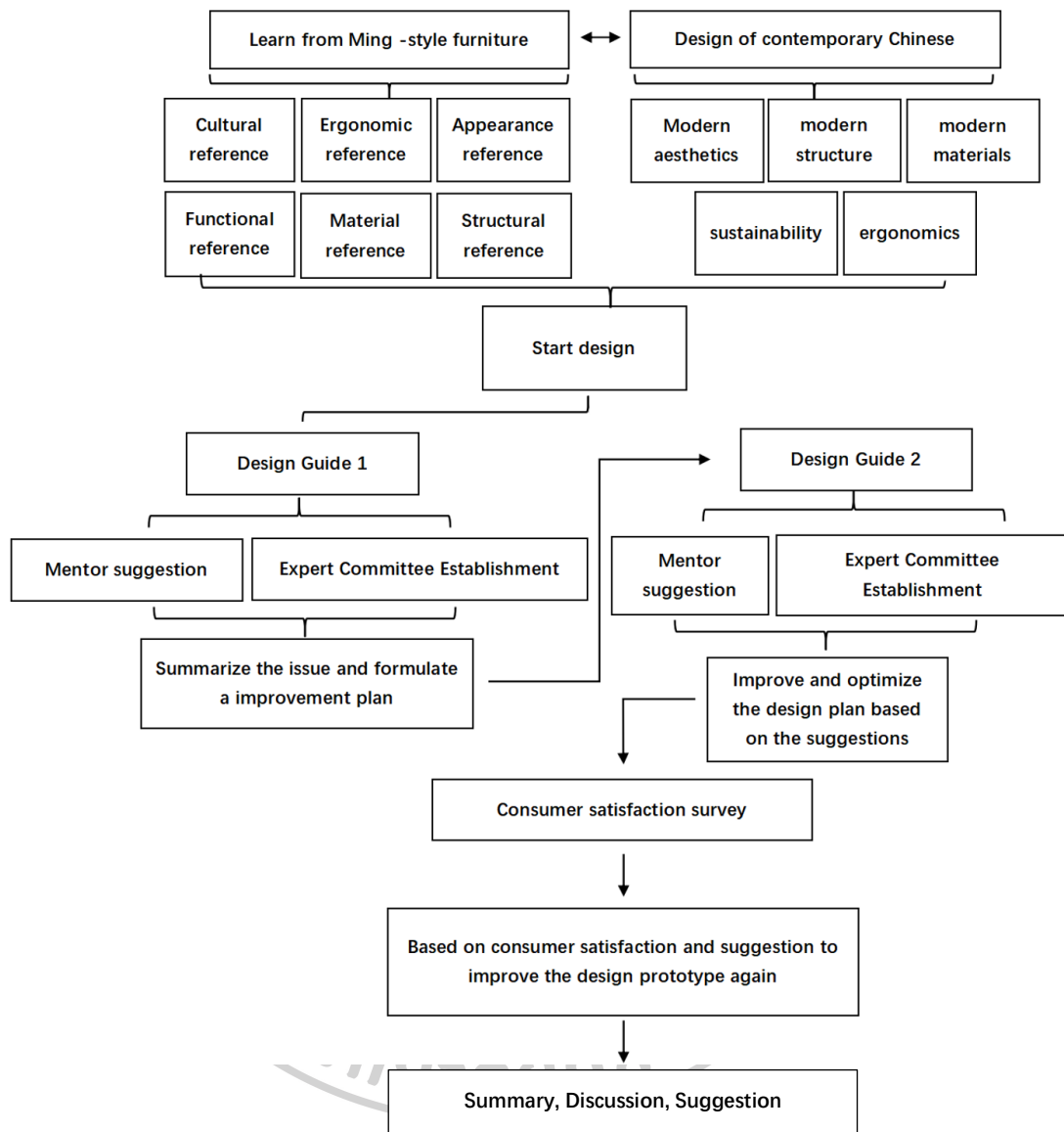


Figure 1 Research framework
Design by: chen yanbin, (2022)

1.5 Research Scope

The content of the research includes three parts. The first part is the content of theoretical research, mainly on contemporary Chinese furniture and Ming-style furniture and the feasibility of mutual conversion. The second part is the research on the design phase, which is designed for design guides one and 2, and an expert evaluation is conducted. The third part is to display the product and conduct a satisfaction survey of consumers.

1.5.1 Content range

Contemporary Chinese furniture is the inheritance and innovation point of Ming-style furniture in contemporary Chinese furniture, and the needs of the target consumer group are mainly the following aspects.

A. Cultural Background of Traditional Chinese Furniture

- 1) Overview of Ming-style furniture
- 2) Overview of contemporary Chinese furniture
- 3) Combining modern Chinese furnishings based on Ming-style furnishings

B. Symbiosis under the new material trend of contemporary furniture.

C. Principles of furniture product design.

D. Proportion of furniture users

E. Furniture manufacturing systems and Methods

F. Related research

1.5.2 Design phase

In this section, researchers create design guidelines based on keyword summaries divided into two steps. Design guideline 1 is to create two sets of design guidelines for different scenarios based on keyword summaries, namely living room space and bedroom space. The group is divided into three design sections. The first product design for the living room space is the furniture design for the bar cabinet, the second is the furniture design for the dining table, and the third is the furniture design for the dining chairs and bar stools. The first product design for the bedroom space is the makeup table furniture design, the second is the mirror cabinet furniture design, and the third is the bed furniture design. Then according to the design of the three parts of these two groups, experts in different fields make decisions and select the best product and research method for further design development.

Design guide 2 summarises the problems of the products designed in the first part and improves the design method to re-innovate the design. The design takes the Chinese contemporary style folding wood furniture as the design keyword and designs 3 product prototypes with different structures and processes. Finally, based on the three product prototypes, experts in different fields and target consumers will choose a suitable and best product and research method for in-depth design.

1.5.3 Satisfaction Research Procedure

Bring custom furniture product prototypes to the exhibition to study the satisfaction of the target consumers.

1.6 Study the definition of the term

Research term refers to the particular terms and concepts used in specific disciplines or research areas. These terms and concepts usually have specific meanings and usage and are widely used in academic research and practice in this field. This research mainly studies three terms: Ming-style furniture, contemporary Chinese furniture, integration and symbiosis.

1.6.1 Contemporary Chinese Furniture

Chinese contemporary furniture is part of Chinese furniture, which refers to furniture products with traditional spirit and temperament since the founding of China. It is an open, compatible packed furniture category and system, including three types: high imitation traditional furniture, improved traditional furniture and innovative traditional furniture. The reference objects of high imitation and improved traditional furniture are classic styles in old traditional furniture (mainly indicating furniture in the Qing Dynasty). Their production groups are mostly traditional furniture artisans. The former is a high degree of restoration of these classic styles. The latter is appropriately adjusted to the classic style to cater to current needs but maintains old traditional furniture's overall system and charm. The reference target of innovative traditional furniture is all traditional objects and forms related to tradition. It takes Chinese style and traditional characteristics as the leading tone and, at the same time, absorbs and integrates many international ideas and modern spirit. It is the designer in the contemporary space-time background. Based on tradition's longing and imagination, the furniture's design expression is the carrier. (Q. Liu, 2020)

1.6.2 Ming Dynasty furniture

Furniture in the Ming Dynasty was made from the period of the early Qing Dynasty (1368 to 1644). It is one of the critical stages of Chinese classical furniture production. The furniture of the Ming Dynasty is famous for its practicality, exquisiteness, and luxury, reflecting the level of socio-economic and cultural development and artistic achievements at that time. The characteristics of furniture in the Ming Dynasty are simple shape, smooth lines, rigid structure, stable shape, and exquisite details.

Its materials are the most valuable wood, such as rosewood, yellow rosewood, chicken wings, etc. The carving of bright furniture is also very delicate. The patterns include cloud heads, dragons and phoenixes, auspicious patterns, etc. In addition, the Ming Dynasty furniture focuses on practicality and comfort, such as chairs, beds, and cases. The Ming Dynasty furniture significantly impacted later Chinese classical and modern furniture and was known as the golden period of Chinese classical furniture. Now, the furniture of the Ming Dynasty has been widely collected and cherished and has become a precious cultural heritage. (Jingbin, 2020)

1.6.3 Fusion and symbiosis

Fusion and symbiosis are concepts, but they often describe communication, interaction and mutual influence between different cultures, groups or elements. Fusion refers to the communication and mixing between different cultures, groups or elements and forming new cultures, groups or elements. The original culture, groups, or elements may gradually lose some characteristics. However, at the same time, it will also absorb new elements and form new cultures, groups or elements. The process of fusion is a dynamic process, including both conflicts and fusion. Fusion can be two-way or one-way. Symbiosis refers to interaction and interdependence between different cultures, groups or elements. In symbiosis, different cultures, groups, or elements can promote each other, support each other, survive and develop together. Symbiosis can be harmonious or nervous. *Symbolism* is a relatively stable state that requires good communication and mutual understanding between different cultures, groups or elements. Fusion and symbiosis are two different cultures, groups or elements. They have advantages and disadvantages but often exist simultaneously in practice and affect each other. (Kayizzi, 2021)

1.7 The benefits of research

The advantages of this study mainly include the formulation of design specifications, providing some methods for the design of contemporary Chinese furniture, facilitating the life of modern people through the design of the design products, and finally, trying to create benefits for furniture companies.

1.7.1 Formulate the design specifications of Ming-style furniture and apply them to the design of other related furniture.

1.7.2 The design process can be applied to the product design of the relevant working group.

1.7.3 The furniture products designed are suitable for the needs of the younger generation and the lifestyle of modern people.

1.7.4 The product design guide exhibited the furniture concept in the Ming Dynasty to the contemporary design concept at the furniture exhibition.

1.7.5 Get a way to apply for a patent and create benefits for the furniture industry.



CHAPTER 2

REVIEW OF LITERATURE

This chapter reviews the research material that leads to analysis and conclusions for redesigning the persistent aura of Chinese cultural identity. In this study, Data will be transcribed, interpreted, and combined with demographic needs and survey data to find conclusions that fit the current reality. Most of the literature reviews in this chapter are based on background information on antique Chinese furniture. The information leads to an overview of contemporary Chinese furniture. The study of literary information will include the following topics.

2.1 Cultural Background of Traditional Chinese Furniture

2.1.1 Overview of Ming-style Furniture

2.1.2 Overview of Contemporary Chinese Furniture

2.1.3 Mixing contemporary Chinese furniture based on Ming style furniture

2.2 Symbiosis under the new material trend of Contemporary furniture.

2.3 Principles of furniture product design.

2.4 Proportion of furniture users

2.5 Furniture manufacturing systems and Methods

2.6 Related research

2.1 Cultural background of traditional Chinese furniture

The rich cultural history of ancient China includes traditional Chinese furniture. Its historical roots can be found in the Shang, Zhou, Qin, and Han dynasties, which existed thousands of years ago. Furniture represented people in ancient China, reflecting the social standing and cultural knowledge of the owner. Traditional Chinese furniture has a cultural history that is inextricably linked to traditional Chinese culture. It reflects the lifestyle and aesthetic concepts of ancient Chinese society and contains the essence and wisdom of ancient Chinese culture. It has a distinctive cultural heritage and connotative values. (Wu & Liu, 2019)

Cultural overview of traditional Chinese furniture. Traditional Chinese furniture culture is one of the critical parts of ancient Chinese culture, representing the essence and cultural heritage of

ancient Chinese home lives. The formation and development of traditional Chinese furniture culture are closely related to the development of ancient Chinese society, the humanistic environment, and national characteristics.(Yang, 2023)

1) The formation of traditional Chinese furniture culture is inseparable from the development of ancient Chinese society. In Chinese history, it has experienced a variety of replacements for many dynasties. Each dynasty has different social systems, cultural traditions, and aesthetic concepts. These factors have affected the formation and development of furniture culture. For example, the Ming and Qing dynasties were the peak period of Chinese furniture culture, closely related to the political, economic and cultural prosperity of the Ming and Qing Dynasties. (Y. Liu, 2020)

2) The formation and development of traditional Chinese furniture culture are closely related to China's humanistic environment. In ancient China, the cultivation of humanistic care and ideas, this thought influenced the formation and development of furniture culture. For example, the design and production of traditional Chinese furniture need to follow the principle of "shape into the gods", pursue spiritual sublimation and achieve a realm beyond practical. (Chéry & Marcandella, 2008)

3) Chinese traditional furniture culture also reflects China's national characteristics. China is a nation with a long history and cultural inheritance. This cultural heritage is also reflected in furniture culture. For example, traditional Chinese furniture's materials, structures, styles and designs reflect China's national characteristics and represent the essence and cultural heritage of ancient Chinese home lives. (Xi & Quiet, 2009)

Traditional Chinese furniture culture is one of the essential parts of ancient Chinese culture. It represents the essence and cultural heritage of ancient home life in ancient China and reflects the social development process, human environment and national characteristics of ancient China.

Connotation values of traditional Chinese furniture culture. The connotation values of traditional Chinese furniture culture reflect the essence and cultural heritage of ancient Chinese home lives, which mainly include the following aspects.

1) Order: Traditional Chinese furniture reflects the orderly values of respect and inferiority. The use of furniture is allocated according to the status and status of family members, reflecting the

tradition of ancient Chinese respect for elders and attaching importance to the harmony of the family.

(Zhenhan, 2011)

2) State of etiquette: Chinese traditional furniture culture emphasizes the values of etiquette, especially on official or essential occasions, paying particular attention to etiquette and ritual sense. The furniture's style, use and placement need to follow certain etiquette and rules. (Zhang et al., 2014)

3) Tradition of frugality: Chinese traditional furniture culture emphasizes the values of frugal tradition, especially in the use and design of materials, focusing on excellence, not waste, and not luxury, reflecting the tradition of focusing on conservation and integrity in ancient China. (Ye, 2013)

4) Family concept: Chinese traditional furniture culture reflects the values of family concepts. Furniture is a practical home supply and an essential carrier of family culture. It can carry family history, inherit family style, and express family emotions. (ZHAO, 2011)

5) Pursuit of spiritual pursuit: Chinese traditional furniture culture reflects the values the ancient Chinese spirit pursued. The design and production of furniture need to follow the principle of "shape into the gods", pursue spiritual sublimation and achieve a realm beyond practical. (Lingyu, 2011)

The connotation values of traditional Chinese furniture culture have solid national characteristics and cultural heritage. It represents the essence and cultural heritage of ancient Chinese home lives and reflects ancient China's cultural wisdom and aesthetic concept.

2.1.1 Overview of Ming-style furniture

2.1.1.1 Definition of Ming-style furniture

Ming-style furniture is not divided by historical years but is distinguished and defined from the artistic style of furniture. Yang Yao, a Ming-style furniture researcher in my country, reasonably interpreted Ming-style furniture as early as 1948: Ming-style family has prominent characteristics: one point is the style established by the structure; Weighing. That is simplicity and integration. However, in the simple form, there is an elegant charm. The artistic style of Ming-style furniture originates during the two Song Dynasties. In the middle and late Ming Dynasty, it was established in the Wuzhong region. It reached its zenith in the middle and late years of the Qing Dynasty. Ming-style furniture has a broad and limited sense at the same time. Furniture in the broad style has a straightforward form, a precise construction, and the right scale. By the length of manufacturing, it is

limitless. Even contemporary furniture that complies with Ming-style furniture design can be referred to as Ming-style furniture. Furniture that follows the Ming-style furniture -style during this approximately 200-year historical period is referred known as narrow-minded Ming-style furniture. (Wu & Liu, 2019)

Yang Yao, a researcher, also explained the connection between Ming furniture and the Ming Dynasty. In contrast to Ming-style furniture, the furniture from the Ming Dynasty is connected. As may be seen in Figure 2 below, it has intersections as well as differences. The middle and late Ming dynasties are when Ming-style furniture first emerged historically speaking. After the early Ming Dynasty furniture vanished, the early Qing Dynasty saw further development of the Ming Dynasty furniture outside the realm of furniture. For the study of Ming-style furniture art style, the furniture from the Ming Dynasty can serve as a comparison sample and historical backdrop. One of the primary artistic styles of Ming Dynasty furniture, though not the only one, is Ming-style furniture. For example, the large painted furniture running through the Ming Dynasty also has a unique artistic appearance. (Wu, 2015)

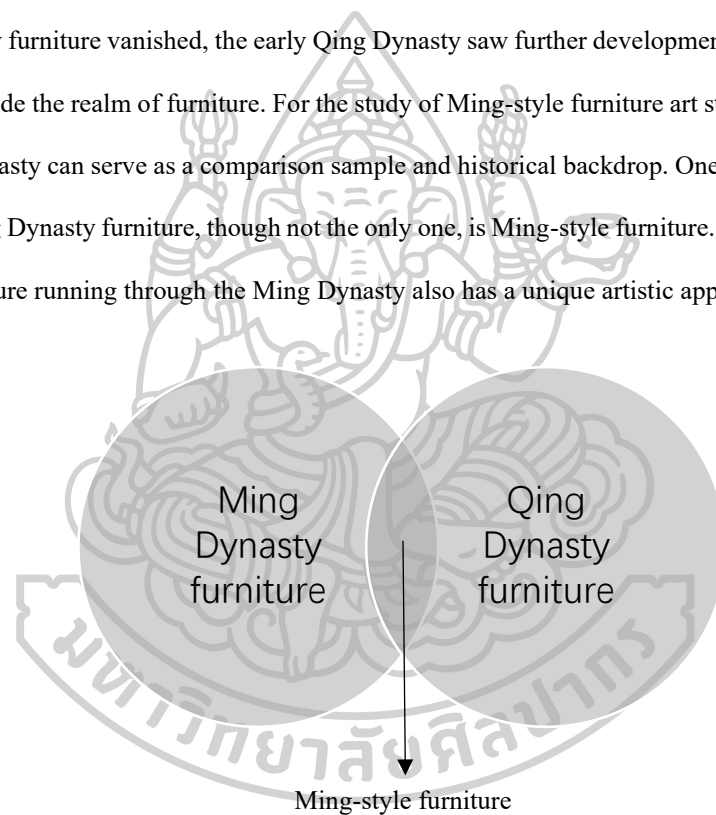


Figure 2 The relationship between Ming-style and Ming Dynasty furniture

Design by: chen yanbin, (2022)

Furniture from the Ming Dynasty and furniture made in the Ming style fall under the category of traditional Chinese arts and crafts and are a vital component of Chinese traditional culture. Arts and crafts are one of the modelling arts, with dual practical and aesthetic characteristics. On May 20, 1997, the "Regulations on the Protection of Traditional Arts and Crafts" issued by the State Council Order No. 217 stated: "Traditional arts and crafts referred to in these regulations refer to more

than 100 years, long history, exquisite skills, passed down from generation to generation, and complete craftsmanship. Made of natural raw materials, processes have a distinctive national style and local characteristics. It enjoys reputable handicrafts and techniques at home and abroad. " One processing method, which reflects the processing process from raw materials, semi-finished products to making finished products; it can also be understood as "industrial skills 'or" industrial art', but not all crafts are art. Factors of art processing. Its significant characteristics are the integration of craftsmanship and art, constituting a working department and discipline. "Ming-style furniture, as a part of traditional arts and crafts, is both practical and artistic aesthetic. Practical and artistic and artistic. Practicality is the functional attribute of Ming-style furniture. Others use the furniture itself and need to meet the physiological needs of people's use. Therefore, it is necessary to ensure its practicality in structural design. The design requires functional support. Furthermore, art aesthetics is the artistic attribute of Ming-style furniture. More than furniture is needed to meet people's physiological needs. It also needs to meet people's psychological demands and meet people's pursuit of beauty and art. (Chen, 1981)

2.1.1.2 Design ideas of Ming-style furniture

Since ancient times, Confucianism and Taoism have prevailed and have not separated from the education of being people. Even in modern society, these inheritance factors also affect the philosophy of Chinese people's survival. The form of art and culture is reflected. With the sprouts of Confucianism in people's minds, "Force" is implemented in all creative activities such as architecture, furniture, etc. In the process, it reflects the restraint of people, and the restrained advantage in the form is also through furniture. Style reflects. Compared with heavy Confucianism, Taoism is much more "free". For example, in a limited space, the garden has merged the natural epitome of nature, earth, mountains, water, stones, plants, etc. It also twists and turns, and many straight lines used in ritual buildings are replaced by curves here. In the creation and appreciation of Chinese classical gardens, the highest aesthetic level is not the existence and carving of Yishan and Yishi but the pursuit of the "realm". At a glance, they will always leave people's rich imaginations. (Wang, 2008)

The primary spiritual spirit of traditional Chinese philosophy requires self-improvement, is people-oriented, and pays attention to internal transcendence and being significant. For example, Ming-style furniture pays attention to people-oriented design ideas. The author Fan Wei

mentioned the people-oriented ideas of Ming-style furniture. Furniture design needs to adhere to people-oriented. On the one hand, it must meet people's basic needs and reasonable functions.

On the other hand, It is widely accepted by the public. Many literati in the Ming Dynasty participated in furniture design and injected their artistic cultivation into the furniture design so that Ming-style furniture has a literati. Ming-style furniture is elegant, concise, and generous. It is a carrier of the subjective spirit of literati, which gives Ming-style furniture deep humanistic connotations. Based on the cultural and artistic background at the time, Ming-style furniture reflected humanistic care and penetrated the "people-oriented" concept. In addition, Ming-style furniture, especially seats, also reflects early ergonomics. The Ming Dynasty artisans did not contact the ergonomics of modern systems, but they explored some human engineering laws based on their practical experience.

The brain, back, and armrests of Ming-style seat furniture fit the bone characteristics of the human body, which can provide good support functions and make people entirely rest. This also reflects the humanistic ideas in the design and production process of Ming-style furniture. The "unity of heaven and man" is also the essence of Ming-style furniture. "One of the unity of heaven and man" is a concept of getting along with nature, reflecting people's attitudes towards nature. "Heaven" means that people live in harmony with nature and form a natural design concept of Taoism; "people" is the design concept considered from the users' perspective. The "unity of heaven and man" is reflected in the furniture as advocating the concept of natural design and the mutual reconciliation of humanistic design concept, forming a furniture design style with Chinese characteristics. Ming-style furniture shows the characteristics of the "unity of heaven and man" during the design process. The form complements the splendor of nature. Additionally, Ming-style furniture has a strong practicality and is consistent with the social and cultural context of the Ming Dynasty. Additionally, the reconciliation is reflected in the overall and local furniture combinations as well as the local furniture combinations. (Jingbin, 2020)

The relationship between heaven and humanity has been the topic of discussion among philosophers for thousands of years throughout the history of Chinese philosophy. The central issue in ancient Chinese philosophy was how heaven and man interacted. In the history of ancient Chinese philosophy, there have been two somewhat significant philosophical discussions. Early in the Eastern Han Dynasty, there was a first. Through the Western Regions, Buddhism was spread throughout

the Mainland. After several years, Buddhism completed the process of Sinicization and formed a Chinese-style Buddhist sect such as Zen. Finally, the mainstream of Chinese philosophy was remitted, forming Song and Ming Confucianism, which is conjunctive of Confucianism, interpretation, and Taoism. The second time was the introduction of Christianity and modern Western science in the late Ming Dynasty, which prompted Chinese philosophy changes, and famous philosophers such as Wang Fu and Fang Yizhi emerged. Ancient Chinese philosophy is the complementary use of Confucianism, Taoism, and Buddhism.

Confucianism should be "beautiful and happy", while Taoism requires "seeing Pu Hao Su", does not advocate excessive pseudo-decoration and always pays attention to "harmony". That is the unity of humans and the individuals' hearts and bodies. The introduction of the Buddha directly changed the sitting posture of ancient Chinese and then changed the shape of the furniture. The three philosophical realms of Confucianism, Taoism, and Buddhism are the three historical forms of deep Exploration and recognition of the enormous universe life entity of the unity of heaven and man in the traditional Chinese culture. Exploration and worship of the soul ontology. When an excellent traditional artistic work that recognizes Confucianism constitutes a deep-level artistic conception, it often shows his persistence on moral ethics in the ethics of the universe. Some people call it moral respect or rationality worship.

When outstanding traditional artworks pursue the realm of life, when the outstanding traditional artworks constitute the profound artistic conception, it is often manifested as exploring the aesthetic realm of people and nature, that is, a deep understanding of the natural body of the universe. The profound artistic conception beauty of excellent traditional artworks that recognize the Buddhist way (such as Zen Realm) is different from the tendency of the "Bid" of Confucianism and the "materialization" of Taoism (people to return to nature). The aesthetic tendency of over-distance care for the universe's life is to surpass the restraint of society, nature, and even logical thinking in the quiet view of Vientiane and realize the transcendence and acquisition of subjective minds as the ontology. A moment of seeing eternal life. This is an empty view that is easy to guide nihilism. The idea of the "unity of heaven and man" and "the unity of gods" is a concentrated manifestation of Chinese and Western attitudes towards nature. In the Western biography culture, the relationship between man and nature is the opposite.

It advocates observation of nature, understanding nature, and conquering nature. It is believed that nature and people are two independent individuals. The conquest and transformation of human beings is the driving force for cultural development and the evolution of civilization. The Chinese people take the unity of heaven and man as the universe's core. The relationship between man and nature is harmonious, and humans and nature must develop harmoniously. As a result, the two people explored the outside objects and later turned to the natural view of nature to reflect on the natural view of the East. (Jiang et al., 2018)

The formal proposal of the "Heaven and Man Unity" proposition is shown in Song Zhangzai. The theory of the ancient Chinese universe was constructed in Confucianism and Daorong Tong (later joined the content of Buddhism). The life theory of this large universe believes that everything in the entire universe and Ning universe has its active inner Life, and the eternal continuous movement that determines this inner Life is invisible, but in humans, but in humans Life and nature experience the "Tao" of its existence everywhere. In addition to the "Tao" as the thinking of the living body, the theory of Life in the Great Universe includes qi and harmony theories. Lao Tzu believes that Tao contains "elephant", "things", "fine", "faith", "essence" and "qi". The traditional way of thinking in China's "unity of heaven and man" allows people only to seek God in portraying aesthetic objects. What creates abstract and ethereal decorations is a vague image way of thinking. The view of the Western "God and Man" made them think that beauty is a precise aesthetic. The earliest aesthetic definition in the West originated from the Pythagoras School. He believes that the world's original is the same, and the principle of numbers is the principle of all things. This rational precision makes decorative portrayal more likely. The idea of "the unity of heaven and man" coincides with modern culture in many ways. (Wang, 2008)

The Ming Dynasty was the golden age of Chinese classical furniture. This was inseparable from the maturity of design ideas. During this period, the aesthetic thoughts of natural beauty advocated natural beauty, emphasizing changes and advocating "turning ancients into me" and "ancient is my service". For example, thinker Li Yan advocates "as nature as nature, not in the poor work"; gardener's plan to promote "fineness and appropriate", "ingenious and decent". These innovative and pragmatic ideas have a particular impact on the formation of the Ming-style furniture style. Many scholars and scholars have also got rid of the bond of the old thoughts of "people of hundreds of workers,

six arts, gentlemen are not teeth" and participated in the research of furniture shape and craftsmanship, and made significant contributions to the development of Ming-style furniture. This means further promoting the elegant style and usage of Ming-style furniture.

For example, Ming-style furniture attaches great importance to the beauty of nature in design ideas. The ancients were in awe of nature, advocating the beauty of nature and the beauty of nature, and produced the natural design thinking of the teacher. Many pieces of furniture have a sense of sculpture. The shape of the animal shape and the human body is often used as the modelling image of decorative parts or supporting components, reflecting the power of other life in nature. The decoration of Chinese classical furniture reflects the softness of nature, and the furniture materials (extensive use of bamboo and rattan materials) are full of an idyllic atmosphere. Many decorative patterns depict pastoral and natural landscapes and put Chinese landscape painting with craftsmanship, such as carving and painting, as if they are in nature. This style affects all aspects of production and life. From architecture to furniture design expresses the respect and emulation of nature and promotes the appearance of the "natural natural" design style. Ming-style furniture pursues natural and simple beauty, forming natural beauty. Wang Shixiang proposed five aesthetic characteristics of Ming-style furniture: wood beauty, beauty, beauty, carving, and decorative beauty. The production of Ming-style furniture retains the gloss and texture of the wood itself, minus unnecessary carvings, and makes the furniture as simple as possible. Such as Ming -style official hat chairs, the brain is slightly raised, and the back of the chair uses S-shaped, which reflects the beauty of natural curves; the "gooseneck" under the handrail is also presented as S-shaped, rough and thin, reflecting the dual beauty of materials and curves As shown in Figure 3 below. (Ellsworth, 1998)



Figure 3 Ming -style furniture clock "goose neck" shape application

Design by: China Ming -style furniture collection website(2022)

2.1.1.3 The characteristic elements of Ming-style furniture

1) Material features of Ming-style furniture

Ming-style furniture is exceptionally particular, mainly hardwood, such as Huanghuali, rosewood, iron knife wood, etc. The author Pu Anguo mentioned that the materials of Ming-style furniture mainly used precious hardwood as the primary raw material for furniture for two reasons. First, hardwood furniture is sturdy and durable and easy to save. Most of the Ming-style furniture that can be preserved today is hardwood furniture; collectors also favour well-processed hardwood furniture. The second is because hardwood and wood have beautiful natural textures. Ming-style furniture is commonly used in yellow rosewood, rosewood, nanmu, iron power, etc., as shown in Figure 4 below. Huanghuali Wood is excellent in colour, texture, odour and other aspects. The material is beautiful. It is a commonly used material in Ming-style furniture. From the material point of view, the Huanghuali pear pattern is beautiful, lively and natural, sometimes like mountains, sometimes like clouds, which can trigger the viewer's association. In terms of colour, Huanghuali wood is as warm as amber, making people feel very comfortable. There is also rosewood. The rosewood has a delicate and complex texture and has been a superior furniture material since ancient times. Many classic Ming-style furniture has rosewood furniture. Tielimi, also known as Tie Pearwood and Tieli Wood, is a tall hardwood, and many large pieces of furniture are made of it. In addition, Tieli is also used in the back of the furniture or inside. (Liu, 2008)



Figure 4 Huanghuali, Nanmu, Rosewood, Tieli Wood, commonly used in Ming -style furniture
Design by: China Ming -style furniture collection website(2022)

A. The material characteristics of Ming-style furniture wood

The furniture design is composed of materials, and the reasonable application of materials must complete it. The shape design, production process and aesthetic characteristics of furniture in different periods are closely related to the choice of furniture materials. Ming-style furniture uses natural materials, which is not only in line with environmental factors but also applies such pleasant materials to the items of life. This is the contribution of people at that time. It will excavate the indispensable beauty in its natural materials by looking at its characteristics. Study these materials with a further understanding of the characteristics of wood. The prominent feature of Ming-style furniture is made of complex, high-quality wood, also called hardwood furniture. During the Ming Dynasty, overseas trade was unprecedentedly developed. It has cultural exchanges and trade activities with Japan, Central Asia, and South China countries. The trade and diplomacy between the country and the country also inspired the vigorous development of the domestic economy. High-quality woods in Southeast Asia, such

as rosewood, chicken wings, etc., enter China, such wood materials are complex and high, and they are the key options for Ming-style furniture. (Sun & Hammett, 1999)

Ming-style furniture uses a framework structure, which is in the same vein as my country's unique wooden structure building. Moreover, according to the needs of the shape, various types of stick structures have been created. It enriches the furniture's shape and makes it solid and durable. This structural design is obviously due to the reasonable choice of "hardwood"; it also reflects and strengthens the effect of "hard materials; wood must be stable". It can be made into exquisite furniture with such hardwood because of advanced woodworking tools and craftsmanship. It could also be said that the historical change in furniture materials promoted the development of the manufacturing process at that time and created a generation of capable artisans. The achievements of Ming-style furniture manufacturing are unparalleled. Although we can still appreciate the physical objects after hundreds of years, this primarily benefits the natural durability of such wood. (Chéry & Marcandella, 2008)

B. The pattern characteristics of Ming-style furniture wood

Wood pattern refers to the natural patterns produced by texture, structure, growth wheel, wood rays, axial thin-walled tissue, catheter, wood fibre, pigment, wooden section, and sawing direction. In a broad sense, any noticeable markings or stripes on the surface of the wood can be called a pattern. Different wood tissues give different wood patterns, and various structural characteristics form the intertwined and layered. The most remarkable wood pattern is the pattern formed by the growth wheel. Regardless of the horizontal section, the cutting surface of the wood, or the cut surface of the string, these growth wheels are not intersecting and have parallelism; on the other hand, these growth wheels are not that kind of complete geometric parallel. The reasons for growth, age, climate, and production conditions have made some growth wheels in the form of rising and falling. The natural characteristics of wood patterns give people the feeling of natural, changing ups and downs, exercise, and life. (Han et al., 2009)

For example, the colour of rosewood has a rhino character, and some think the annual wheel pattern is twisted and okay. From the wood perspective, the rosewood pattern analysis can be concluded that rosewood is axial thin-walled tissue with developed wooden moulds. The texture; the pattern resembles the chicken wings and feathers, "chicken wings wood". From the perspective of the

wood structure, it is because of a wide-started axial thin-walled tissue and the dark wood fibre tissue on the string surface. The dark tissue is wood fibre dimension. The cell cavity is small and thick, so it is dark. The light-coloured tissue is axial thin-walled tissue. The wall is significant. Multiple tree species can show chicken wings-shaped patterns, such as red bean trees, cliff beans, iron knife wood, etc.; Huanghuali is also known as Laohua Pear. The colour is from light yellow to red-purple, with delicious colours and a clear and fragrant texture. Many of the more sophisticated furniture in the Ming Dynasty were made of old rosewood. The wood grain of the three materials is shown in Figure 5. When Ming-style furniture is made, it does not paint, and the surface treatment is waxed or transparent painted and less carved to fully display and not destroy the natural patterns and colour of the wood. This is also a significant feature of Ming Dynasty furniture and its aesthetics. (Muhammad Suandi et al., 2022)



Figure 5 The characteristics of rosewood, chicken wings, and yellow rosewood pattern characteristics commonly used in Ming -style furniture

Design by: China Ming -style furniture collection website(2022)

Ming-style furniture uses natural wood texture, and various solid wood texture does not add paint or are less modified. People feel kind and comfortable in the touch of the furniture, reflecting the closeness and harmony of man and nature.

2) The styling characteristics of Ming-style furniture

Ming-style furniture is exquisitely shaped, focusing on combining geometric elements such as points, lines, faces, and bodies. The most classic modelling part belongs to the change of "line". China is a country with a long history and culture. Traditional artistic thought has had a significant impact on the art of other countries. The Chinese art wisdom is primarily reflected in the sensitivity and talent of "lines". Whether it is a weaving rope line, the ink line that constitutes Chinese

calligraphy and Chinese painting, or the wooden lines that build Ming-style furniture, it reflects a deep-rooted "line" complex, as shown in Figure 6 below.

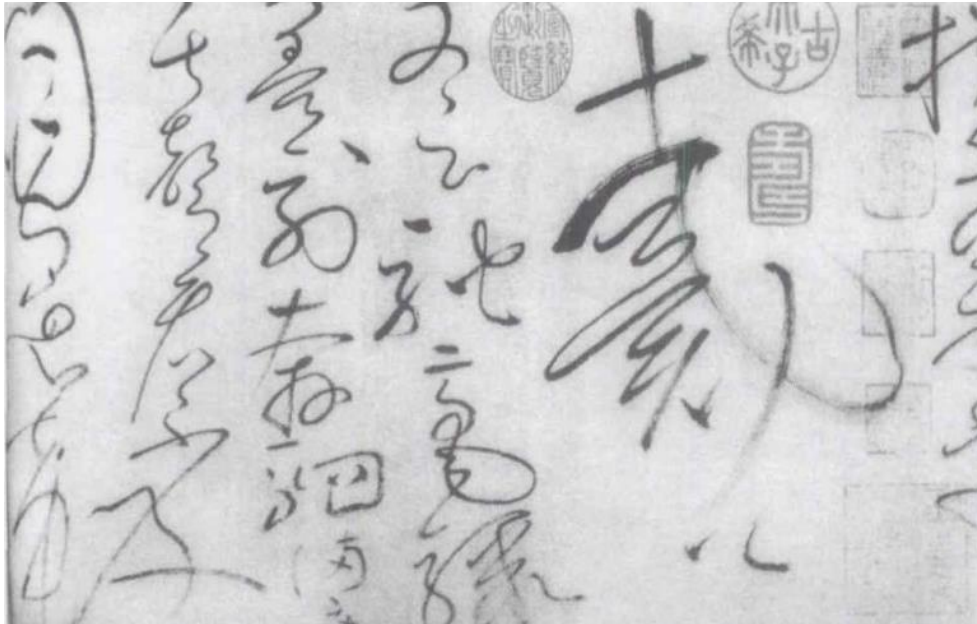


Figure 6 Chinese calligraphy and Chinese painting ink line

Design by: China culture website(2022)

Ming-style furniture shapes are the main lines, emphasizing void. Various strong or gentle and smooth line components are connected by tenon -and -mortise, combined in the frame structure of the beam pillar. The line changes are straightforward, and the beautiful and simple lines are used to an impeccable level. The strict lines of the strict line set out the atmosphere and Shen Mu of Ming-style furniture, which produced momentum and was full of beauty. Like the flowing clouds, the curve changes fluent and soft, producing a quiet, long charm, adding ethereal interest. The straight line and curve are rigid and soft, and the yin and yang are born, fully reflecting the universe's inner harmony. The characteristics of Ming-style furniture lines are like the emotions of Chinese calligraphy lines. A deep understanding of Chinese calligraphy lines inspires the furniture shape. The block-like lines and face make it realise solemnity, agility and comfort. And the high degree of satisfaction with the use function. Therefore, developing the "line of line" to this end has a more profound cultural and artistic connotation and has become the core of Chinese culture. (Yu, 2014)

In Ming-style furniture, Pu Anguo also mentioned that the seat design fully reflects the characteristics of Ming-style furniture. The monotonous backboard has become rich in connotation because of the use of point elements, which enhances the overall beauty of the chair. In Ming-style furniture, the use of lines includes straight lines and curves. The curve is simple and sharp, solid and powerful, and the curve is beautiful and beautiful. In Ming-style furniture, straight lines are often used to constitute a general outline of furniture, and curves constitute decorative parts. The thread foot in Ming-style furniture combines straight lines and curves. It mainly appears in the areas, legs and feet, etc., to enhance the sense of layering and artistic expression. The design of Ming-style furniture fully considers functionality. The seat is mainly square, so people will be more comfortable sitting up. In furniture design, it refers to the shape of the shape, which is formed by the motion trajectory of the surface. The body deeply affects the proportion, scale, structure, etc., of the furniture, which constitutes the overall form of the furniture, as shown in Figure 7 below. (Jiang et al., 2018)



Figure 7 Ming -style furniture official hat chair shape

Design by: China Ming -style furniture collection website(2022)

Ming-style furniture gives people the most robust and attractive beauty of the shape. As the idealized "line" of Ming-style furniture, it runs through the entire shape. It is not only the appearance of the component of the furniture but also the internal form of the overall shape of the

furniture. "Bridge" of artistic function. Furniture creation is to meet the needs of people's daily lives, furniture's artistic processing, and aesthetic taste requirements. The use of exquisite lines in Ming-style furniture perfectly unifies these two aspects of affection to adapt to the aesthetic ideals of people's social life. Various bright pieces of furniture are concise and thick; some are simple, some are very beautiful, and some are elegant and fresh. The artistic image of Qianzhong is the feelings and associations that are ever-changing lines. The "line" in Ming-style furniture has its unique concept and role. First, it overcomes the attributes of material materials and directly becomes the essential element of the shape. According to the requirements of furniture use function, when the folk artisans express the line as the entity of the furniture parts, the line becomes a structural form of the furniture image; when the various parts are composed of the online perceptual form, the line becomes again—the artistic image of the outline and shape of the body. Secondly, because of hardwood materials' dry and contraction performance, most structures use linear profiles. In this way, the shape and meaning of the furniture, the material and the artistic nature are wholly integrated, fully showing the unique artistic style of Ming-style furniture. This "line" that shows the artistic image of the shape has many "lines", and the wooden craftsman often calls it a "model". They often rely on these samples to draw lines, profiles, and processing to form a specific body shape of various furniture.

Such as the model of the foot, the so-called "horseshoe", "three-curved foot", "ping -style", and so on. The brain models include the so-called "bridge", "book scroll", "saddle -type", "hump", and so on. These lines are all artistic languages of Ming-style furniture. The "horseshoe" feet are shown in Figure 8 below. It is a line that extends from the leg to the foot of the foot. This line is naturally smooth, strong and powerful and has an intense and rapid trend. It is a typical line that reflects the characteristics of Ming-style furniture. When talking about the significance and application of the Ming-style furniture shape, Mr The Land reflects the firm style of our national art. (Ellsworth, 1998)



Figure 8 "Horseshoe-style" feet -Ming Rosewood Stool

Design by: China Ming -style furniture collection website(2022)

The smooth and simple lines of Ming-style furniture are changeable and harmonious. The expression of wooden lines, adhering to the consistent processing method and cultural connotation of Chinese line art, once again reveals the wisdom and superb of Chinese people's emotional and rational thinking. Essence The curve and straight line are cleverly matched. There are rounds in the square. There are squares in the circle; the line type is diverse, and endless changes are changed. There are free and geometric curves, such as S-shaped, C-shaped, vortex curves, etc. The proportion and scale are appropriate. The changes are harmonious. The connection transition between different lines is naturally perfect and coordinated, which reflects the ingenuity of the artistic quality and personality, physical and mental body, and physical and humanistic. The various lines of Ming-style furniture need to be understood as beautiful lists. They pursue different changes in formal performance alone and, closely linked with people's social life and practical requirements, have infinitely rich expressive power. For example, in the anti -S-shaped back of the "Ming-style" curve, as shown in Figure 1 below, the folk craftsman first starts from the function of the back of the chair to make the curve suitable for the human body to sit on the back of the chair back. Relying on comfortable requirements; secondly, contact the

changes in the overall shape of the chair to uniformly adjust it with the linear gallery line -shape and integrate with other parts of other parts. In addition, according to the different chair scales and pattern Changes.

Another example is that the armrest line of the armchair starts from the intersection with the hind legs and gradually turns outward to increase the seat's space. There are also corner dental decorations, as shown in Figure 9 below; you can also see the linear characteristics of enriching Ming-style furniture to cater to technology. The performance methods of this obedience to the use requirements on Ming-style furniture and the beauty of the line form from the content of life concentratedly reflect the high level of the artistic level of Ming-style furniture. Generally speaking, the "line" is the most flexible and accurate expression characteristic of the image, and the lines are used to express the vividness of the image. (Wu, 2015)

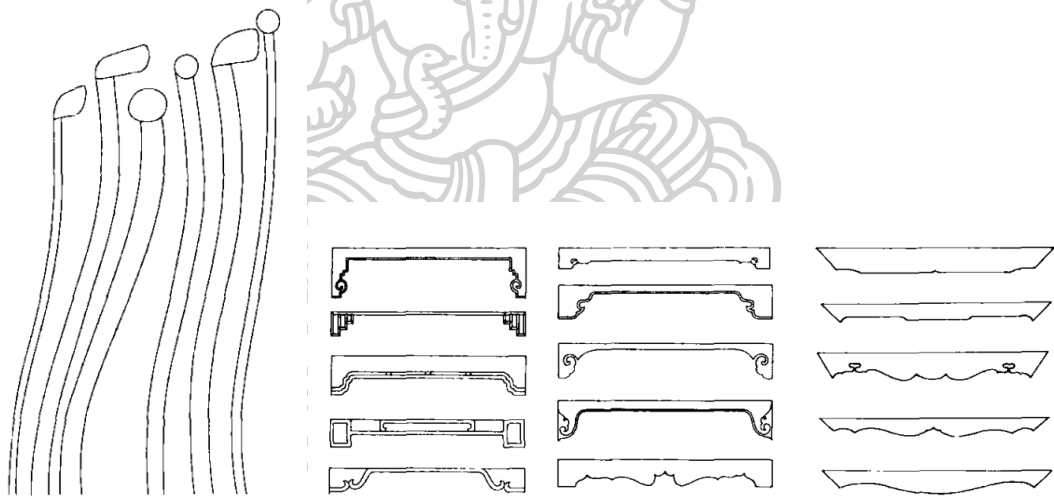


Figure 9 Ming furniture backline and dental board sample maps

Design by: Pu Anguo "Ming-style furniture"

"Line" has special significance for our national art. This is linked to the development of my country's pictographs, wooden architecture, craft decoration, pen and ink tools, seal seals, wooden board printing, creative methods and aesthetic meaning. Since ancient times, countless artists and folk artists have used the formal characteristics of the "line" to create different artistic styles and increasingly make them responsible for various complex styling tasks compatible with social

development. Ming-style furniture is another massive contribution to the use of lines to use the line to shape, so Chinese furniture has developed to its historical peak, adding new glory to the treasure trove of our national art. The beauty of calligraphy has inspired Chinese furniture designers and artisans to a certain extent. The talent and rectification of the lines flowing in the blood flowing in the blood of the Chinese people once again burst out in the production of furniture. It ushered in a new era of Ming-style furniture comparable to the world's European furniture and represents the highest achievement of Chinese furniture. (Liu, 2008)

3) The structural characteristics of Ming-style furniture

The manufacturing process of Ming-style furniture is based on using tenon-and-mortise structures. The mortise and tenon structure uses the nature of the mortise structure to give full play to the nature of the wood and discover many clever furniture combination methods. This can reduce the use of nails, thereby reducing the destruction of furniture components, but also prevent moisture-proof effects so that the furniture is solid and beautiful. In the tenon-and-mortise structure in Ming-style furniture, the author Li Kun mentioned that according to the parts and structures used, it could be divided into many styles, such as grid tenon, shoulder tenon, cricket horn, and tie. Shoulder tenon is generally used in places where horizontal and vertical parts are combined, such as stools, chairs, horizontal water, etc.; holding shoulder tenon is mainly used for the shoulders of furniture, and occasionally it is also used in the waist with waist furniture; Corner tenon is made up of three kinds of wood to a point, which is often used for tables, cabinets, bookshelves and other furniture, which is firm and elegant. Classes are usually used in cases, tables, and the centre of the case. The head and tooth strips are embedded under the case as support, which can be sturdy and carry heavy objects. Ming-style furniture improved and innovated the social and cultural characteristics and people's actual living needs at that time, leaving precious furniture design references for future generations, as shown in Figure 10 below. (Jie, 2018)



Figure 10 The diversity of Ming -style furniture tenon and tenon

Design by: China Ming -style furniture collection website(2022)

The tenon-and-mortise structure is the basic structure of traditional Chinese buildings and Ming furniture. It is precisely a node technology caused by wood characteristics. This technology has existed in our lives since ancient times. When we strip out the tenon-and-mortise structure from a distant and profound historical background, when we surpass the temptation of the surface layer of its practical form and sink to the original starting point of the wooden structure, one exists in technology and art, structure and aesthetics, tradition and modernity. The critical point between the between? The exquisite craftsmanship of Ming-style furniture is reflected in "workmanship" on the one hand; on the other hand, it is reflected in the scientific and reasonable process design. This has produced an essential role in the high degree of decorative artistic art of Ming-style furniture and is also the unique style of Ming-style furniture. The design and processing of classical furniture are completely yearning for the rational year of "the shape of things is beautiful and evil, and then my love increases." Therefore, the fine wood craftsmanship characterized by traditional handicrafts has worked on the "ingenuity" from the beginning; from the eyes of the right to a thread, all of them are not accurate and stubborn. Especially in the calculation and application of different specifications and sizes of different types, different specifications, the industry has reached an extremely outstanding level, and it reflects the maximum expressiveness of physicality with humanized standards everywhere. The craftsman's masterpiece has achieved the ability to make clever skills and the talents of cleverness and realizes and meets people's material functional requirements and special spiritual needs in daily life. (Kun, 2009)

The so-called craftsmanship of Ming-style furniture has won the unanimous respect of the world with its reasonable and scientific tenon-and-mortise structure. The unparalleled design makes the furniture unwavering, solid and solid—the physical effect of natural materials. In the history of human beings, the advanced nature of Ming-style furniture design concepts is the most prosperous ideological treasure house in my ancient country's ancient material and cultural field. The first central tenon and tenon structure was drawn by the famous scholar Yang Yao, Mr Yang Yao, and the measured patterns of various types of furniture. You can see the richness and science of the tenon-and-mortise structure. To researchers' statistics, there are dozens of tenon-and-mortise structures of the furniture of the Ming and Qing dynasties. For example, the traditional "edge method" of the furniture facial frame and the panel structure, as shown in Figure 11 below, is 45 ° by the side of the surface, slotting inside the frame and installing the panel. The desktop, stool surface, chair surface, etc., are made into furniture with this structure, all of which are made of thin plates as panels, not only saving materials but also avoiding the interception surface of the plate, which improves the unity and beauty of texture.

The tenon -and mortise production is the most critical aspect. After long-term practice, the Ming-style furniture tenon-and-mortise structure has further improved. For example, the so-called "large in small out" of the joint shape of Ding figure, that is, half of the horizontal end of the horizontal gear, is made into a dark tenon, and half of the meditation is made into Zen Zen. At the same time, the pillar material is cut out of the corresponding eye so that the column side can be used as a mortise and tenon on the side of the column. Ming-style furniture generally prefers a different method.

Another example is the use of the corner tenon, as shown in Figure 12 below; after making corresponding changes according to different situations, it is more adaptable to the structures and aesthetic requirements. Another example is a typical shoulder tenon of traditional hardwood furniture. As shown in Figure 13 below, Ming-style furniture generally does not make small shoulders. The extensive shoulder approach also often takes the comprehensive method of solid and dirty shoulders. The shoulder part of the horizontal shoulder is sawed a slope, and a diagonal leather is left on the vertical material on the contrary. This method of making is not only because the opening has increased the tide surface, and it still needs to be eliminated due to the position of the leather, and the processing is convenient. Jiangnan craftsman called this kind of shoulder power "floating shoulders". (Yiqing, 2009)

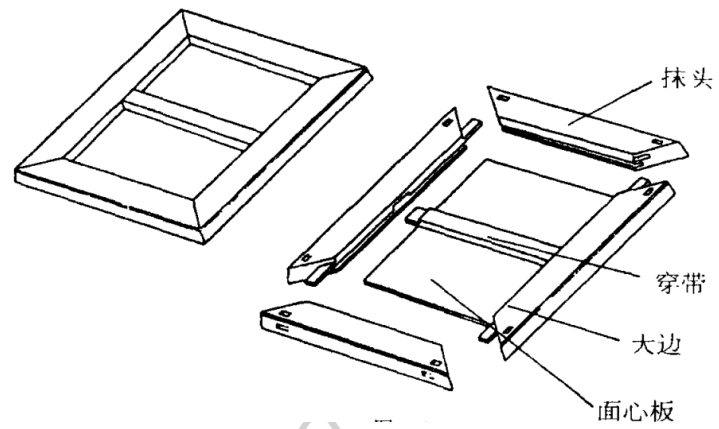


Figure 11 edge method

Design by: Pu Anguo "Ming-style furniture"



Figure 12 corner tenon.

Design by: Pu Anguo "Ming-style furniture"

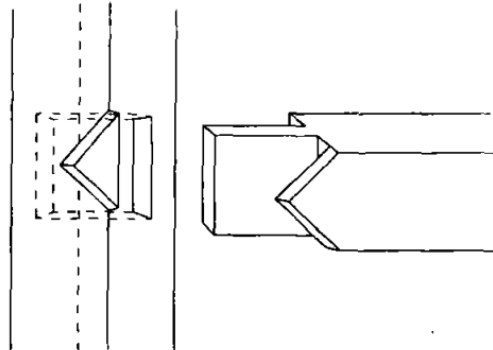


Figure 13 corner tenon.

Design by: Pu Anguo "Ming-style furniture"

Ming-style furniture uses less glue and no nails. This is also a revolution in the world's creature technology. At the same time, the solid structure and reasonable connection method are promoted under the premise of paying attention to "modern environmental protection consciousness". Contribution of science and technology. In this way, the whole tenon and tenon can achieve up, down, left, left, left, left, left, right, and oblique. In order to strengthen its splicing, the structure of many furniture uses the sheet reasonably, and the "Dragon and Phoenix Puppet and the Structural Method. This method first opens a long side of the thin plate to the small slot and uses the push to insert it. The way to spell the two plates can increase the tie and tenon's glue surface, prevent the seam from getting up and down, and achieve the strict structure setting from the horizontal direction. The craftsmanship is the crystallization of the high wisdom of our ancients in practice. Hundreds of years have passed. The production of traditional furniture has continued this process, showing that good craft technology can stand the test of the times. , Especially today, focusing on "environmental protection" consciousness, our requirements for "green design" are unswerving with many craftsmanships of Ming furniture. When we think of Ming-style furniture as "artwork", If you appreciate it, then the experience of painting, sculpture and furniture composition, but more cleverly use the aesthetic relationship of "uneven" to measure the aesthetic value of Ming-style furniture. There will be some superficial skin when looking at the beauty of Ming-style furniture from a single aesthetic thought. The visual curing of the form of understanding

and the form of beauty. When this visual solidification is to a certain degree, the aesthetic value of Ming-style furniture will change, especially when the aesthetic appearance of modern furniture is full of people's ideas about how to seek a kind of furniture for furniture. The new field of cultural aesthetics is the interpretation of the beauty of the inner structure of Ming-style furniture. Although the form of Ming-style furniture can already explain its aesthetic appreciation value, the beauty hidden in the structure itself is the most. Significance. The creation of tenon -and -mortise structure is a reaction of craftsmanship. At the same time, the structure beauty formed in technology creation is also particularly precious. (Zhu et al., 2023)

4) The decorative characteristics of Ming-style furniture

Because many literati in the Ming Dynasty participated in the design and production of furniture, the decorative effect of many Ming-style furniture reflected the aesthetics of the literati. Regarding decorative concepts, the author Yan Qing mentioned that Ming-style furniture follows the natural inaction of the Taoist family and advocates returning to nature, but it is divided into carving. Ming-style furniture reflects the specific manifestations of Taoist thoughts: in terms of material, focusing on retaining the natural texture of wood, increasing the feeling of natural simplicity, and closer to the distance between the furniture and humans; The simple and generous image gives people a fresh and elegant feeling. Ming-style furniture decoration technology is superb, the decorative style is superb, and the beauty is excellent in practicality and decoration. It can represent the highest level of ancient Chinese furniture decoration art, as shown in Figure 14 below. (Boming, 2022)

The decoration of Ming -style furniture is divided into two categories: the first category is the decoration that is closely connected to the structure, such as teeth (tooth strips and teeth), voucher mouth, ring mouth, baffle, short old, and card flower. In addition, such as Luo Guo, Tyrannosaurus, Cross, Mud, etc., although it is called a mule, it is an authentic structural component. However, due to the clever treatment of the craftsman, it also plays a good decorative role. The second category is pure decoration, such as sculpture, inlaid, linear, etc. After hundreds of years of accumulation of classical furniture, in terms of furniture decoration, themes, techniques, decorations, etc. are very rich and colorful. (Heping, 2009)



Figure 14 The decoration of Ming -style furniture

Design by: Pu Anguo "Ming-style furniture"

Many pieces of furniture are decorated at the corner of the brackets of Limu and Hengmu. Such as the corner of the hind legs and brains, the armrests and hind legs of the circle chair, the corner of the handrail and the front leg, the intercity of the table and the corners of the four -legs, the corner of the two columns of the hanger, and the mirror frame At the junction of screens, stools, bed couch, horizontal woods and standing wood, all kinds of teeth (including dental bars and teeth) are applied. These teeth are called teeth with long horizontal directions, and short flower teeth applied on the corner are called teeth. In addition, it is also used on both sides of the upper part of the hanger and frame, named the tooth hanging. The teeth on both sides of the screen and the hanger of the screen are called the tooth, also called the angled tooth. The form of classical furniture is decadent and rich. Common ones are cloud-patterned teeth, grid teeth, phoenix teeth, rolling cloud teeth, bow-back teeth, and wooden teeth. These teeth are an excellent decoration of furniture and a solid and durable structural component, as shown in Figure 15 below. (Qi, 2017)

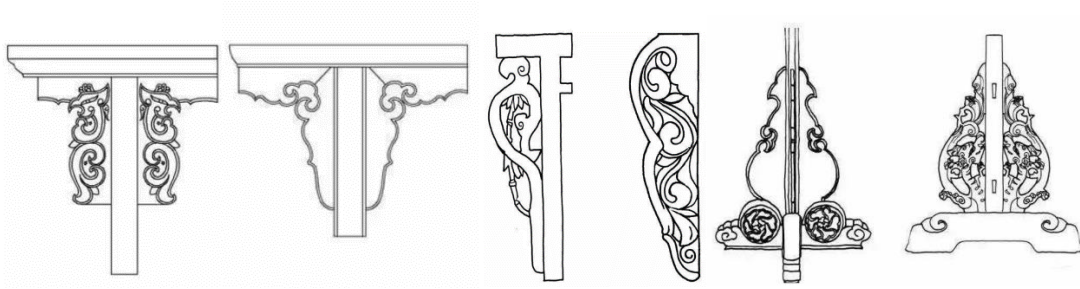


Figure 15 The decoration of Ming -style furniture

Design by: Pu Anguo "Ming-style furniture"

Another decorative feature of Ming-style furniture is the decoration of the bench foot. The bench foot decoration is inlaid between the four columns between the furniture, such as between the legs of the chair. Various hollow panels have frames around them, and empty holes are carried out in the middle, as shown in Figure 16 below. (Huang & Zhang, 2015)



Figure 16 The stool foot decoration of the rose chair

Design by: Pu Anguo "Ming-style furniture"

At the same time, it plays a supporting weight and strengthening a solid role. This is a few common styles, as shown in Figure 17 below. (Jiang et al., 2018)

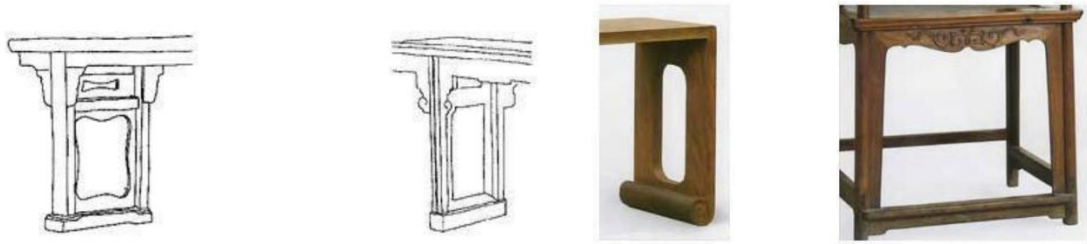


Figure 17 The common stool foot decoration of Ming -style furniture

Design by: Pu Anguo "Ming-style furniture"

On both sides of the table case, that is, between the front legs, it is decorated with various decorations. This form of various forms is called a baffle. The baffle reinforces the stability of the legs, and at the same time, it is also an excellent decoration. The standard baffle is shown in Figure 18 below. (Wang, 2008)



Figure 18 The common baffle of Ming -style furniture

Design by: Pu Anguo "Ming-style furniture"

In the four corners of the box, the door fans of the cabinet, and the corner foot of the chair and stool, use metal parts, which is also a feature of classical furniture, as shown in Figure 19 below. Metal parts on classical furniture are mostly made of white copper or brass in the early Ming Dynasty, and red copper gold plating in the later period is even more gorgeous. These metal parts have a variety of forms and beautiful shapes. They are decorated with deep and beautiful furniture such as rosewood and rosewood, which is indeed doubled. At the same time, it also plays the role of protecting furniture and durable use. There are many types of decorative parts and different shapes, mainly square and round, as shown in Figure 20 below. (Wang, 2008)



Figure 19 bronze ornaments of Ming -style furniture

Design by: Pu Anguo "Ming-style furniture"

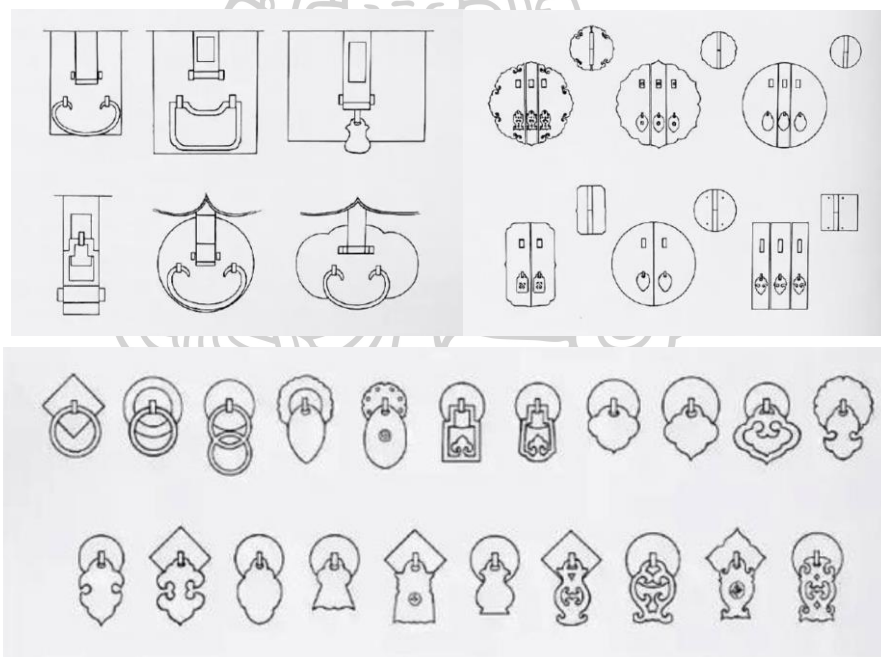


Figure 20 Bronze decoration shape category of Ming -style furniture

Design by: Pu Anguo "Ming-style furniture"

5) The scientific characteristics of Ming-style furniture

From the perspective of an era, the role of Ming-style furniture in human creation activities, the culture and art of Ming-style furniture is highlighted, and the principle of "technical aesthetics" rich is also reasonable. Ming-style furniture, especially Ming-style chairs, pays great attention to the rationality of the scale and curvature of the furniture to achieve comfort. For

example, the "S" back in the Ming chair is fantastic with the spine curve of the human body, as shown in Figure 21 below. When people lean on it, the back will be resting. This is very similar to the design of modern ergonomics on design. Let us understand the science of some ergonomics about the use of seats. (Mirka, 2005)



Figure 21 The "S" back in Mingchang chair

Design by: Pu Anguo "Ming-style furniture"

Ergonomics is the factors such as the aspects of anatomy, physiology, psychology and other aspects of people's anatomy, physiology, psychology, etc., and study the various parts (efficiency, health, safety, and comfort) of the interaction of people in the environment of a person. In the family, how to achieve the optimized question in the vacation environment, as shown in Figure 22 below. (Smardzewski & Smardzewski, 2015)

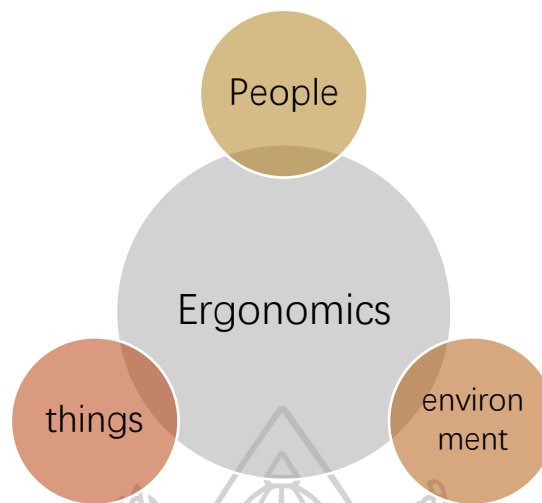


Figure 22 one thing in the Ming chair, one thing, one environment system

Design by : Chen Yanbin,(2022)

According to the ergonomics principle, the chair's function is to support the "sitting" of the human body. When the human body is sitting down, the trunk structure cannot maintain the original posture because the pelvis and spine lose the natural balance upright. When you sit down, you can get a reasonable looseness. This is the most basic function of the chair. The "S" back design described in the previous Ming chair aligns with this principle. When people sit at work, the natural state of the lumbar spine is difficult to maintain. With different sitting positions changing their curvature, the muscles and ligaments will be in a tense contraction state. Over time, it will produce uncomfortableness. The key to solving this problem is to design the angle of the seat surface and the back, analyze the distribution of the body, and choose the appropriate support position so that the contact surface of the sitting and the human body can be satisfactory comfort. Analysis of the seat height can determine the vertical distance between the seat and the ground. The chair's seat surface is often tilted slightly or concave and usually uses the height of the chair in front of the seat. The reasonable height of the seat will lead to correct sitting positions. Over time, it will cause fatigue to the waist. People determine the situation of lumbar spine activities by analyzing the human body at different heights. It can be seen that when the height is 400mm, the activity is the highest, and the fatigue is the strongest. If it is slightly higher or lower than this value, the activity decreases, and the comfort increases. Sitting above or less

than 400mm is not easy to get fatigued. Therefore, seat height is an essential factor affecting the comfort of a sitting position. The general seat height of Mingchang chairs is about 520mm, and the scale analysis of contemporary people needs to be more appropriate. However, the sitting position and facilities of Ming-style chairs are different from today. The important thing is that most of the footstools are available for people's feet, which also regulates people's height, as shown in Figure 23 below. History books in the Ming Dynasty were mainly recorded. In the Ming and Qing dynasties, literati and Mohn often changed their scientific chairs due to their office writing, and their scientific nature was cleverly harmonious. (Qi, 2017)



Figure 23 The scoot stool in Ming -style furniture chair

Design by: Pu Anguo "Ming-style furniture"

The depth also significantly impacts the comfort of the human body. The thigh length is usually smaller than when the sitting position is so that the front of the seat to leave the calf has a certain distance to ensure that the calf has a certain degree of activity. At the same time, the inside of the knee joint will be oppressed. From the perspective of the depth of the bright chair, it is too broad. It is advisable to be about 400-450mm in average seat depth, and most of the Ming chairs are about 620mm. The seat width should accommodate all the hips of the human body.

Moreover, to leave a certain amount of generosity to adjust the seat at any time, it should be slightly larger than the width between the elbow. The width of the back chair is 380mm, and the seat width of the armchair is 460mm. The width of the Mingchang chair is generally more than

480mm. From the depth of the seat and the width, you can feel the large scale of the bright chair. At that time, the era had been inherited, with the characteristics of the times and had certain particular opinions. The curvature of the seat surface directly affects the body pressure distribution of the human sitting on the chair and stool elbows. According to the ergonomics analysis, the seat surface suits the slightly curved surface. The curve is too large, but it makes people feel uncomfortable. The material of the sitting noodles is better to be half soft and slightly more complex. In the Ming chair, the seat surface is dominated straight, but to coordinate the curvature and reach a degree of comfort, most Mingchang chairs have rattan drawers and dumpling drawings on the seat surface. Different from the hard drawers, the soft drawers are woven with vines, brown silk threads, etc., which are delicate and breathable. The seat surface naturally recesses the curve of the human body after pressure. It is similar to the Western fabric seat. People in the chair are comfortable. Figure 24 below shows that this also differs from our current scientific scale. (Qi, 2017)

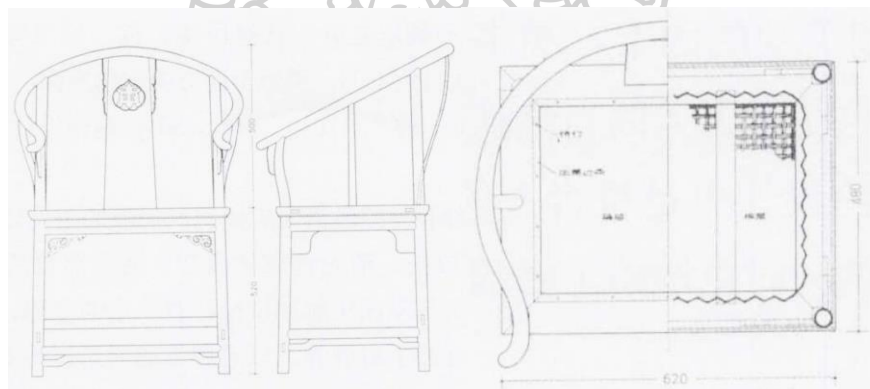


Figure 24 Large scale of Ming -style circle chairs

Design by: Pu Anguo "Ming-style furniture"

There is a "wooden pillow stool" in the seat. As shown in Figure 25 below, the seat surface is designed as a micro fox with a reasonable body pressure distribution and is very comfortable to sit on. Generally, the seats of the seats are tilted backwards, and the angle of leaning is 3-5 degrees. It is appropriate. The back of the chair supports the torso, relaxes the back muscles, and eliminates fatigue in the back. Usually, lean backwards so that the lumbar spine of the human body can obtain comfortable support. It is best to have a particular gap in the contact site of the back and the seat to make the gluteal muscles from being squeezed. The height of the back is generally not higher than the scapula, and it is advisable to touch the back with the inner corner of the scapula. The tartness of Ming-

style chairs is more suitable for people's back dependence, so it has both leisure and refreshment. (Lingyu, 2011)



Figure 25 "wooden pillow stool" with arc
Design by: China Ming -style furniture collection website(2022)

In many bright chair designs, not only consider the aesthetic factors but also the science of these factors, such as the curve of the handrails, such as the bright circle chairs and the restraint of relying on the hand, to the coordination of line-shaped Qu Mei and functional comfort. The brain's design is more than the need for people's head dependence; naturally simple and in line with human physiological feelings. While processing the functional shape, it also adds the detailed beauty of the unique bright chair with the brain, as shown in Figure 26 below. (Qi, 2017)



Figure 26 The curve of the armrests such as Ming -style circle chairs
Design by: China Ming -style furniture collection website(2022)

These reflect the scientific thinking of Ming and Qing artisans during furniture design. We use modern scientific functional standards to analyze Ming-style seats and their limbs, and we can see the reasonable design of Ming-style furniture in ergonomics.

2.1.2 Overview of contemporary Chinese furniture

Contemporary Chinese furniture is inspired by traditional Chinese furniture culture as the inspiration and foundation based on modern industrialization and technological development. Combining modern design concepts and production technology, it is produced to meet modern life needs. With the development of the Chinese economy and the acceleration of modernization, contemporary Chinese furniture has gradually emerged out of tradition, and it has continued to push out new, showing a variety of styles and forms. The design and production of contemporary Chinese furniture follow traditional production skills and aesthetic concepts and combine modern craftsmanship and materials, making the furniture more beautiful, practical and durable. The main characteristics of contemporary Chinese furniture include diverse design styles: There are many design styles, which can be traditional Chinese furniture or modern European, American or straightforward style. Materials are diversified: The selection of materials for contemporary Chinese furniture is diversified, including traditional hardwood materials, such as rosewood and Huanghuali, but also modern metal, glass, plastic and other materials, making the furniture more beautiful, practical and durable. Exquisite crafts: The production process of contemporary Chinese furniture continues to innovate and develop, and technical means such as CNC processing, 3D printing, and other technical means are used to improve production efficiency and product quality. Green and Environmental Protection: Contemporary Chinese furniture focuses on environmental protection and sustainable development during the materials and production process, which meets modern people's environmental awareness and life needs. Contemporary Chinese furniture combines traditional Chinese furniture culture with modern technology, materials, and design. It has a variety of styles and forms, showing the continuous innovation and development of Chinese furniture in the modernisation process.

2.1.2.1 The historical process of contemporary Chinese furniture

1) Contemporary Chinese furniture in the 1950s, 1960s, and 1970s

In 1950, the founding of New China, Chinese furniture continued the Republic of China furniture system. Foreign furniture continued to be popular, and traditional furniture was also in a state of free development. In the 1970s, the set of self-designed furniture in my country became fashionable, traditional furniture was left out, and contemporary Chinese furniture innovation was in a trough period. However, the trough is still growing, and some innovative traditional furniture products have been produced during this period. For example, the sofa and coffee table designed by the Central Academy of Arts and Crafts for the Hall of the People in 1958, as shown in Figure 27 below. In 1969, the TV cabinet was designed by the Beijing Chinese Furniture Factory for the Tiananmen Tower lounge, as shown in Figure 28 below. From the design of its form and function, we can feel the exploration and innovation of designers to meet the needs of the new era. In general, there are only a handful of traditional furniture innovations in this period, which belong to occasional and unsustainable innovation, so it has yet to be able to form a particular influence. (Boming, 2022)



Figure 27 The sofa in the hall

Design by: Contemporary furniture collection website(2022)



Figure 28 days of Ansmen's TV cabinet

Design by: Contemporary furniture collection website(2022)

2) The budding period of contemporary Chinese furniture in the 1980s

After 1980, the cultural trend swept China, and all sectors of society began to pay attention to and reflect on the contradiction between "tradition" and "modern". Economic development has injected a new driving force into the Chinese furniture industry. The original wooden factories, furniture factories, newly established furniture companies in the coastal areas, and furniture workshops scattered in various places have initially formed a relatively complete furniture industrial system. At the same time, traditional Chinese furniture (mainly indicating Qing furniture) has also attracted the attention of all sectors of society with the deepening of academic research and the chase of the collection world. During this period, some forestry colleges have set up furniture majors and started training professional talents. However, due to the lack of experience and experience, these talents failed to play a leading role in the development of traditional furniture. Traditional furniture workers are often both "designers" and "producers" of traditional furniture. However, workers mostly imitated or slightly improved the classic ancient traditional furniture styles. Overall, contemporary Chinese innovation only appeared in the 1980s. However, the formation of the modern furniture industry system and the revival of traditional culture provided fertile soil for traditional furniture innovation. The new demand for the differences in the injection of solid catalysts for traditional furniture innovation. Essence Under the influence of these factors, contemporary Chinese furniture innovation is ready to sprout. (Liang, 2013)

3) Contemporary Chinese furniture in the preliminary development period of the 1990s

In the 1990s, the Chinese furniture industry began to conduct innovative practices and theoretical exploration of contemporary Chinese furniture in the modern sense. In terms of innovation practice, some furniture companies use modern technical means and processing equipment to combine modern design theories and methods to create many innovative traditional furniture products. For example, the chair of the Guangdong Federal Group in 1992, as shown in Figure 29 below, the bedroom series furniture of the three furniture Co., Ltd. in 1999, and the "Ming Concept" official hat chair designed by Mr. Wu Mingguang in 1999. Generally speaking, the number of institutions and personnel engaged in traditional furniture innovation in the 1990s was small, the strength was relatively weak, the product models developed were not many types, the product update was slow, the product system was not complete, the theoretical exploration was not deep, it belonged to contemporary The development period of Chinese furniture innovation. (ZHAO, 2011)



Figure 29 The chair of the Federal Group of Guangdong in 1992

Design by: Contemporary furniture collection website(2022)

4) The rapid development period of contemporary Chinese furniture in the 2020s

Entering the 2000s, many companies devoted themselves to researching and developing contemporary Chinese furniture products. In this period, contemporary Chinese furniture innovation has the following characteristics:

The number of innovative brands and products has proliferated

The high frequency of innovation

The diversification of innovative ways

The expansion and professionalization of the innovation team

In 2003, Zhu Xiaojie of Wenzhou Aoper Furniture Co., Ltd. designed a series of furniture products such as water chairs, butterflies, and partners, as shown in Figure 30 below. The texture reflects a natural solid atmosphere and traditional meaning. Lu Yongzhong, a designer of the Banmu Furniture Brand, has independently developed the "Walk" and "Qingfeng" series of furniture products since 2006. Among them, several stools of "Shiba" won the EDIDA International Design Award in 2008. As shown in Figure 31 below. These excellent furniture products are affectionate and expression of traditional culture in contemporary China. Their novel shapes, practical functions, traditional temperament, and diverse categories have enriched and improved the contemporary Chinese furniture product system. Welcome to the merger to lead the market demand at that time, and at the same time, it has caused extensive discussions in the academic and industry. (Liang, 2013)



Figure 30 The partners designed

Design by: Contemporary furniture collection website(2022)



Figure 31 The "Pianzhou" designed

Design by: Contemporary furniture collection website(2022)

5) The comprehensive development period of contemporary Chinese furniture in the 2010s

During the period of contemporary Chinese furniture in the 2010s, in the period of comprehensive development, this process also triggered the criticism and reflection of the furniture industry's innovation of contemporary furniture innovation. Some scholars have criticized the "traditional element collage" in the innovation process, saying traditional furniture innovation should return to the essence of beauty, good craftsmanship, and suitable materials. Some scholars believe that the furniture of the Ming and Qing dynasties should be rational. In the process of traditional furniture innovation, not only the Ming and Qing furniture can be the creative prototype, but also the design elements from traditional furniture in other periods and even other traditional objects other than furniture. Furniture companies have begun to design contemporary Chinese furniture products with a rational and scientific attitude and method. For example, the "U+" furniture brand and Gujia Home Furnishing Co., Ltd. was launched by Jinan Youjie Furniture Manufacturing Co., Ltd. in 2012, "Oriental Hui" furniture brand was launched in 2014. Most have a minimalist shape and contain restrained and implicit traditional temperaments. At the same time, some independent designer brands have also begun to show significant influence, such as the "Pingzhang" of the military and civilians, as shown in Figure 32 below, Wen Hao's "bonus", etc., as shown in Figure 33 below. Most of these independent designers have undergone

professional education and training, making their contemporary Chinese furniture products reflect a solid conceptual and avant-garde sense. These furniture products sharply contrast with mainstream products in the market and gradually become them. The essential visual focus and space area from the Furniture Exhibition to the Home Store leads to the new contemporary, traditional furniture design trend. After experiencing extensive and profound reflection on contemporary, traditional furniture innovation in the 2010s, a group of more mature designers and contemporary Chinese furniture brands emerged. These designers have found more diverse traditional furniture innovation channels from their international perspective. (Chen & Porncharoen, 2022)



Figure 32 Fu Junmin's "Ping Ping"

Design by: Contemporary furniture collection website(2022)



Figure 33 Wen Hao's "Bi Life"

Design by: Contemporary furniture collection website(2022)

2.1.2.2 The innovative trend of contemporary Chinese furniture

1) The product system is becoming more and more complete

Traditional furniture has gone through the process of innovation to series and innovation and finally formed a product system with diverse forms, functions, structures, materials, colours and decorations. In terms of form, contemporary, traditional furniture contains a variety of styles of product types of heavy, luxurious, lightweight, and simple; from a functional point of view, it contains almost all furniture categories that can meet the contemporary lifestyle; It contains a variety of product types such as solid wood frame structures, plate structures, and plate wood structures. In addition, diversified materials, colours and decorations also shaped different types of contemporary, traditional furniture products.

2) The innovation system is getting more and more mature

Personnel, technology and platforms are the main components of contemporary, traditional furniture innovation systems. Since contemporary, with the improvement of the professionalization of furniture design, production, sales, and management personnel, the introduction

of advanced manufacturing technologies such as automation and informatization, as well as the establishment of platforms such as home stores, exhibitions, museums, etc. Mature.

3) Innovative themes are increasingly expanded

Contemporary, traditional furniture innovation initially used Ming and Qing furniture as a prototype. By the 2000s, the designer would not only follow the history of the furniture to trace up and strive to find and refine design elements from the furniture design of the Song, Yuan, Tang, Tang, Wei, Jin, Qin and Han dynasties, and even the pre-Qin period. Traditional things such as utensils, landscapes, and kung fu images expand horizontally and create unique contemporary, traditional furniture. By the 2010s, some designers wanted more than the symbolic performance of traditional images. Based on international design concepts, they used morphological semantics, design art-related theories and methods to transform the abstract traditional ideas and concepts in traditional culture into Design language, and then used furniture as a carrier to express it. (Chen & Porncharoen, 2022)

4) Innovation channels are becoming more and more diverse

Before the 2010s, the furniture industry mainly explored the innovation of traditional furniture from the "furniture body". After that, the "furniture situation" design was gradually incorporated. The former refers to the innovation of contemporary, traditional furniture from its shape, structure, function, material, colour and decoration so that the innovation results have traditional characteristics; It shows the traditional meaning and atmosphere. In short, both have enriched the innovation of contemporary, traditional furniture from different angles.

5) The concept of innovation is increasingly blended

In the early days of the innovation of contemporary, traditional furniture, many design concepts, such as Western functionalism, deconstruction, and postmodernism, played a leading role. In the later period, with the revival of traditional culture, some classic traditional ideas and aesthetic concepts such as "the unity of heaven and man", "literary quality", "Dao Fa nature", "harmonious and orderly", "virtual reality", "mysterious", etc.) have been gradually being furniture. Pay attention to and absorb. The two constantly blend in symbiosis and gradually make contemporary, traditional furniture present the dual characteristics of localization and internationalization. (Shikui, 2016)

6) Innovation theory and methods are becoming more and more complete and scientific

From the above explanation of the innovation of contemporary, traditional furniture, we can see that the focus of contemporary, traditional furniture innovation theory has experienced "symbolization-de-symbolization", "form-image", and "localization-internationalization". The innovative theoretical system is becoming more and more complete. During the period, scholars also introduced the relevant theories and methods of humanities, such as design, art, psychology, cultural anthropology, and statistics. The muscle electrical instrument, eye movement, brain electrical instrument, etc.) were gradually absorbed. These theories, methods and equipment have laid the foundation for the systematic and scientificization of contemporary furniture innovation. (ZHAO, 2011)

2.1.3 Mixing contemporary Chinese furniture and Ming style furniture

The inheritance and development of Chinese furniture design is the excellent gene to inherit traditional Chinese furniture and continue to develop. Ming-style furniture is the peak of the development of Chinese furniture. Its concise styling style is not only a good comic for ancient literati but also, by the highly respected modernist design style since the 20th century; it still meets modern people's people. Aesthetics occupies a stable market share in the modern furniture market. There are many high -quality high -quality works in Ming-style furniture. It is simple in shape, has a strong structure, and has a suitable scale. From the perspective of shape, structure, and people, it meets modern people's furniture needs. This part of the furniture can maintain traditional craftsmanship and satisfactory work. In terms of shape, materials, and technical techniques, they are required to exceed the style of traditional Chinese furniture. Using traditional craftsmanship and technology, the vertebrae structure can be used, and some mechanical tools can be used as vertebral machines. However, the furniture works designed by hand to maintain the original flavour of traditional Chinese furniture are the continuous development of the excellent genes of traditional Chinese furniture. (Chen & Porncharoen, 2022)

In terms of shape, the simple and smooth shape language of Ming-style furniture is inherited. It is mainly simple and decorated in the appropriate position. The best S-shaped curve of Ming-style furniture is cleverly combined with straight lines with curves. Inheriting Ming-style furniture sculpture -like aesthetic space shape, you can feel the beauty of the furniture from the four sides of the

furniture. Inheriting Ming-style furniture, the design component of shape and structure is not only shaped by the shape but also by a solid force structure. Inheriting Ming-style furniture's implicit and restrained literary temperament, even if it is hard to condense all the details, the whole still feels natural and straightforward, with no traces.

In terms of materials, inheriting the attitude of wood using Ming-style furniture on the spot and the use of wood reflects the simple and natural concept. Inheriting Ming-style furniture using solid wood and using physical glue's environmental protection concepts reflect the concept of green design. The concept of inheritance of Ming-style furniture handed down is the cultural accomplishment of inheriting things.

In terms of function, the function of Ming-style furniture is rich. Ming-style furniture focuses on practicality and can meet the various needs of people's daily life. For example, explanatory furniture is usually designed with storage space such as drawers, cabinets, bookshelves, etc., which can effectively store home products and cultural art. However, with the advancement of time, contemporary life may be diverse. In this state, the function of bright furniture may be single. The designer needs to re-measure the needs of contemporary life and carry out innovative design.

The artistic style of Ming-style furniture was explored ahead. From the perspective of shape, structure, materials and decoration and science, the research and analysis of Ming-style furniture summarized the laws and changes in the artistic characteristics of Ming-style furniture. Studying tradition is not just studying history, nor is it to return to the life of the ancients, but to innovate and develop and create the future. The artistic style of Ming-style furniture, as a Chinese treasure, should be reflected in Chinese furniture design. Therefore, this section will be based on the previous research results from the perspective of modern design, combining the trend of world furniture design and development, and draw on the successful cases of foreign furniture designers to absorb Ming-style furniture art and explore the cultural genes reflected in Ming -style furniture art. The embodiment of Chinese furniture design and development proposes the artistic style of Ming-style furniture in terms of shape, materials, and functions. The ideas of innovation and inheritance in Chinese contemporary furniture design will briefly analyze the successful design works in China. As shown in Table 1-3.

Table 1 uses traditional architecture as inspiration for furniture design



Name	Hui-style architecture	"Banmu" brand Huizhou set a few
Icon		
Description	<p>The designer introduced the concept of architectural space into the furniture and captured the form of the "horse head wall" eaves in Huizhou houses as the external outline of the set so that its contour line resembles the skyline formed by Huizhou architecture, and the relationship between furniture and region and space is closer. Compared with the traditional set, the form of the "Huizhou" set is more concise and straightforward. The legs on both sides are connected to several sides, and the sense of wholeness is strong. Short feet are cut out at the bottom of the plate legs, making the originally monotonous board legs lively. It can be said that the "Huizhou" set borrowed the form of classic architecture to complete the giving and interpretation of furniture culture.</p>	

Table 2 Innovative material design for Ming stools





Name	Traditional stool furniture	Contemporary furniture designer Chen Min – Hangzhou stool
Icon		
Description	<p>The Hangzhou stool, designed by contemporary furniture designer Chen Min is also a contemporary design of the traditional Chinese "low stool". The designer focuses on contemporary materials and craftsmanship, and the Hangzhou stool is made of multiple layers of bamboo skin. Each bamboo skin is 0.9 mm thick and varies in length, a total of 16 sheets. The bamboo skin is bonded together from the last 25 cm at both ends, one about 3 in diameter Centimeters of green bamboo penetrate layers of bamboo skin, joining the two ends of the stool together at the bottom. The layers of bamboo skin at the top naturally form an arch, like the lake's ripples. The superimposed bamboo pieces have good toughness, and when the person sits down, as the weight increases, the support of the stool gradually increases, and the elasticity that the person can feel is also accumulated in the centre of the stool. Seating heights vary from person to person, and comfort varies, incorporating contemporary materials and craftsmanship to the greatest extent.</p>	

Table 3 Innovative design of the function of the Ming stool

Name	Chuck mortise stool	"Duo shao" of "stacked arhats" bookshelves
Icon		
Description	<p>The "stacked arhat" bookshelf is a transformation and extension of the original function of the traditional furniture of the bar stool. Several stools are stacked in the order of up, down, left and right, their legs play a supporting and partitioning role, and the stool surface forms the shelf of the bookshelf. It can be seen from the small stool with a clear woodchuck that is in line with the needs of modern life and home design; the designer cleverly borrowed the function of "two legs and one board" in the traditional bench and gave new life to the bench with modern design techniques.</p>	

2.2 Symbiosis under the trend of new materials of contemporary furniture

The trend of new contemporary furniture materials is to develop in a more environmentally friendly, sustainable and functional direction. Symbolism refers to the relationship between mutual dependence and promotion between different life forms. This concept can be used in the design of new furniture materials.

2.2.1 Research Status of Contemporary Furniture Materials

1) New Materials of Contemporary Furniture Domestic Research Status

At this stage, my country has 46 National Institute of Materials and Materials Laboratory, mainly concentrated in the eastern coastal areas. Institute of Materials Research; 36 Institutes of Materials Research on Graduate Students, and 199 colleges and universities with materials majors. In addition, there are individuals in China and the individuals of research materials, and enterprise laboratories are not counted. Internationally, 15 of the top 100 materials scholars in the world released from 2001 to 2010 released by Science Watch in 2011 are 15 Chinese scientists. Search for the papers related to new furniture materials in the three major domestic academic platforms of "Weipu", "Zhiwang",

and "Wanfang". Wide has 300,000 articles related to new materials, 70,000 in Zhiwang, 290,000 squares, and 290,000. Research popular mainly includes nanomaterials, composite materials, graphene, metal materials, etc. With "furniture materials" and "new furniture materials" as keywords, they are retrieved among the three major domestic academic platforms.

As shown in Figure 34, "Furniture Materials" related literature knows 1695, 8243 of Wanfang, 198 Victoria, " 151 related documents, 481 articles, 481 Wanfang, and 143 Victoria. From the quantity perspective, my country's literature on furniture materials is small, and there are few studies on new furniture materials. From 2000 to 2019, the three major academic platforms related to the changes in the number of new furniture materials literature. As shown in Figure 35, it is easy to find that the research on new furniture materials has dramatically improved from around 2004. The following fifteen years of the following fifteen years. The number of Chinese research is volatile, and the overall number is rising. When sorting out the research content of the three major domestic academic platforms on new furniture documents, it is found that in addition to Victor's literature on new materials such as wood plastic composite materials and nanofibilities, the other two platforms have more studied traditional furniture materials and materials and materials of traditional furniture materials and materials. Design, style, and other related topics need more research on new materials. In general, my country's research institutions on furniture materials have a wide range of coverage and are covered in broad fields. However, there are few professional academic researchers and research results, and research content and depth must be improved. (Wang & Yin, 2019)

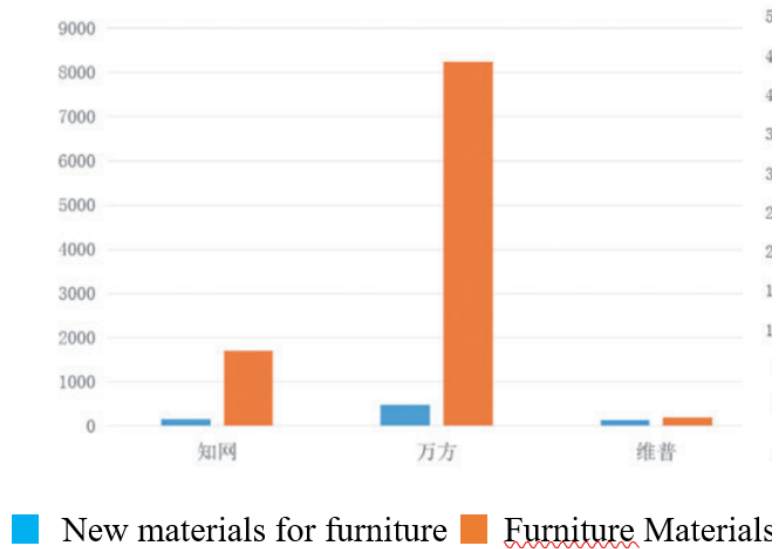


Figure 34 Keyword search volume
 Design by: www.stats.gov.cn, (2020)

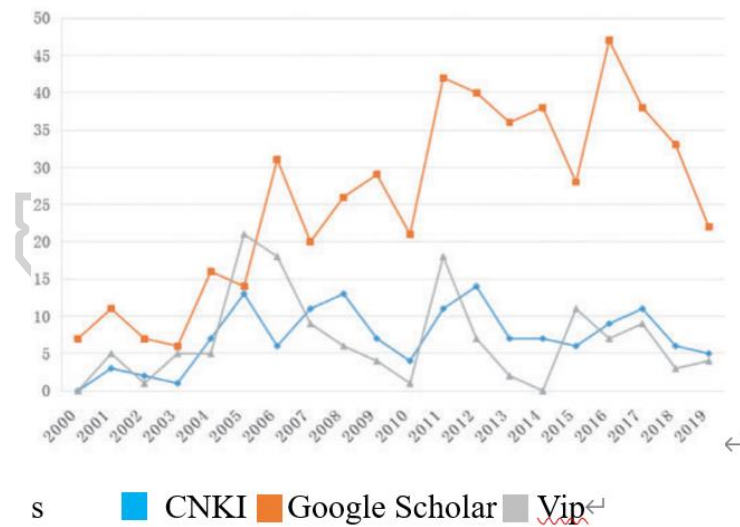


Figure 35 changes in new materials literature
 Design by: www.stats.gov.cn, (2020)

2) Foreign research on new furniture materials

At this stage, the United States has the world's most and top new materials scientific research institutions. There are 210 new institutes nationwide, including the world's top Oaksling

Composite Materials National Laboratory, Agen National Laboratory, and NASA National Laboratory. Materials Research Institute; Europe, Japan and South Korea have a total of 123 new materials laboratories, of which Max Planck Science Promotion Society, British National Composite Materials Center, Japan National Institute of Materials, Japan National Institute of Science and Technology, Korean Materials Research It is also the world's top material research institute. Among the top 50 colleges and universities released in the top 50 colleges and universities released in 2018, the top ten of the top ten, and the first, second place is also American universities; second, there are seven universities in China and Hong Kong, China, and 4 in the United Kingdom, South Korea, Japan and Germany. Researching new furniture materials abroad is earlier than domestic time, more comprehensive range and more profound research. New foreign materials research is more inclined to scientific research. It is often optimized for weather resistance, water resistance, and fireproofing of a particular material, and it is rarely mentioned in the combination of materials and design. In 2018, the influencing factor of the scientific journal and the top ten rankings included in the SCI were shown in Table 4. It can be seen from the table that, in addition to the two more authoritative comprehensive materials science magazines, which were published in Britain and the American "Science", most of the other journals are specifically for materials science. There are different authoritative scientific magazines in the field of new materials.

In summary, the academic research level of new materials abroad is leading China in both breadth and depth, while the United States is in the world's leading position, followed by other countries with better economic development. Developing and researching new materials have become an essential part of the scientific and technological development of countries worldwide. Most developed countries and developing countries have begun to pay attention to the research of new materials, and they are willing to invest a large amount of financial and workforce for this. Get satisfactory results. Not only is it now, but for a long time in the future, the development of new materials will still be an essential criterion for measuring a country's scientific research level. (Xiong et al., 2017)

Table 4 2018 SCI included material science journal impact factor ranking

1	Nature	自然	31.434
2	Science	科学	28.103
3	Nature Material	自然(材料)	23.132
4	Nature Nanotechnology	自然(纳米技术)	20.571
5	Progress in Materials Science	材料科学进展	18.132
6	Nature Physics	自然(物理)	16.821
7	Progress in Polymer Science	聚合物科学进展	16.819
8	Surface Science Reports	表面科学报告	12.808
9	Materials Science & Engineering R-reports	材料科学与工程报告	12.619
10	Angewandte Chemie-International Edition	应用化学国际版	10.879

Design by: Chen Yanbin,(2022)

2.2.2 Characteristics of Contemporary Materials

1) Natural wood

Natural wood has been the first choice for furniture from ancient times to the present. Wood has accumulated large volume, wide distribution, convenient materials, extensive use, and excellent characteristics as a natural material. Elasticity, with natural colour, beautiful patterns and plasticity. Its natural and simple characteristics can make people feel intimacy. Wood can also adjust the humidity of the room. It is an excellent furniture material. Therefore Status. In the context of increasing attention from low-carbon environmental protection, natural wood has been recognized by more and more people for its unique superiority. The phenomenon has gradually reduced wood resources, especially some precious tree species. Therefore, many furniture manufacturers will use ordinary wood to replace precious wood to make furniture. Make furniture with imitation wood materials. Usually, use wood in critical parts, essential parts and key parts, and key parts in the essential and critical parts. Some decorative components use imitation wood to achieve the purpose of saving cost and low-carbon environmental protection. Of course, besides the above advantages, there are some disadvantages: wood has the physical characteristics of dry shrinkage and swelling, which is easier to deform and crack; wood belonging to Flammable materials is not conducive to fire prevention. They are easy to breed termites in a humid and opaque place. (Bovea & Vidal, 2004)

2) Plastic material

Plastic is a relatively earlier wood substitute. It was initially used in the furniture industry in the 1920s. At first, plastic was used only as the coatings and adhesives of wooden furniture. Light, colourful, solid colour, not easy to change colour, and decorative; plastic is lighter than metal, robust than wood, vibration resistant, and excellent anti-corrosiveness. With the development of technology, plastic production technology has gradually improved, and some new types The application of plastic in the furniture industry is extensive, mainly manifested in the following aspects: plastic as a synthetic material can be made into any colour, and the development of scientific and technological development has dramatically improved its performance. Therefore, plastic has become the primary material of furniture; furniture in Western European countries; In the industry, they emphasize that the characteristics of plastic are made of wood for furniture manufacturing. For example, the formula of plastic can be accurately copied. Plastic furniture is easy to clean, humid resistant, strong corrosion resistant, and not easy to deform; combined furniture made of plastic consists of component furniture— composition of different units and high and vast extension of random assembly according to demand. Today, the raw materials of plastic furniture are used for polyvinyl chloride that covers materials, and polyurea is used to replace wood. Plastic also has its shortcomings. For example, it is not resistant to high temperatures, is toxic when burning, and is easy to age. (Wu & Liu, 2019)

3) Paper material

One of the four main inventions from ancient China is paper. It has become a common practice in many of the modern sectors as a result of social and technological advancement. The use of paper in the manufacture of furniture is now progressively gaining popularity in the furniture business. Paper chairs, tables, and other paper furniture have already entered the family and are extensively used in the United States, Europe, Singapore, and other nations. In our country, the paper furniture development space is inclusive. You can get a good social response and economic benefits with full use. Honeycomb paper in paper materials. Due to its particular mechanical structure, it is ideal for reducing consumption to ensure the regular use of furniture significantly. One of the paper materials. Some furniture manufacturers use paper cell composite plates to make the support legs of furniture. Paper materials' widely used processing method is connected, shear, combined, curved, curved, Folding, etc.

The performance of paper materials is to corrode, fire, etc., of chemical methods to increase their strength and toughness. The source of paper materials can be widely obtained by chemical treatment of wood fibres or collected waste packaging paper. Comp compression and other newspapers obtain it, and paper materials can be naturally degraded. The weight itself is light, which helps save transportation costs. Therefore, paper materials can be used as essential materials for furniture materials. (LIU et al., 2013)

4) Glass material

As a transparent artificial material, glass has a high definition and solid durability advantage. It can not only bear the conventional squeezing and bumps but also withstand the exact weight of wooden furniture. It can reduce the sense of oppression caused by the small space. The more commonly used glass types in furniture include glass plates with very transparent and smooth technology through polishing and brightening technology; made of high-grade glass on the surface, the surface does not have ripples; in the surface; there is no ripple with high -grade glass, in the surface; in the surface; After heating in the mould, the curved glass made of weight after being bent, and then cooled; the colourful glass that contains metal oxides, which presents different colours. Strong reflection makes the glass bring a changeable colour sense, design design, design Teachers can thoroughly choose different colours of glass boards. The glass home in the market has many types and is favoured by many people. However, glass furniture also has certain limitations. For example, most of them are rectangular and round. , Triangle, the form is more monotonous. (Zhang & Xu, 2010)

5) Bamboo and rattan materials

Bamboo vine is solid; there are many festivals, the skin is smooth, the texture is challenging, full of elasticity, easy to bend, and easy to split. Today, bamboo vines are widely used in the market for furniture design. In furniture design, Face and wait. With the advancement of modern technology, primitive bamboo can be processed into a new type of bamboo collection material. It is a new type of ecological furniture substrate. According to industry experts, in the case of a lack of global wood resources, all Bamboo furniture will become an essential branch of future furniture. The bamboo texture is straight, elegant in colour, and rigid material. It has many excellent characteristics of hard wide-leaf tree materials. It is an ideal material for furniture, flooring and various components. Functions, more

ornamental, can make people feel the comfort of returning to nature and the breath of traditional Chinese culture. (Zhang & Xu, 2010)

2.2.3 The trend of contemporary materials

In addition to academic research, market applications continue material life. The popular materials in the market will get better and better, and materials not recognized by the market will go downhill. The author has collected and classified the new materials in the domestic furniture market into three categories: mature mass-produced and niche experimental types and regeneration synthesis—the development trend.

1) The development trend of mature mass-produced new materials market. The so-called mature new material refers to the company's willingness to invest or sell such new materials. At the same time, some audiences in the market accept such materials, so the products have been fully closed, and production practice has been continuously carried out for a long time. Such materials are better in combination with furniture in new materials and make consumers more accepting. It mainly includes paper materials, 3D printing materials, carbon fibre materials, acrylic materials, sound insulation panels, concrete, etc. Each material has its advantages and disadvantages. Among them, carbon fibre materials and 3D printing materials are more representative. Carbon fibre is a kind of composite fibre that has excellent physical and chemical performance of good heat resistance, high heat resistance and excellent impact, low heat swelling and expansion resistance coefficient, energy saving, heat-resistant and corrosion, heat-resistant radiation, ultra-light quality and other good At present, the technology of carbon fibre has not yet matured, and the price is expensive, so it has not been fully recognized and widely used in the market. 3D printing has been widely used in large-scale buildings and machinery industries, and mature 3D printing products have also begun to appear on furniture. Compared with traditional natural wood and bamboo materials, 3D printing, while saving the use of solid wood materials, can realize the more complex overall structure of solid wood furniture and fully display the beauty of furniture design. However, 3D printing in mass production is expensive and slow, and it is still mainly based on personalized customization or local printing. (Xu & Zhang, 2013)

2) The development trend of niche experimental new materials market development trends The main feature of niche new materials is that these materials are generally born in designer

studios and universities. They are a type of material full of experimental and show designers. This material mainly shows the various possibilities and development trends of furniture materials. It cannot adapt to the assembly lines of mass production, and it is not easy to be applied by companies and enterprises to production. For example, inflatable metal furniture, pipe furniture, and environmental silicon-based gum materials used by FIDU metal forming technology used by OSKAR Ziet. (Zhang et al., 2014)

3) The development trend of the new material market in regeneration and synthesis, in addition to the above two categories, environmental protection materials made from food residues, marine garbage, etc., new artificial boards, modified wood composite materials, softwood and other environmentally friendly materials, and other new materials are currently very possessive New furniture materials with prospects. Due to the immature technology and the performance of this kind of materials, the performance of all aspects is still under research, but there is indeed huge development potential. For example, the modified quick-born Yang can alleviate the tension of wood resources, and the price is low. For materials, in recent years, there has been a tendency to use in bathroom and kitchen furniture, but it has yet to be able to get rid of development bottlenecks such as low market awareness, single modelling, and incomplete standard formulation. Although no furniture products have yet to mature for new materials, as technology develops, it will promote the development of the furniture industry shortly. (Zhang & Xu, 2010)

2.3 Principles of furniture product design.

The design of furniture is done to benefit people. People require a specific product in order to use the advances in modern science, technology, and aesthetics. The indoor environment for human survival is made up of furniture, interior space, and other things. The outdoor environment for human survival is made up of people, people, things, and people, as well as the environment that makes up the social environment. Furniture design seeks to facilitate cooperation among people, people, things, people, and the environment, as well as between people and society. The core is to serve human beings better. As far as people are concerned, there are dual attributes. People belong to the category of biology and the category of society. Human needs are also dual: as people creatures, they require furniture to be suitable for people's physiological and continuous development of working methods and lifestyle needs:

as people in society, the requirements for furniture and the environment of furniture are aesthetic functions, Symbolism, educational functions, and entertainment functions. The laws of the market must also be observed, as furniture is an industrial good and product that must adhere to the requirements of the textile industries. Therefore, the following guidelines should be used when designing furniture:(Zhang Kefei, 2006).

1) Principles of work and efficiency

The principle of work effect is to use the principle of human work efficiency to guide furniture design. When determining the scale of the furniture, when determining the angle of the human and the furniture from the face and the backlashing of the back, when determining the padded nature of the human body and the furniture, and when designing the colour and gloss of the furniture, The scale and the various physiological characteristics of people are carried out. And according to the nature of the function (such as the different requirements of rest and homework for different treatments. The ultimate goal is to avoid inefficient, fatiguing, and accidents caused by improper furniture design. , Tight and worrying, environmental and ecological damage, and various tangible losses, make people and furniture in the best state. The simplicity and coordination between people, furniture, and the environment make people's physiology and psychology the most excellent satisfaction to improve work efficiency and rest.(Xu Boming, 2009).

2) Principles of Dialectical Concerto

Dialectical concepts, the design principles and methods of dialectical thinking, are thought. Furniture is a complex with material and spiritual functions. The laws cannot be purely composed in a form, that is, a single form of beauty, to handle the shape of the furniture. When dealing with furniture shape, it must not only meet the laws of artistic modelling. It must also be in line with the laws of science and technology. Not only must we consider the style and characteristics of the styling (such as ethnicity, region, and the times, but we must also consider materials, structures, equipment and processing techniques. As well as production efficiency and economic benefits. The principles of dialectical ideas are also the principles of industrial design and the principle of technical aesthetics. The principle of dialectical ideas is to deal with various design elements comprehensively, dialectically handling the shape and function of furniture.(Xu Boming, 2009).

3) Humanized design principles

A humanized design is one that prioritizes the spiritual and psychological needs of individuals while still addressing their physical necessities. The so-called human nature refers to human nature or essential characteristics and is the common characteristic of everyone. The characteristics of human nature are seeking truth and love for goodness, pursuing novelty, but also in love; emotional needs and desires are endless: self-expression and self-realization needs. The role of human nature has promoted the development and progress of human civilization.

The humanized design is based on a specific basis, first of all, to meet human needs at the material level. Secondly, it is to meet people's needs at the physiological level and then use specific material means and art forms to reveal and render some kinds of Emotions and emotions as much as possible to meet human needs from mental, behavioural and psychological, and realize the humanized design. (Chen Zujian, 2012).

4) The principle of creativity

The core of the design is creation. The design process is the creation process. Of course, creativity is also one of the puppets. The expansion of the new function of furniture, the idea of new forms, Through imaginative thinking and the use of innovation approaches, designers produce new materials, new structures, and new technologies. There are people with this kind of creative ability. Human creativity is often determined by the accumulation, judgment and integration of the accumulation, judgment and integration of his usual experience based on Lenovo. A creative designer should master the basic theory and modern design methods of modern design science and apply creative design principles to develop new products. (Chen Zujian, 2012).

5) The principle of popularity

The principle of design is to require designed products to show the characteristics of the times in line with famous fashion requirements designers can regularly and timely launch products with suitable marketing roads to meet the market's needs. To successfully apply the principles of popularity, we must study the laws and theories related to popularity. The aesthetic concepts of beauty and its people are the products of social history, and they have apparent characteristics of the times, showing the differences and popularity of the times. For example, the conciseness of Ming-style furniture, the dignity

of the Qing Dynasty furniture, and the luxury of the Louis style have different characteristics of the times, generating different popular and popular styles. New lifestyle changes and the influence of contemporary cultural concepts are the sources of new forms and new characteristics, and the application of new materials and new processes is frequently the pioneer in the development of new product forms. (Chen Zujian, 2012).

6) The principle of continuous resource use

Furniture is processed with different material materials. Wood and wooden materials are the most crucial furniture materials. Because wood has the most aesthetically pleasing nature, the visual effects of natural materials, and processing properties that make it easier to mold. Wood is a natural resource, though. High-quality wood has a protracted development cycle and is valuable because of its scarcity. To design furniture, the continuous use of wood resources must be considered. Specifically, it is necessary to try to use the raw material with fast-growing materials, trails and medium fibre plates. Reduce the consumption of large-diameter wood. Precious wood should be covered on an artificial board in the form of thin wood to increase the utilization rate of precious wood. In order to accomplish the harmonious development of the human living environment and the ongoing use of their wood resources, precious tree species must have controlled and planned logging.

Today, in the era of the knowledge economy, the simplest and most effective way to apply knowledge to the production field is product innovation, which provides ideas, ways and organizational guarantees for new product development. In the process of new product development, product innovation is the "soul". With product innovation ideas, enterprises can stay based on the original products or copy other people's products; in the rapid development of the market, competition can only do something and will eventually be eliminated. A company can have a clear product development plan. According to furniture design principles, constantly innovating products according to development ideas can maintain a competitive advantage and win the final victory. The following is only based on the premise of the current era change and demand concept update and puts forward the following product development ideas.(Zhang Kefei, 2006).

1) Traditional inheritance and innovation

Traditional culture and furniture are essential resources of furniture culture and an important source of furniture design ideas. Chinese Ming-style furniture is a treasure of Chinese furniture culture and an important heritage of world furniture culture. Comprehensively or partially inheriting and carrying forward traditions through decomposition, reconstruction and innovation, developing new furniture forms is a crucial way to develop new furniture products. The inheritance and innovation of traditional furniture can be realized in the following ways. (Horseshoe Method et al., 2008).

Retention: This is an antique inheritance achieved through restoration and copying. Using precious woods such as yellow pear, wenge or rosewood, we are faithful to the traditional style and specifications of furniture development. (Q. Liu, 2020)

Inheritance: Inheritance is to retain the basic appearance of traditional forms, improve and change parts under the premise of overall inheritance, and realize the old and new improvement methods

Decomposition: Reorganization and reconstruction of broken classical form elements on the premise of breaking and decomposing traditional forms. Thus acquiring new forms is a development path that is a holistic change, partial inheritance. (Q. Liu, 2020)

Innovation: This is based on the traditional furniture culture, does not pay attention to the inheritance of traditional forms, but pays more attention to the inheritance of traditional culture and concepts to meet the needs of contemporary life in a new form to express the concept and connotation of traditional culture. This is the highest level of the development path. (Q. Liu, 2020)

2) Multifunctional combination of furniture systems

System design thinking is one of the guiding ideas that must be followed in using systems engineering methods to solve product design, and a series of ideas can refer to a way or method. From an overall perspective, the system's people, things, products, environment, society and other elements are comprehensively processed and coordinated. As far as furniture design is concerned, the idea of system design is to regard the single furniture or complete set of furniture as a system, and at the same time, take the elements of product production and product function as a unity, comprehensively consider social, human, economic, technical, physiological, psychological, efficacy, artistic and other elements, in order to meet the comprehensive needs of people to carry out creative design. (Horseshoe Method et al., 2008).

The diverse combination of functions is to organically combine the different functions required by modern life and work through the medium of furniture better to meet the needs of modern work and life to achieve the purpose of comfort, efficiency and safety. Multifunctional combination furniture is an effective way to develop new furniture products under the guidance of system design ideas, and it is also one of the development trends of furniture design in the new century. For example, screen-type semi-open office furniture is a new type of furniture that uses modern office functions such as computers, communication, lighting, word processing, and copying to meet contemporary office needs. For example, the home sound and light cabinet also combines TV, audio, VCD, power amplifier and other multi-functions to meet the needs of modern family cultural life. (Yun et al., 2022)

3) Strengthening and weakening of technology

Mainly through the use of modern new industrial materials, exposing the structure of products, and highlighting the characteristics of new materials and new structures, the furniture is designed as a machine or survey industrial products, breaking the traditional form and striving to make industrial technology close to people's habitual lifestyle and aesthetics, making people easy to accept and produce pleasure. The weakening of technology is the combination of a high-tech core and a low-tech appearance. Although high-tech content is injected into the furniture materials, structure and technology, and the function of the furniture is more in tune with the times, the appearance is still nostalgic for a certain rough and authentic original charm in the remote mountain countryside, showing favour for village style and handmade. For example, the surface of wooden parts is mistreated. The microstructure that highlights the wood texture creates a weather-beaten feeling, undoubtedly the idea of contemporary individual product development. (Horseshoe Method et al., 2008).

2.4 Consumer Data Research

2.4.1 Proportion of furniture users

The proportion of furniture users depends on different factors, such as age, income, family status and place of residence. Some of the available data information is collected through the collection of literature on the Internet.

Affected by various factors, such as the international foreign trade situation and the environment of upstream furniture enterprises, China's furniture industry has slowed growth since 2018.

In 2020, affected by the epidemic, the home furnishing industry was affected to a certain extent, and China's furniture retail sales reached 159.8 billion yuan, down 18.9% year-on-year, as shown in Figure 36 below. (Zhang et al., 2022)

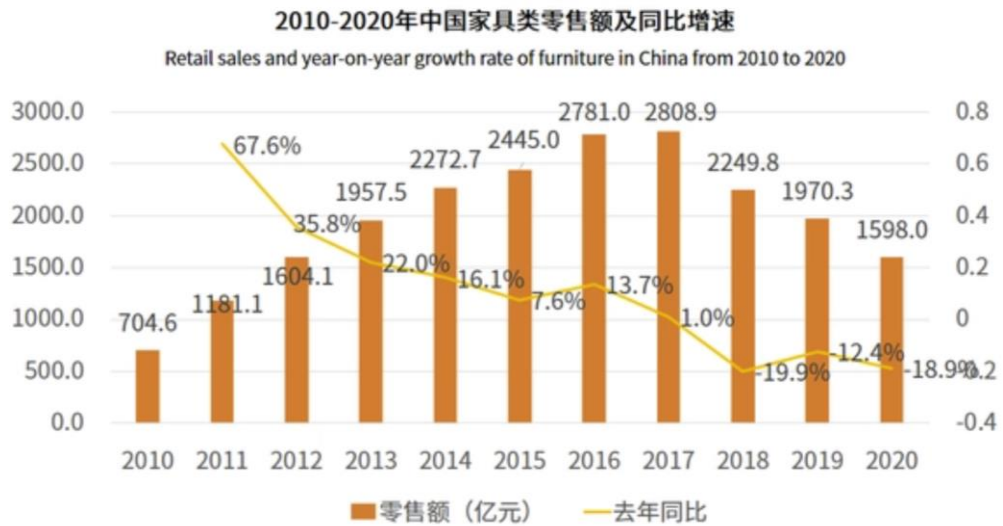


Figure 36 Retail sales growth rate of furniture in China from 2010 to 2020

Design by: www.stats.gov.cn, (2020)

According to the data of China Statistics Network in 2022, the leading consumer groups in China's furniture consumer market are people aged 20-39, of which 49.7% are 30-39 years old and 28.6% are 20-29. These two age groups are China's largest consumer groups, as shown in Figure 37 below. (Zhang et al., 2022)

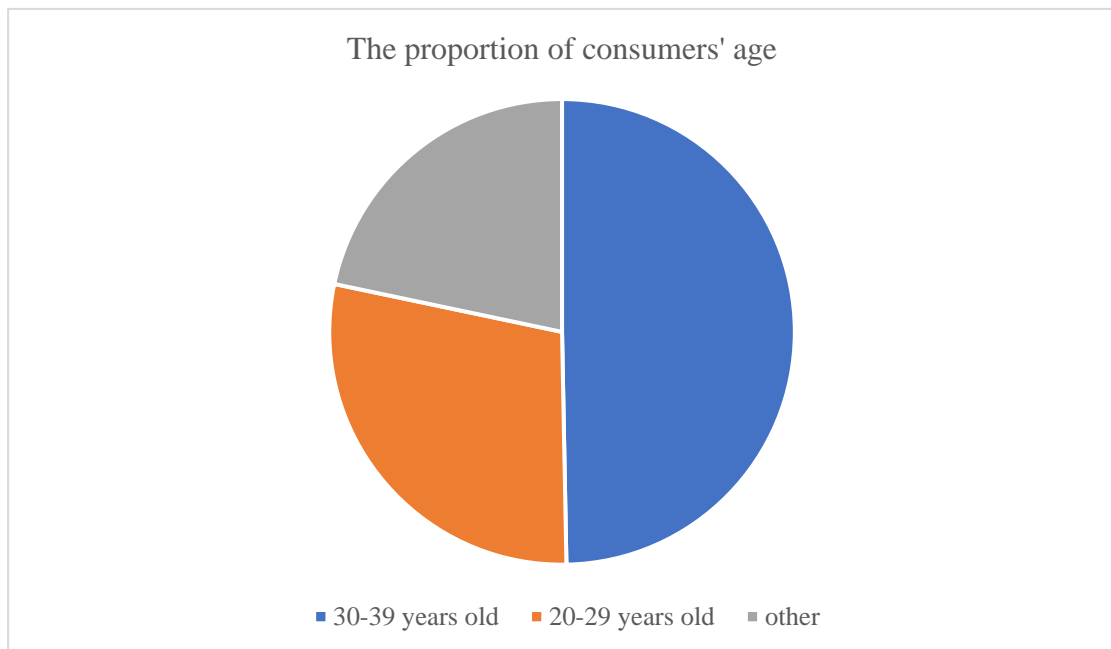


Figure 37 The proportion of consumers' age

Design by: www.stats.gov.cn, (2020)

Therefore, furniture consumers are mainly concentrated in the age group of 30-39 years old. The main reasons include the age group who need to get married or start living independently; they need to buy furniture to furnish their home or apartment; young people are usually more frequent in migration and moving house. They may move to a new city after graduating or relocate frequently as they progress in their careers. Every time they move, they usually need to buy new furniture to adapt to the new home; compared with other age groups, the younger generation usually has higher spending power. They may start their jobs with relatively high incomes and no additional expenses like children's education or retirement savings. This gives them more financial capacity to purchase furniture. (Barbaritano & Savelli, 2021)

The research shows that first-tier cities have the highest concentration of furniture product demand. In 2018, furniture consumption in top-tier cities made up 47.25% of the country's total, a much larger percentage than in other cities. The majority of furniture is purchased by residents of first-tier cities, with second- and third-tier cities well behind. The furniture consumption demand in the first-tier cities is lower than in the first-tier cities. The furniture consumption in the second-tier cities only

accounts for 16.48% of the national proportion, and the third-tier cities are even less, accounting for only 5.95% of the national proportion. as shown in Figure 38 below.(Cai & Aguilar, 2013)

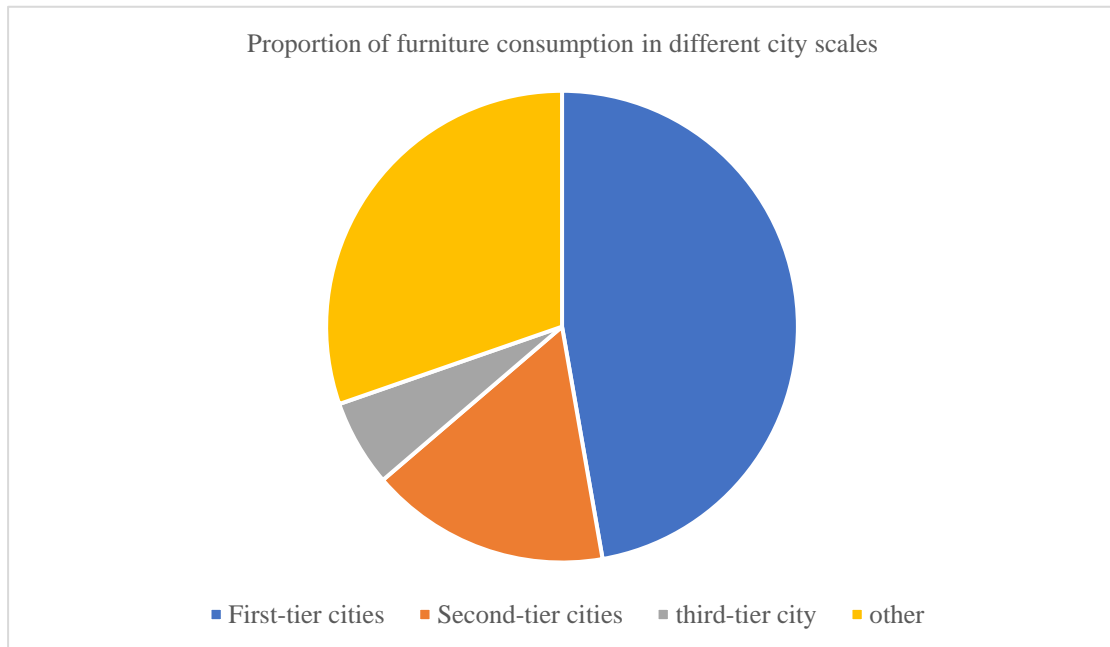


Figure 38 Proportion of furniture consumption in different city scales

Design by: www.stats.gov.cn, (2020)

According to statistics, first-tier cities' income is higher than other cities, and relatively more funds are allocated to purchase furniture. In 2022, 58% of residents in first-tier cities will have a monthly income above RMB 10,000, 29% will have a monthly income of RMB 5,000-10,000, and only 13% will have a monthly income below RMB 5,000. as shown in Figure 39 below.(Zhou et al., 2021)

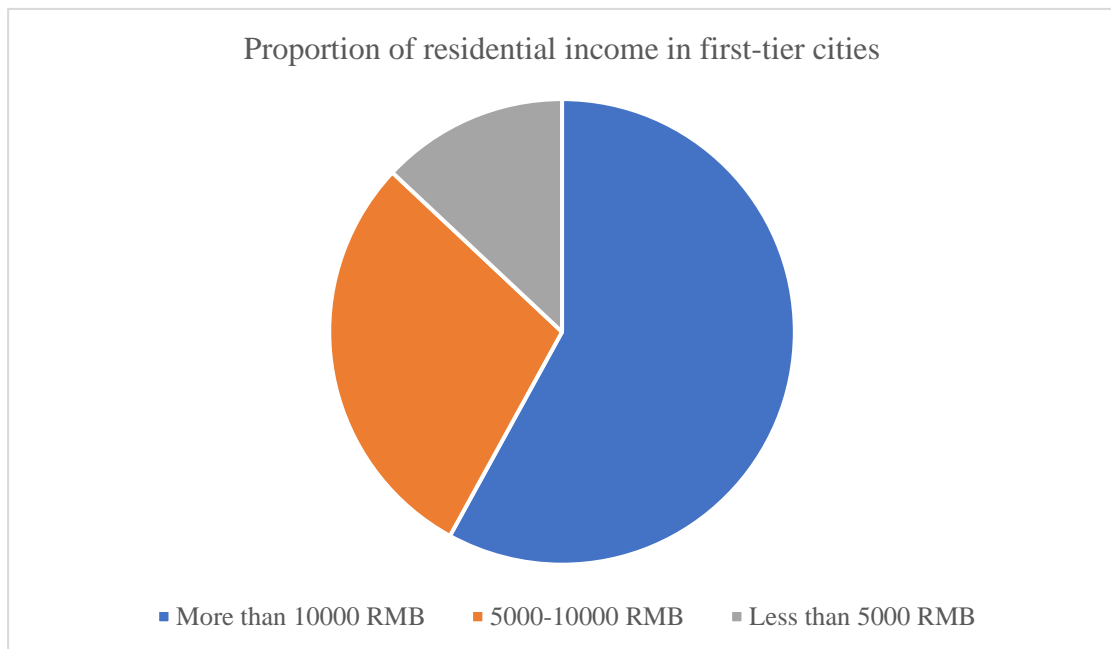


Figure 39 Proportion of residential income in first-tier cities

Design by: www.stats.gov.cn, (2020)

On this basis, through the data survey of how much consumers are willing to spend on furniture, it is concluded that 66% of consumers will spend more than 20,000 yuan on furniture when buying a new house or replacing furniture for the house, and 22% will spend Consumers spend 10,000-20,000 RMB on furniture, and only 12% of users spend 10,000 RMB on furniture. As shown in Figure 40 below. (Zhou et al., 2021)

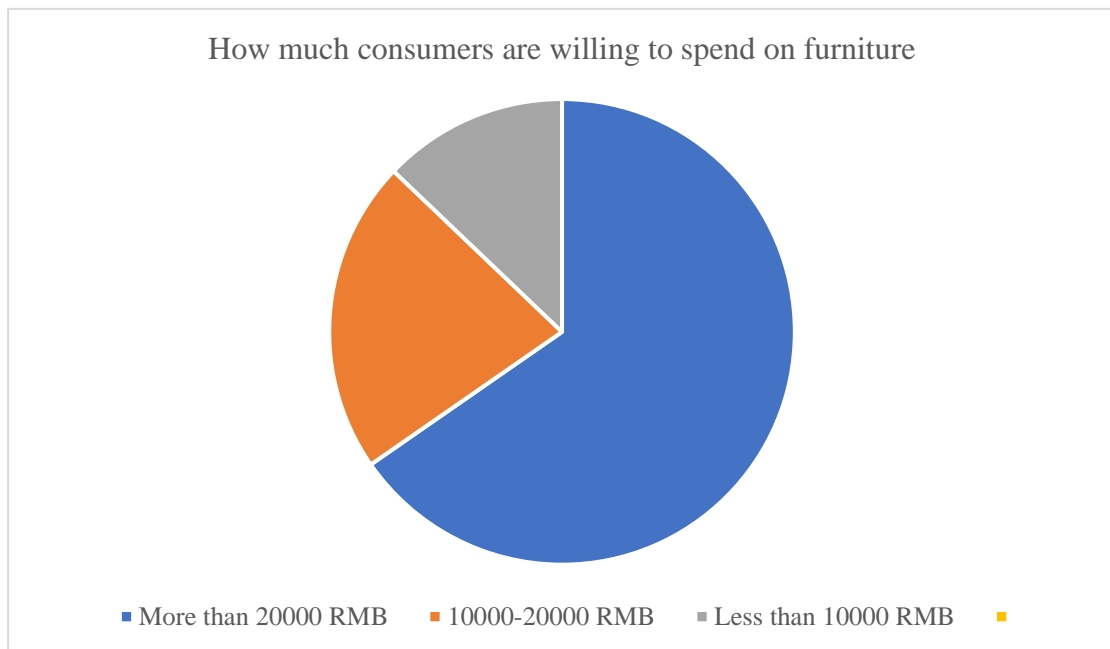


Figure 40 How much consumers are willing to spend on furniture

Design by: www.stats.gov.cn, (2020)

The consumer group is gradually younger, with a broader range of home users. When purchasing household products, young people show advanced consumption concepts and pursue product comfort, and they have the characteristics of high acceptance of new things, preference for appearance and minimalist style, which will bring new traffic to the development of the furniture industry.

Through the analysis and summary of Internet data, the following possible proportions of furniture users can be obtained:

1) Young singles: Young singles often need less furniture because their housing space is usually smaller. They may focus more on the design and aesthetics of the furniture than on functionality. For example, they might opt for simple bed frames, small sofas, and folding tables. They may prefer spending more time and money on furniture for a high-quality and personalized design. (Ponder, 2013)

2) Home users: Home users usually need more furniture to meet the needs of family members. They may focus on the practicality and functionality of the furniture rather than just the appearance. For example, they might opt for large sofas, dining tables, and storage furniture. They may consider the durability and ease of furniture cleaning for everyday use and family life. (Ponder, 2013)

3) Seniors: Seniors may need more comfortable and easy-to-use furniture, such as comfortable chairs and beds that can quickly get in and out. They may focus on the ergonomic design of furniture to improve body comfort and reduce physical burden. For example, they may choose chairs with armrests, easily adjusted beds, etc.

4) High-income people: High-income people may pay more attention to the quality and design of furniture and may be more willing to invest in high-quality furniture. They may choose high-end designer or custom furniture to meet their quest for uniqueness and quality. They may pay attention to the materials and quality of the furniture to ensure its high quality and long life. (Zhang et al., 2022)

5) City dwellers: City dwellers often need more miniature furniture to accommodate smaller living spaces. They may pay more attention to the versatility and space utilization of furniture. For example, they might opt for folding chairs, storage beds, and expandable dining tables. They may consider the versatility of the furniture to maximize their space. (Zhang et al., 2022)

6) Students: Students often need versatile, easy-to-move furniture to suit their learning needs. They may choose furniture that is easy to move and organize, such as foldable desks and chairs that are easy to move. They may focus on the practicality and cost-effectiveness of furniture to fit their usually tighter budgets.

7) Renters often need furniture that is easy to remove and move to accommodate their frequent moving needs. They may opt for furniture that is easy to remove, such as removable bed frames and easy-to-assemble bookshelves, etc. They may focus on the portability and cost-effectiveness of furniture to suit their budget and lifestyle. (Zhang et al., 2022)

8) Office users: Office users often need ergonomic furniture to improve work efficiency and employee comfort. They may choose ergonomic chairs and height-adjustable tables, etc. They may focus on the durability and practicality of the furniture to accommodate long periods of use and frequent mobile needs. (Zhou et al., 2021)

2.4.2 Residential status of the consumer

From the perspective of the total amount, the per capita housing area in my country's cities and towns has reached 40 square meters, and the housing demand of residents has changed from "living with a house" to "living in a good house". If "commercial housing built after 2000" is taken as

the minimum statistical threshold for "good housing", the per capita area of commercial housing for "post-00s" urban residents in my country is about 23 square meters. The economically developed first-tier cities such as Beijing, Shanghai, Guangzhou, Shenzhen and other first-tier cities are at a relatively low level, all 20 square meters or less. Shenzhen, in particular, is only 8 square meters per person. Beijing and Guangzhou perform slightly better, at 16 square meters, respectively. , 15 square meters, the highest saturation in Shanghai, reaching 20.4 square meters. as shown in Figure 41 below.(Lihra & Graf, 2007)

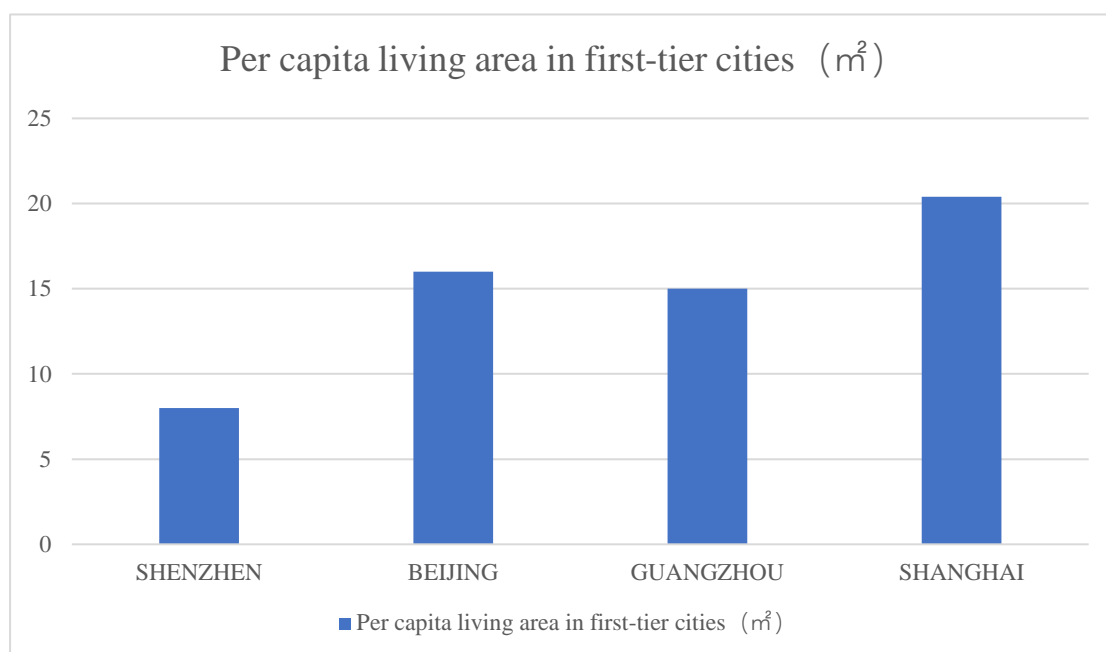


Figure 41 Per capita living area in first-tier cities (m²)

Design by: www.stats.gov.cn, (2020)

The difference in per capita accumulative commercial housing sales area is because, due to differences in housing prices and income levels, the ratio of housing prices to income in central and western cities is relatively low, and the increase in per capita housing ownership is faster than that in first- and second-tier cities. Related to the process of urbanization, first-tier cities with high levels of economic development, on the one hand, have a rapid increase in population size, and on the other hand, they have more old houses before 2000, coupled with high housing prices, resulting in a relatively low per capita housing sales area after 2000. Less; the urban population in central and western cities was relatively small before 2000, and there were relatively few old houses before 2000. With the advancement

of urbanization, the real estate industry has also developed rapidly, and housing saturation has been significantly improved. (Li et al., 2020)

Data research shows that houses in first-tier cities are divided into unit type, apartment type, duplex type, and bungalow type. 41% lived in unit houses, 51% in apartment houses, 7.7% in duplex houses, and 0.3% in bungalow houses. as shown in Figure 42 below.(Zhou et al., 2021)

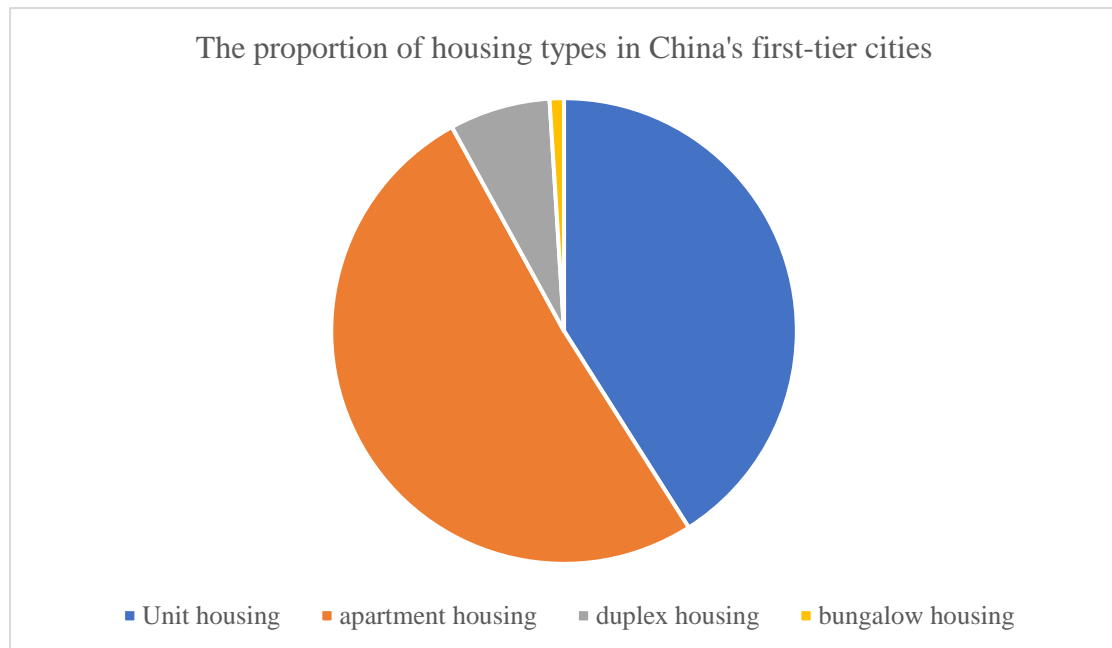


Figure 42 Per capita living area in first-tier cities (m^2)

Design by: www.stats.gov.cn, (2020)

The number of living rooms in first-tier cities is also relatively low, with only 42% of one-bedrooms, 31% of two-bedrooms, 22% of three-bedrooms, and 5% of more than three-bedrooms. as shown in Figure 43 below.(Zhou et al., 2021)

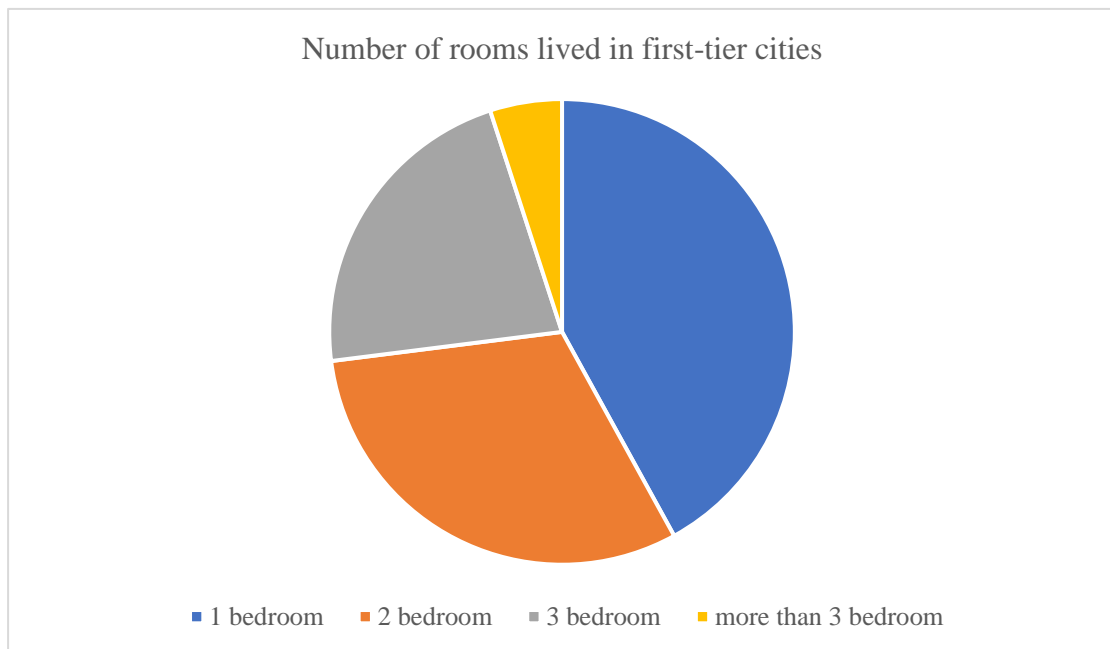


Figure 43 Number of rooms lived in first-tier cities

Design by: www.stats.gov.cn, (2020)

2.5 Wood Furniture manufacturing systems and methods

Wood furniture production is significant in the furniture manufacturing system because wood is one of the primary materials for furniture manufacturing. In furniture manufacturing, wood must be processed and made into different components, such as chairs, tables, cabinets, beds, etc.

Making high-quality wood furniture requires multiple steps, which require experienced carpenters and modern manufacturing equipment. Therefore, it is essential to have a complete furniture manufacturing system which combines all these different steps and elements to ensure a high-quality, efficient manufacturing process. Let us take a look at the specific production process.

Step 1: Cutting, wood cutting.

Log cutting is levelled with the heart of the tree as the base point, the centre height of both sides of the log cannot exceed 10mm, the centre part of the cut with cracks must be made flat, and the cut board ensures the horizontal wire, as shown in Figure 44 below. (Mirka, 2005)



Figure 44 Step 1: Wood cutting

Design by: www.jououoo.com (2020)

Step 2: Retort the plate:

The purpose of the cooking board is to soften the wood, increase the plasticity and moisture content, reduce the cutting resistance during planing, and remove some of the extracts, such as grease and tannins, in the wood. Boiling and soaking wood can change the colour of the wood; Reduce the colour difference between wood core and sapwood; Maintain the natural lustre of the wood; Alleviate the poor gradient of initial moisture content of wood; Reduce the probability of wood drying defects, at the same time, it is not easy to crack after cooking, and also help to prevent corrosion and moth. The plates in the soaking tank must be soaked for three months, changing the water every 20 days while maintaining sufficient pressure on the surface to ensure that the plates are entirely immersed in water, as shown in Figure 45 below. (Ratnasingam, 2022a)



Figure 45 Step 2: Retort the plate

Design by: www.jououoo.com (2020)

Step 3: Dry the plates

Wood drying is an essential process in wood processing and production, and the wood, after proper drying treatment, can improve its mechanical strength and dimensional stability of wood products, Prevent decay, mildew, and moth and reduce cracking, deformation and other losses; It can also improve the decorative and glueing power of paint colouring. The temperature in the boiler must be controlled within 2~4 pressures; the staff must discharge the boiler once a day, keep the hot water system circulating smoothly, and record the boiler temperature in detail every hour in order to determine the date of the furnace, as shown in Figure 46 below. (Ratnasingam, 2022a)



Figure 46 Step 3: Dry the plates

Design by: www.jououoo.com (2020)

Step 4: Furniture cutting

When selecting and unloading, the exact product must keep the colour and pattern consistent and no white edge, especially the front face panel, to keep the colour and pattern consistent. When flattening the material, it must be marked with a ruler to ensure that the wood is flat; if necessary, it must be marked with a ruler in the designated operation area after roasting, and if necessary, it must be marked with a ruler to ensure that the wood is flat, and if necessary, it is levelled after roasting with fire in the designated operation area, as shown in Figure 47 below. (Ratnasingam, 2022a)



Figure 47 Step 4: Furniture cutting

Design by: www.joouoo.com (2020)

Step 5: Furniture making

The production workshop staff makes furniture according to the design department's drawings, divided into line drawing, eye-making, tenon-opening, falling arms, modelling, assembly and other processes. The marking should be carried out in strict accordance with the design drawings, the scribing size should be consistent with the components of the design drawings, and the joints of mortise and mortise should be accurate. When the slope of the sheath belt is found or when the special-shaped material is found, the line is strictly marked according to the size of the template. (Ratnasingam, 2022a)

When punching the eye, the design drawings and the line must match, ensure 90° vertical when the eye is straight, and ensure the accurate slope when the eye is straightened to achieve the depth of the eye is accurate; Eat the thread and leave the thread to ensure accuracy, the size of the skin is accurate, distinguish the large noodles, small noodles, front, and back, and ensure that the colour has no colour difference. Opening the mortise should be consistent with the design drawings and scribing. The mortise and mortise shoulders must match the mortise, and the length of the dark mortise must be 2mm less than the depth of the mortise eye. When falling, strictly implement the size of the design drawings and streaking so that the inner eating line and the outer line are left, the chuck mortise and tenon falling arm must be consistent with the clamp eye, the angle must reach 45 ° when the large corner is reached, and

the knife is not jumped or jumped when the special-shaped arm is dropped to ensure the integrity of the mortise shoulder, as shown in Figure 48 below.(Ratnasingam, 2022b)



Figure 48 Step 5: Furniture making

Design by: www.joouoo.com (2020)

The shape and size of the design drawings must be consistent with the shape and size of the design drawings to ensure uniform thickness, symmetrical concave and convex, smooth back parts of the product, precise plate shape, avoid jumping knives, jump knives, and ensure that the material is smooth and complete, and the depth is uniform. Before assembling the product, make sure that the colour and pattern of the same product are consistent. When assembling the core, ensure that the perimeter waxing is in place and that the diagonal is consistent. The joint of the mortise and eye should be glued and applied evenly; The chuck mortise and eye must be tightly closed, and the corners are complete; When assembling the frame, turn up to ensure that the diagonal lines are consistent. There shall be no traces of hammers and clips on the surface of the product, the corners must be grounded, and it is forbidden to fix them with iron nails; The outflow adhesive should be wiped clean to ensure that the overall product assembly is square and beautiful, as shown in Figure 49 below.(Ratnasingam, 2022b)



Figure 49 Step 5: Furniture making

Design by: www.jououoo.com (2020)

Step 6: Furniture carving.

When the pattern is roughly chiselled, according to the overall intention of the pattern, consider the direction of the pattern line surface and comprehensively process the depth of the pattern to achieve the proportion of the pattern coordination. The knife marks and chiselled scales in the blank are repaired by carving techniques, and the thickness is uniform so that the subtle details of each part of the pattern are displayed, so that the lines are smooth, the depth is even, and the pattern has a three-dimensional sense, as shown in Figure 50 below. (Ratnasingam, 2022a)



Figure 50 Step 6: Furniture carving.

Design by : www.jououo.com (2020)

Step 7: Scrape the furniture

When scraping, adopt a smooth scraping method to ensure that the corners of the scraping are in place so that the edges and corners are transparent, the force should be uniform when grinding, and the surface should be smooth and smooth, as shown in Figure 51 below. (Xiong et al., 2020)



Figure 51 Step 7: Scrape the furniture

Design by : www.jououo.com (2020)

Step 8: Apply the wood paint

When the product is painted, it is required to act quickly, the brush pattern is smooth, the thickness is uniform, there is no flow stone pendant, the brush pattern is smooth, and it cannot be missed. To achieve bright and soft furniture, complete and uniform paint film, no particles, no sagging, and good hand feeling. Moreover, to better reflect the natural grain of the wood and the protection of furniture, the effect of using wood wax oil brushes is generally better. Because wood wax oil is a vegetable oil extracted from plants, environmental protection and health are harmless to the human body, and brushing wood wax oil has friction resistance, mildew and waterproof, anti-cracking, and prolongs the service life of the furniture. It is also beautiful to make furniture, as shown in Figure 52 below. (Xiong et al., 2020)



Figure 52 Step 8: Apply the wood paint

Design by: www.joouoo.com (2020)

2.6 Related research

Related research can help researchers understand the completed research, find relevant variables and methods, and provide references and guidance for their research. Moreover, determine the theoretical basis of research to provide a framework and guidance. It can also provide examples and methods for practical operations and help researchers evaluate their research quality and reliability, thereby improving the scientific and credibility of research.

2.6.1 The author Jing Nan mentioned in the thesis "Research on Chinese Modern Furniture from the Perspective of Inheritance of Design Principles"

The research on modern Chinese furniture should be based on traditional furniture and modern Chinese and Western furniture as the research object, and traditional furniture modern design theory and methods are used. Research purposes, combined with history, art, design, cognitive psychology, and engineering, in-depth research on traditional furniture design principles and their inheritance, performance, and pathway in modern Chinese furniture. It has crucial promotional significance for the modern Chinese furniture industry's transformation and design development. The main conclusions include: 1) The design principles of traditional furniture are familiar with modern furniture design. 2) The research model of modern Chinese furniture from the inheritance of design principles must follow the system's research mode research model: to extract advanced design principles in traditional furniture. It has sorted out the inheritance evolution of modern Chinese furniture from attack and confusion to innovation since the 1980s; combined with the comparison and evaluating related furniture research, it highlights the feasibility and characteristics of design principles inheritance. 3) Traditional furniture design principles that conform to the perspective of modern design mainly exist in function, structure and form, as well as the overall view of iodization. The study of instances, verifying the research theory and methods of traditional furniture inherited from design principles, is feasible. (Nan, 2015)

2.6.2 The author Ye Lu mentioned in the thesis "Inheritance and innovation of Chinese modern furniture design"

The design innovation of modern Chinese furniture must find the most original, core, and irreplaceable part of Chinese design. Therefore, we can innovate the reinterpretation of traditional elements and reflect the unique style of Chinese design. In transforming traditional elements, we must thoroughly consider modern people's lifestyles and use needs, grasp the contemporary pulse of the times, respect and understand the connotation of traditional elements, and extract elements that conform to modern furniture design. For example, the elegant and simple design concept of furniture in the Ming Dynasty, a superficial appearance of the appearance, beauty of the atmosphere this design form makes it worth studying and scrutinizing modern furniture design. In addition to seeking inspiration from

traditional furniture design, you can also seek brand-new ideas from other Chinese art forms. The above point of view simultaneously emphasizes the essence of modern Chinese furniture design and the importance of integration with the times. The environmental pollution of modern society is severe, and resources are gradually lacking. Therefore, while modern furniture design focuses on people's needs, it should protect the environment to a greater extent so that the earth's limited resources can be reused. Against such a background, the concept of "green design" emerged. The so-called "green design" is the entire process of product design, production and use. It fully considers the saving of resources and reduces or eliminates the destruction of the environment. "Green Design" is the core concept of modern design. To develop modern furniture design in innovation, we must firmly grasp this concept and penetrate design design.(Lu, 2018)

2.6.3 The author Yu Dehua mentioned in the thesis "Study on the Art Style of Ming Style Furniture"

From the perspective of design, through the analysis of the design trend of the world today, the design concept of "unified design trend" was proposed to describe the background of the global integration background. Below, the global design style tends to be diversified. The changes in the times have discussed the value of Ming-style furniture art style to modern design and put forward the idea of Ming-style furniture art inheritance innovation: First, the inheritance and development of traditional furniture style, and the other is the innovation and innovation of modern life. The analysis of Nordic furniture design and Japanese aesthetics provides ideas for the value exploration of Ming-style furniture in modern design and proposes the extraction of Ming-style furniture cultural genes. Finally, inheritance and innovation in the sofa and long table series, chair and desk series, F stools, sofa couches and other furniture design practices. Combined with some successful domestic design works, the practice of inheritance and innovation is analyzed from the perspective of three pieces of furniture such as modelling, structure and materials.(Dehua, 2018)

2.6.4 The author Yao yang mentioned in the thesis "Research on Ming-style furniture"

The style of the Ming Dynasty furniture evolved from the form of garden buildings. Whether it is because of the entertainment needs of literati or the needs of aesthetics, it always reflects

the "integration" between products and space. Because the furniture of the Ming Dynasty is a product, it is easier to observe its styling characteristics from the preserved physical and literary images. Through the style elements obtained by the Ming Dynasty furniture extraction, after being applied to the design of modern products, get the following conclusions 1. According to the analysis and understanding of the furniture shape of the Ming Dynasty, the application of the Ming Dynasty style in modern product design has a basis and shape basis. : 2. After analysis of the structure and shape of the various parts of the furniture of the Ming Dynasty, the characteristics contained in the Ming Dynasty furniture are discussed and summarized. Simple, smooth, proportional and rounded characteristics can be widely used in modern product design. After the results obtained from this design research, we can see that the Ming Dynasty style is designed in modern product design, which can present different previous product modelling designs, which provides us with a new product design creative development thinking model. Chinese culture has a long and profound history, but because of such a complex and substantial cultural system, there has not been a complete "Chinese culture" design. After locking in the study of the Ming Dynasty style of cultural ideas and craftsmanship in Chinese history, whether it is the living habits, philosophical trends, craft product design and the style characteristics of the furniture of the Ming Dynasty, it shows the resources contained in ancient Chinese culture. Fortune is waiting for us to dig and apply. (Yang, 2002)

2.6.5 The author Xu Jifeng mentioned in the thesis "Research on Harmonious Design System of Modern Chinese Furniture"

People have a social (environment) system that constitutes modern Chinese furniture's material system and design behaviour's element system. This article is in the system in the system. Based on each element's materiality and value demands, modern Chinese furniture is included in a system composed of a person with a society and a natural (environment). Discuss the value orientation of the design, the principles and the theoretical methods of the design so that the design of modern Chinese furniture is not only solved by a specific problem but based on clarifying the value goals of the value goals. Integrating various system elements adopts comprehensive, systematic and cross-analysis methods to achieve the harmony of the overall system. Modern design ways are systematic and hierarchically logical analyses; that is, they define the design concept from the overall system, determine the

corresponding design methods for different levels, and finally implement the design goals step by layer. This study proposes the "three views" of the harmonious design system through the analysis of the composition and their relationships in a social (environment) of a person in a society and a natural (environment): a macro level, a mid -view level and a micro level, from the design concept, from the design concept, the design concept, the design concept, Explore the specific theories and methods of harmony at the level of methods and forms, and combine the concepts of sustainable design and green design concepts, types of scientific methods, and people due to analysis, morphological theory, etc. sex. Establishing the system analysis method for the harmonious design of modern Chinese furniture helps form a clear and precise design thinking context by converting the design method into a method of solving the system constitutional relationship. (Jifeng, 2009)

2.7 summary

This chapter first conducts literature research on traditional furniture culture and summarizes and sorts out the characteristics of Ming-style furniture. In-depth literature collection and analysis of the significant aspects of decoration and science. Then we combed the historical overview of contemporary Chinese furniture and tried to propose the artistic style of Ming-style furniture in terms of modelling, materials, and functions of innovative inheritance in Chinese contemporary furniture design. Finally, the new materials of contemporary furniture were collected and studied.

The innovation and innovation of Chinese furniture should also stand on the shoulder of Ming-style furniture that develops into the peak of traditional Chinese furniture, but it is not to copy and imitate it. Get inspiration and inspiration from it, and get new power. In recent years, Chinese, new Chinese, cultural design and other design vocabulary and design trends with Chinese cultural genes have emerged. Designers are trying the development trend of Chinese furniture design.

CHAPTER 3

RESEARCH METHOD

In a study on "Contemporary Chinese furniture design of Integration and Coexistence", the researcher conducted an in-depth study on applying Ming Dynasty furniture design concepts. Bring to remove the identity to have a contemporary aura for the general public to access the contemporary from past cultures. In this research, there was a 3-step process according to the stated objectives as follows.

1. Study data to create design requirements.
2. Stage of design Product development and prototyping.
3. A study of the satisfaction of the target group of consumers toward the product.

3.1 Study data to create design requirements.

The information in this section studies various parts of the literature, Internet search. Including the needs of the target sample. In order to create the design requirements With the following issues.

3.1.1 Population and sample

This study conducted a data survey for the target consumer group to analyze the design of contemporary Chinese furniture and meet the current demand status. A total of 4 data have been collected; The Internet and consumers survey these four data. The source of the Internet data and the China Statistics Bureau, including consumers' preference data for materials, attention to Chinese brands, users' attention to furniture use scenarios, and consumer questionnaires. A total of 158 copies were collected, with 156 valid data. The data included the proportion of consumers interested in contemporary Chinese furniture.

3.1.2 How to create tools

Consultation and analysis of information studied mainly in the furniture sector with the advisor. Including directly using data from the furniture demand survey in China during 2009-2019 in the past.

3.1.3 Tools used in research

Consultation with a research advisor at every stage since the design prototyping improvement and putting it to the real test Including tools to record observations and interviews by

measuring and evaluating the effectiveness of the tools. (Create a tool through IOC determination, and/or certified consultants prior to use).

The examiner evaluated the questionnaires used.

- 1) professor He renke
- 2) Professor Tong Huiming
- 3) Professor Wu Hongmin

Use IOC = (Np - Nd) / Np

Set the following marking objectives.

Np represents all target scores in the project plan

Nd means the number of targets inconsistent with the plan criteria for a consistency index of no less than 0.5 as follows.

Rating: +1 indicates confidence that the question is entirely consistent with the definition of the intended term

Rating: 0 shows doubtful uncertainty that the master meets the plan objectives and intent of terms

Rating: -1 suggests that the project plan is wholly inconsistent and that all goals are inconsistent with the plan

By upgrading the questionnaire to a consistency index equal to 1.00

3.1.4 Method of collecting data

1) Distribute the questionnaire for the participants to write and answer, and the researcher collects the results himself

2) Recording both still images and videos during the training.

3.1.5 data analysis methods

1) Expert group. Use the descriptive writing method to analyze together.

2) Statistical study data from consumers using statistics as percentages(%) in data analysis.

3.2 Stage of design Product development and prototyping.

The information in this section brings the conclusions obtained from the analysis to create the design requirements. There are steps in different sections as follows.

3.2.1 Population and sample

Experts in the relevant fields will consider the populations and samples in this section, which consists of expert groups.

1) Population is an expert who has been designing cultural designs for ten consecutive years.

2) The sample group is experts in the following areas:

Professor He Renke, a professor and PhD advisor at Hunan University's School of Design and Art. Chairman of the Ministry of Education of China's Industrial Design Teaching Guidance Subcommittee and participant in the Discipline Evaluation Group of the Academic Degrees Committee of the State Council. Hunan University's School of Design and Art's Academic Committee Chairman, the Hunan Design Artists Association Chairman, and an invited vice chairman of the China Industrial Design Association, Chairman of the China Machinery Industry Education Association's Industrial Design Teaching Committee, judge for the American CORE77 Design Award, the German Red Dot Design Award, the IF Design Award, the Japan G-MARK Design Award, and the China Industrial Design Red Star Award. He has received the title of a national teaching teacher, first place in the national teaching achievement award, and first place in the national teaching material.

Professor Tong Huiming is a professor and a postgraduate tutor at the Guangzhou Academy of Fine Arts' School of Design. He earned a bachelor's degree in literature from the Central Academy of Arts and Crafts in June 1983, and a master's degree in literature from the Guangzhou Academy of Fine Arts in June 1986. Member of the China Artists Association's Industrial Design Art Committee, Executive Director of the China Industrial Design Association, Vice President of the Guangdong Industrial Design Association, and Director of the Guangdong Higher Education Institutions' Industrial Design Teaching Steering Committee. Expert on the Experience Design Professional Committee of the Guangdong Industrial Design Association; Chairman of the Jury Committee for the fifth and sixth "Governor's Cup" Industrial Design Competitions of Guangdong Province; Chairman of

the Expert Committee for the Guangzhou "Kapok Design Award"; and judge for numerous domestic and international design competitions. Design research has recently concentrated on a variety of topics, including design strategy, brand development, brand design image, product innovation design, and other areas.

Professor Wu Hongmin, Professor, Master Tutor, Dean of the Academy of Fine Arts of Gannan Normal University, Director of the Provincial Industrial Design Center of Gannan Normal University, Jiangxi Province Hundred Thousand Talents Project, China Design Industry Outstanding Contribution Award for Young and Middle-aged Academic Leaders of Jiangxi Province Colleges and Universities and Young and Middle-aged Backbone Teachers of Jiangxi Province Colleges and Universities. National Member of the China Packaging Federation, Vice President of the Jiangxi Industrial Design Society, Director of the Industrial Design Branch of the China Mechanical Engineering Society, and Deputy Director of the Jiangxi Packaging Federation's Design Committee.

3.2.2 How to create tools

The design will consist of 3 phases:

1) Phase 1 included two sets of new designs based on the data obtained from the study data.

2) Phase 2 has been developed and improved, leaving three approaches.

3) Phase 3 finalization and prototyping.

Consult with an advisor, including creating a questionnaire to assess by measuring and evaluating the tool's effectiveness. (Build tools through IOC review and certified consultants prior to use.)

The examiner evaluated the questionnaires used.

1) Professor He Renke

2) Professor Tong Huiming

3) Professor Wu Hongmin

Use $IOC = (N_p - N_d) / N_p$

Set the following marking objectives.

N_p represents all target scores in the project plan.

Nd means the number of targets inconsistent with the plan criteria for a consistency index of no less than 0.5.

Rating: +1 indicates confidence that the question is entirely consistent with the definition of the intended term.

Rating: 0 shows doubtful uncertainty that the master meets the plan objectives and intent of terms.

Rating: -1 suggests that the project plan is wholly inconsistent and that all goals are inconsistent with the plan.

By upgrading the questionnaire to a consistency index equal to 1.00.

3.2.3 Tools used in research

The testers are respondents with both open-ended and closed-ended information.

3.2.4 Method of collecting data

1) Distribute the questionnaire for the participants to write and answer. and the researcher collects the results himself

2) Recording both still images and videos during the training.

3.2.5 data analysis methods

Information obtained from experts. Use the method of collecting qualitative research results by writing method. individual lecture.

3.3 A study of the satisfaction of the target group of consumers.

In this step, the created prototype will be used to study the satisfaction of interested target consumers. From January 10th to 15th, 2023, the product exhibition will be held in Suzhou, Jiangsu Province, China. The exhibition's theme is "Using the Past for the Present: Exhibition of Design Achievements of Traditional Cultural and Creative Products".

3.3.1 Population and sample

People interested in cultural events

1) Population groups are general consumers. Who are interested in bringing identity from Chinese furniture culture into product design

2) The sample group is 180 people interested in buying furniture.

3.3.2 How to create tools

Consult the research advisor to create a questionnaire to study the design results. Moreover, evaluate the tool's effectiveness (Build tools through IOC review and qualified consultants before implementation.)

The examiner evaluated the questionnaires used.

- 1) Professor Mo Junhua
- 2) Associate Professor Yang Yan Shi
- 3) Associate Professor Dr Xianwei Feng

Use $IOC = (N_p - N_d) / N_p$

Set the following marking objectives.

N_p represents all target scores in the project plan.

N_d means the number of targets inconsistent with the plan criteria for a consistency index of no less than 0.5.

Rating: +1 indicates confidence that the question is entirely consistent with the definition of the intended term.

Rating: 0 shows doubtful uncertainty that the master meets the plan objectives and intent of terms.

Rating: -1 suggests that the project plan is wholly inconsistent and that all goals are inconsistent with the plan.

By upgrading the questionnaire to a consistency index equal to 1.00.

The examiner evaluated the questionnaires used.

- 1) Professor He Renke
- 2) Professor Tong Huiming
- 3) Professor Wu Hongmin

3.3.3 Tools used in research

The testers are respondents with both open-ended and closed-ended information.

3.3.4 Method of collecting data

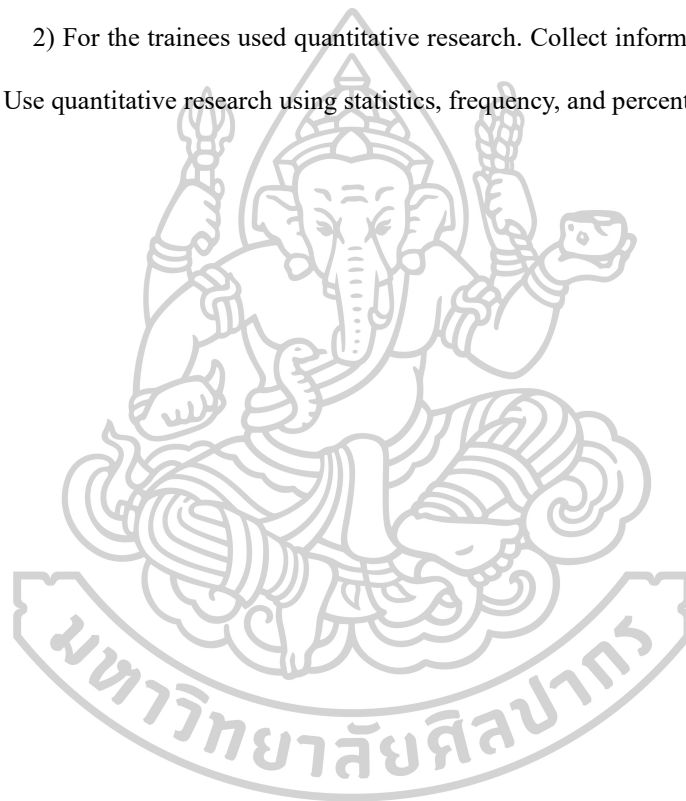
1) Distribute the questionnaire for the participants to write and answer. And the researcher collects the results himself

2) Recording both still images and videos during the training.

3.3.5 data analysis methods

1) Information obtained from experts. Use the method of collecting qualitative research results by writing method. Individual lecture.

2) For the trainees used quantitative research. Collect information from writing to the questionnaire. Use quantitative research using statistics, frequency, and percentage (%) in data analysis.



CHAPTER 4

RESEARCH RESULTS

This chapter will study the comparison and re-innovation of contemporary Chinese furniture based on Ming-style furniture. The results will analyze the data and design the results of the research. Based on the framework of the research goals, the researchers conducted research using established research methods. The specifics are as follows. Study furniture during the Ming Dynasty and study related backgrounds to create products that meet the needs of consumers. Design and develop new furniture according to the standards of relevant experts, and use it to develop, improve, and create design prototypes. Study the satisfaction of the target consumer by collecting data from the exhibition.

4.1 Study furniture during the Ming Dynasty and study related backgrounds to create requirements that meet the needs of consumers.

The information in this section is to study different parts of information so that these data can be used for design. Researchers require a summary of literature analysis and Internet data, including the needs of target samples. The analysis results and research results are as follows.

4.1.1 Literature and Internet search results and analysis summary of Chinese Ming Dynasty furniture and contemporary Chinese furniture.

After the collection of traditional Chinese furniture literature, especially the analysis and summary of Ming Dynasty furniture, a series of results are obtained: Ming Dynasty furniture is the most glorious period in the history of Chinese furniture, and the style of Ming Dynasty furniture is the highest standard of Chinese classical furniture. Ming Dynasty furniture is an excellent heritage of the material culture of Chinese feudal society. The furniture of the Ming Dynasty has its unique historical significance in terms of artistic style and value, such as craftsmanship, shape, and decoration. It is unique and self-contained. (Ye et al., 2022)

One of the characteristics of the Ming Dynasty furniture style: concise shape and line-based. The proportions of Ming Dynasty furniture are extremely well-proportioned and coordinated. For furniture such as chairs and tables, the height, length, thickness, and width of the upper and lower parts of the legs, slats, backrest, and headrest are all impeccably symmetrical and coordinated and are in line

with the functional requirements. , there is no redundant burden; the overall feeling is the combination of lines. The combination of rigidity and softness, the lines are straight but not rigid, soft but not weak, showing the beauty of simplicity, simplicity, elegance and generosity. The second characteristic of Ming Dynasty furniture style: is rigorous structure and fine artistry. The mortise and tenon structure of Ming Dynasty furniture is very scientific. No nails and less glue are used, and it is not affected by natural conditions (wet or dry). Between the parts with large spans, dental boards, dental strips, etc., are inlaid, which is beautiful and strengthens the firmness. Today, after hundreds of years of changes, Ming Dynasty furniture is still as strong as ever, which is enough to reflect the high scientific nature of its structure. The third feature of the Ming Dynasty furniture style: moderate decoration, simple and complex. Ming Dynasty furniture has a variety of decorative techniques and decorative materials. However, we will always be generous for more piles and elaborate carvings but make appropriate partial decorations according to the overall requirements. Keep the whole simple and delicate. It can be described as appropriate and decent, the icing on the cake. The fourth characteristic of the Ming Dynasty furniture style is the hardwood, with beautiful texture. The hardwood furniture of the Ming Dynasty made full use of the texture advantages of wood and brought into play the natural beauty of the hardwood material itself. Most presented hazy images, such as feathers and animal faces, giving people endless reveries. Most of its materials are high-grade hardwoods such as huanghuali and red sandalwood, which have natural beauty in tone and texture. The craftsmen do not add or make large-scale decorations except for meticulous artistry. They make full use of the colour and texture of the wood itself to form its own unique style and aesthetic taste. These points are the most critical features of the Ming Dynasty furniture style. However, the characteristics of simplicity, elegance, natural simplicity, and superb craftsmanship established the critical position of Ming Dynasty furniture in the development history of Chinese traditional furniture. (Ellsworth, 1998)

The results of the analysis of Ming Dynasty furniture show that Ming Dynasty furniture has high research value. The research points are divided into four parts: strict structure, simple shape, moderate decoration and mainly wood. Therefore, it determines the direction for the next part of the design, as shown in Figure 53.

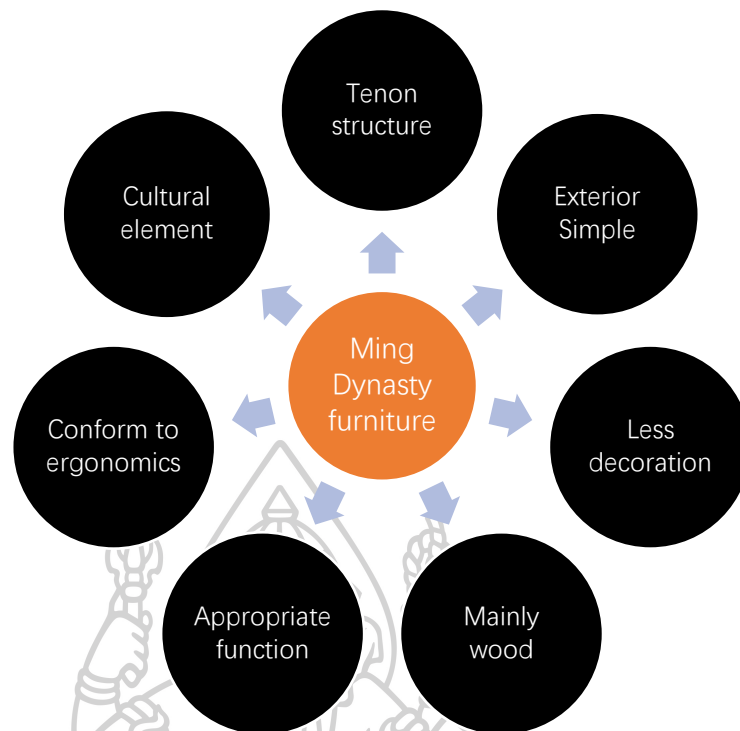


Figure 53 Combing map of furniture keywords in Ming Dynasty

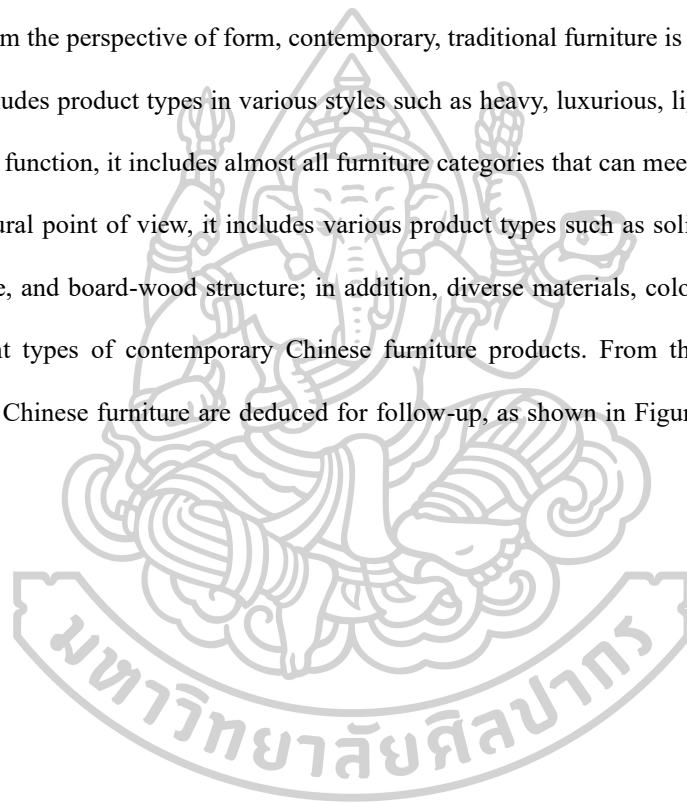
Design by : Chen Yanbin,(2023)

Contemporary Chinese furniture is a part of Chinese furniture and generally refers to furniture products with traditional spirit and temperament formed since the founding of the People's Republic of China. With the advent of perceptual consumption, perceptual elements such as style aesthetics have gradually become an essential factor in furniture consumption decisions, which is of great significance to contemporary Chinese furniture design. With the continuous evolution of aesthetics and fashion trends, consumers' demand for furniture shows a trend of diversification and individualization. Contemporary Chinese furniture, as a design style carrier with a strong sense of the times and national cultural characteristics, is evolving. Continuous development and national characteristics determine the natural emotional recognition and acceptance of contemporary Chinese furniture styles by contemporary Chinese consumers, and the extensive and profound traditional Chinese furniture culture provides rich materials for contemporary Chinese furniture design.(Jifeng, 2009)

The study of contemporary Chinese furniture design is a modern furniture style that integrates design, sensibility, engineering, and aesthetics. Due to the relatively short research time, design

concepts and methods are becoming increasingly mature with the continuous advancement of science and technology. Whether the contemporary Chinese furniture style is a stable design style or a "flash in the pan" remains to be tested over time, but the self-awakening of Chinese aesthetics emerging in the wave of Chinese furniture design is the general trend. (Yantao & Zhongwu)

The literature summary of contemporary Chinese furniture in the early stage shows that it has undergone a multi-dimensional innovation process and finally formed a product system with multiple shapes, functions, structures, materials, cultures, ergonomics, and decorations, as shown in Figure 49. From the perspective of form, contemporary, traditional furniture is dominated by simplicity, but it also includes product types in various styles such as heavy, luxurious, light and simple; from the perspective of function, it includes almost all furniture categories that can meet contemporary lifestyles. From a structural point of view, it includes various product types such as solid wood frame structure, panel structure, and board-wood structure; in addition, diverse materials, colours and decorations also shape different types of contemporary Chinese furniture products. From this, several keywords of contemporary Chinese furniture are deduced for follow-up, as shown in Figure 54. (Shuang & Ismail, 2021)



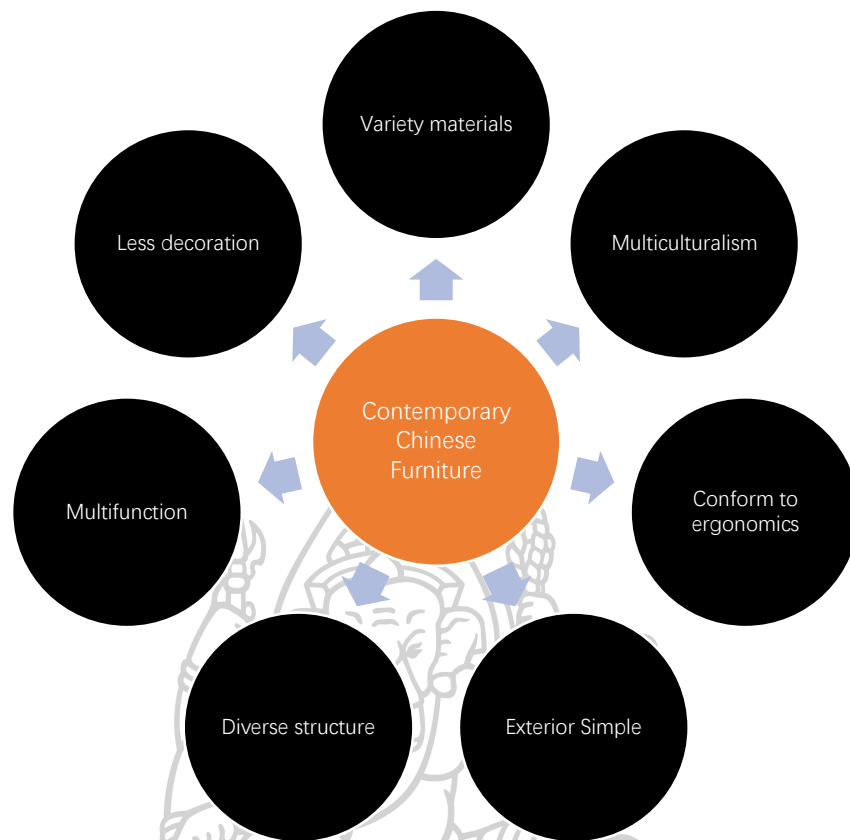


Figure 54 Keyword combing map of contemporary Chinese furniture

Design by : Chen Yanbin,(2023)

According to the collection of previous documents, case studies will be carried out from six aspects of Ming-style furniture: culture, ergonomics, shape, material, function, and structure, to summarize how Ming-style furniture is integrated and symbiosis into contemporary Chinese furniture.

4.1.1.1 Analysis from the cultural perspective.

Many shapes of Ming-style furniture are derived from some specific things in the Ming Dynasty. as shown in Table 5.

Table 5 Cultural elements contained in Ming-style furniture

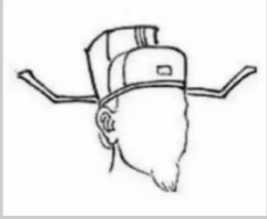








Official hat chair	Cross chair	Half table
		
 	 	 

Table 5 revealed that, for instance, the official hat chair's shape is derived from the top of the backrest and is reminiscent of an ancient official's hat, suggesting that the person seated in the chair is similar to someone who is donning an official hat. The Ming Dynasty's furniture design was influenced by the idea that official hats are often high in position and weight. The upper chair remains unchanged. The Ming Dynasty's highest chair has a lovely and smooth shape. A gentle curve may be seen in the chair circle. A "goose head scorpion" is created on both sides of the armrest using the goose head and beak. The Ming Dynasty's half tables, which emphasize the leg's shape, are no different. Horseshoes with their heads turned outward are known as everted horseshoes, and those with their legs bent inward are known as inward-turned horseshoe legs. A delicate line running from the leg to the toe is known as the horseshoe leg. It is smooth and organic, light and strong. It appears strong and robust and complies with mechanical property criteria. The horseshoe, which contains life, is turned up. The leg is more lucrative because of its pointed tip. Vigorous. It is one of the common designs that reflects the design elements of Ming and Qing classical furniture. (Ellsworth, 1998)

These features are typical cultural manifestations of Ming-style furniture, which contain a lot of humanistic culture and customs, and are worthy of deliberation and reference in contemporary furniture design.

4.1.1.2 Analysis from the perspective of ergonomics.

The ergonomics of Ming-style furniture are very well thought out. For instance, the seat surface, armrest, brain, and backboard make up the majority of the official hat chair from the Ming Dynasty. When we sit on the official hat chair, our weight is divided between our arms and buttocks and thighs instead of just our legs and feet. Department and leader. The official hat chair's headrest and backboard make a "S" shape when viewed from the front, resembling the human spine's natural curve. The backboard and headboard represent the thoracic and lumbar vertebrae, respectively, and the headboard represents the cervical spine. It corresponds to the head's occipital bone. The cervical spine and occipital bone can transport the gravity of the head to the brain when the human body is seated, allowing the pelvis and spine to lose their upright positions. The thoracic and lumbar spine can also rely on the curved surface of the backboard to relax. The official hat chair's great design honors the morphological traits and fundamental requirements of human limbs. The numerous elements and their interrelationships accurately reflect human sitting behavior needs as well as comfort and health. It is definitely deserving of modern The drawing of the furniture is depicted in Figure 55.(Smardzewski & Smardzewski, 2015)

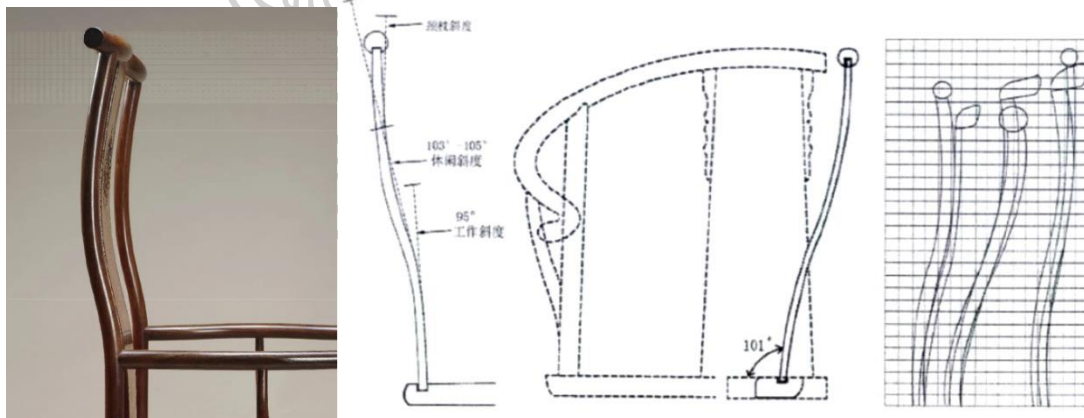


Figure 55 Ergonomics study of Ming-style furniture



Design by : Chen Yanbin,(2022)

4.1.1.3 Case transformation analysis of modeling perspective.

Aesthetic modelling is a unique form for human beings to understand the world. It refers to the non-utilitarian, figurative and emotional relationship between people and the world. There

are also specific changes in aesthetic modelling in different eras. Although Ming-style furniture has simple styling features, in the contemporary era, people are pursuing more extreme simplicity, and more consumers hope to keep the classic Ming-style streamlines in a more straightforward shape, so a small number of designers have begun to study, as shown in Table 6.(Cai & Aguilar, 2013)

Table 6 Comparison of modeling cases between Ming-style furniture and contemporary Chinese furniture.

Circle chair	Magnolia chair
	
<p>The circle chair is the most classic in Ming-style furniture. Ming-style circle chairs, simple and elegant shapes, simple and smooth lines, and production skills have reached a high level. "The sky is round, and the ground is square" is a typical concept in Chinese culture and is also integrated into furniture design. Circle chairs are a combination of squares and circles. The upper circle is the main melody. The circle represents harmony and symbolizes happiness. Fang is stable, and the circle chair perfectly reflects this concept. From the aesthetic perspective, the Ming Dynasty's circle chairs are beautiful and linear, similar to calligraphy art. The visual effects are in line with the aesthetic views of modern people.</p>	<p><i>Magnolia chair</i> is a contemporary Chinese furniture designed in 2018. The design curve is varied, with different arcs, and the vitality is different. Either round and soft, jump dynamic, or intelligent. In terms of function, the vitality and sitting sense, touch, grip and other experiences of the curve are combined. In terms of material, the curve's change is in the limit's boundary, making the texture lines more beautiful. In terms of aesthetics, the curved curve is natural and achieves a balance. In the design, the designer turned the curve of the circle chair into an accessible and dynamic one.</p>

From Table 6, it was found that "Magnolia Chair" is a modern design of the traditional Chinese "circle chair", and the armrests and stool legs of the circle chair are simplified from the perspective of contemporary aesthetics, retaining the classic streamline of the armrests of the circle chair. At the same time, the armrests and legs were redesigned to make the chair lighter and more straightforward, which is more in line with the needs of contemporary aesthetics. This contemporary Chinese furniture combines modernity and tradition from an aesthetic point of view. It balances yin and yang, harmonious coexistence of rigidity and softness. This is an excellent example of a work that combines traditional and modern techniques.

4.1.1.4 Case transformation analysis from material perspective.

Before the industrial revolution, furniture materials were almost all natural materials. After the modern industrial revolution, new material technologies and applied products have sprung up in China. As daily consumer goods, traditional furniture materials are gradually replaced by modern materials with less usage and lower cost, such as chipboard, fiberboard, glass, plastic, metal, etc. Consumers also hope to use modern materials to a certain extent while retaining Ming-style classic shapes, so a few designers have started research, as shown in Table 7.

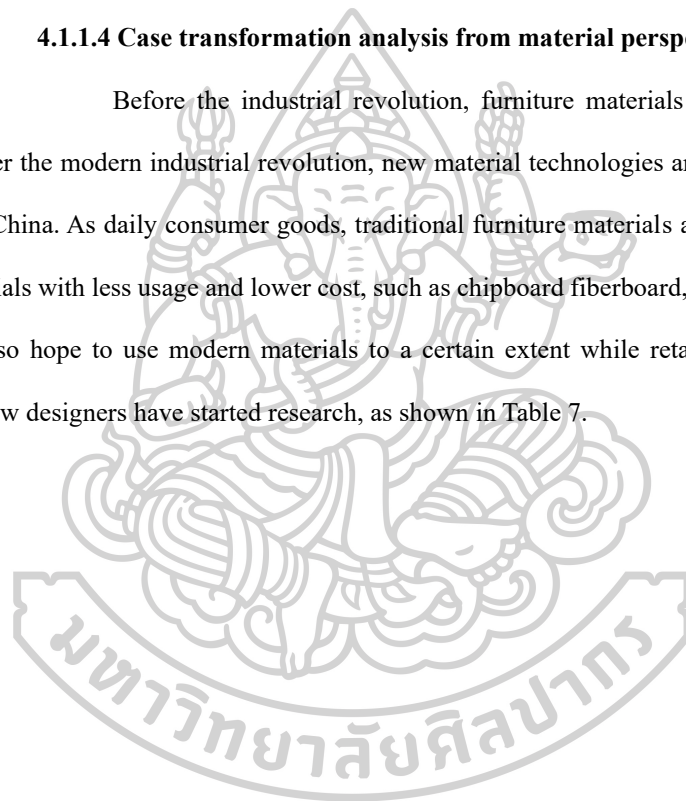




Table 7 Comparison of materials between Ming-style furniture and contemporary Chinese furniture

Circle chair	"Life First" furniture brand - Yunlong chair
	
<p>The circle chair is the most classic in Ming-style furniture. Ming-style circle chairs, simple and elegant shapes, simple and smooth lines, and production skills have reached a high level. "The sky is round, and the ground is square" is a typical concept in Chinese culture and is also integrated into furniture design. Circle chairs are a combination of squares and circles. The upper circle is the main melody. The circle represents harmony and symbolizes happiness. Fang is stable, and the circle chair perfectly reflects this concept. From the aesthetic perspective, the Ming Dynasty's circle chairs are beautiful and linear, similar to calligraphy art. The visual effects are in line with the aesthetic views of modern people.</p>	<p>The Yunlong chair is the "Life First" furniture brand; the inspiration for the Yunlong chair comes from the Yunlong pattern on the ancient bronze wares and the jade. Its symbolism of it is very distinctive, suitable for living rooms, noble temperament and authority. It is also a contemporary design of traditional Chinese "circle chairs" and creates classics in the classics. Based on regional and international, symbolic and spiritual, practicality and ornamental.</p>

From Table 7, it was found that the "Yunlong chair" is a contemporary design of the traditional Chinese "circle chair" with "Subversion" on top of traditional furniture and "innovation" on top of modern furniture. Combining modern laser technology with traditional handicrafts, unique ingenuity on brass, the artistic language of movement and static, virtual and real, loose and dense, straight and curved, rigid and

soft is naturally and vividly applied to the body, the work is atmospheric and elegant, dashing and precise, reflecting extraordinary modelling skills and artistic accomplishment, and retaining the shape of the circle chair itself and the ergonomic streamline of the back panel, and combining the application of modern metal materials. Adding soft materials to the cushions combines advanced craftsmanship with traditional artisan culture to define contemporary Chinese furniture's design boundaries and lifestyles.

4.1.1.5 Case transformation analysis from functional perspective.

The home space in the 21st century is diverse, and the demand for furniture is correspondingly enriched. Combined furniture, folding furniture, etc., began to rise. On the other hand, the housing area in first-tier cities is decreasing, and more and more people are living in small apartments. The role of folding furniture is beginning to appear. Folding furniture is mainly furniture that can compress items with a large area or volume as much as possible through folding. It breaks through the design mode of traditional furniture. It is pragmatism without exception, flexible and free to use, and has multiple functions, which can free up much space for the living room. These practices not only highlight the functional design ideas of traditional furniture but also transform and expand the original functions according to modern needs. It attempts to introduce traditional furniture into modern life, as shown in Table 8.



Table 8 Comparison of functional cases between Ming-style furniture and contemporary Chinese furniture



Traditional maza and bench furniture	"Spring In" furniture brand Zanzhi series of furniture
	
<p>The Maza stool is the oldest traditional sitting gear in history. During the Ming Dynasty, it developed to its peak. The Ming-style Maza was composed of only eight straight materials. Metal decoration. The simple Maza stool is not a nobleman in traditional furniture, but it is the people of the people and the most close to the people. Making, moving, storing casually, and reaching out is simple. Ming-style gown style is lightweight and has various practical functions. The seat surface is refreshing and ventilated. It can also be used as a cool and lying. Regarding the shape of this stool, the board's surface can also be used for placing items. It is a relatively rare category in Ming-style furniture. It is combined with tenon -and mortise, and wood stitching, which is tight, stable, beautiful, and durable. It is the essence of Ming-style furniture.</p>	<p>Spring is called "Spring in China" with "New Oriental Style" in the Chinese bamboo face. It uses vivid methods to cut in from a new perspective to promote the essence of traditional Chinese home furnishings. Combining various traditional functional furniture while striving to inherit the traditional Oriental charm in natural scenes. Brand designers are good at discovering the spiritual characteristics of the culture and finally combining a new design through modern interpretation. This seems to be the "likes and dislikes" evaluated by Qi Baishi, which can be called the realm of art.</p>

Table 8 shows that the bench with maza of the "Zanzhi" series of the "Spring In" furniture brand is a multifunctional piece of furniture that includes a maza and a bench and is composed of different monomers. Interestingly, the single function of traditional furniture is transformed and extended here, which is also the practice often used in modern furniture in functional innovation. This piece of "Spring in Spring" furniture combines the essential functions of traditional Chinese maza and Changdeng while transforming the function of the maza so that its original sitting surface becomes a carrying tray. When the rack is moved, the bench seating space is divided to meet different needs. The function of the traditional bench is thus extended.

4.1.1.6 Case transformation analysis from structural perspective.

"A good product must have much to do with classic structures and materials." This point of view describes the inheritance and innovation of modern furniture in the design principles of traditional furniture structures in the 21st century. The mortise and tenon structure of Ming Dynasty furniture is very scientific. No nails and less glue are used, and it is not affected by the wet or dry nature of the natural conditions; between the parts with a large span, dental boards, dental strips, coupons, rings, dwarfs, overlords, hunchbacks, clip flowers, etc., which are beautiful and strengthen firmness. The structural design of furniture in the Ming Dynasty is an excellent combination of science and art and is also one of the essence of traditional furniture. However, contemporary designers want to be open to traditional craftsmanship. Some companies and designers combine the advantages of the vertebral structure. In modern craftsmanship, trying to find a way of inheriting Chinese traditions, new materials, and new technologies has also broadened the thinking for the inheritance of design structure principles. Wood is no longer the only material selected, and the addition of metal and plastic has inspired a richer modern structure. As shown in Table 9.

Table 9 Comparison of structural cases between Ming-style furniture and contemporary Chinese-style furniture.

Traditional "rose chair" structure	Zhu Xiaojie's "rose chair" structure
	
<p>Rose chair is a common form of the Ming Dynasty armchair. The vertical intersection of the back, armrests and chair surfaces characterize it. The size is insignificant, and the materials are thinner, giving people light and dexterous feeling. Tracing the origin was improved by the Song Dynasty armchair, which was widely popular in the Ming Dynasty. In order to apply it lightly, small chairs do not need to have feet, and the decline of the armrest is a reasonable improvement. Doing toch comfortable the sia little not feel uncomfortable. The structure of the rose chair is the essence, which is concise. It mainly reflects the functional structure. The components are thin and powerful, almost simplifying the frame structure to a level that cannot be reduced. Therefore, there is a good use of materials and craftsmanship.</p>	<p>The rose chair was a classic chair in China hundreds of years ago. It was trendy in the Ming Dynasty. Even in the modern Chinese literati life circle, it was deeply loved. Because it often matches the bookcase, it is also called a chair. In the modern version of the rose chair, the designer respects the original creative mood and appearance, but it uses the principle of concrete to allow the reinforced bars to string in an excellent log cylinder instead of cement. Make it stable and solid in the way of building metal structures. The cushion is fixed by the bright line in a dark line in a manual way. The metal's foot ring and steel wire are interspersed in the rich classical tradition, revealing a harmonious, modern sense.</p>

From Table 9, Zhu Xiaojie's "rose chair" is rich in ebony wood, wenge wood, cowhide and steel. The chair is based on the traditional rose chair, abandoning the practice of vertical sitting surfaces in the backrest and armrests of the traditional rose chair. Its strip-back plate has an "S" shape, making it more in line with the curve of the human spine and bringing comfort to the back. Thanks to modern materials, the structure reflects new characteristics different from traditional wooden chairs, and the structural treatment is innovative and conforming to the material characteristics. The chair's frame is a skinny wooden column, warm and smooth. The interior is pierced with steel bars to increase strength, while a steel cross is placed between the legs to stabilize the chair's structure. The designers refer to the "rose chair" structural approach as the "architectural metal structure" approach.

In contrast, due to material limitations, the legs and feet of traditional wooden chairs are generally connected with lattice shoulder vertebrae. In order to avoid each other, each component adopts a "big in, small out" vertebral joint. In the continuous development of new materials and new technologies, the structure of modern furniture will be more colourful. Through the comparison of traditional Chinese Ming Dynasty furniture and contemporary Chinese furniture, their characteristics and the relationship between them can be obtained. This relationship between inheritance and innovation is always closely connected, and this collision is not a single one. Instead, it is a multi-dimensional fusion and symbiotic relationship.

4.1.2 Requirements Research and Data Analysis of the Target Sample

According to the previous research, the data survey is mainly aimed at the target consumer groups to analyze the design of contemporary Chinese furniture and adapt to the current demand situation. The researchers collected the data and analyzed the following results:

In 2020, the overall trend of China's furniture market is improving, and there is still much room for development in the future. According to the National Bureau of Statistics data, the most popular furniture in China is wood furniture, accounting for 51%; metal furniture for 40%; and other furniture for 9%, as shown in Figure 51. From this, two keywords are drawn: metal furniture and wood furniture. However, after comprehensive consideration, at the beginning of the design of this series of products, how to express contemporary Chinese furniture made of metal in the form of folding is considered. However, in the design process, it is found that folding furniture made of metal materials has

some disadvantages in the design of the folding function, so it is not suitable for making folding furniture. The main reasons are as follows: Higher manufacturing cost: The manufacturing cost of metal materials is usually higher because of casting, cutting, forming and other processing steps. Heavyweight: Compared with other materials such as wood, plastic, etc., metal materials have a higher density, so the products made of folding furniture will be heavier and not easy to carry and move. Easy to rust: Metal materials are easily oxidized, especially in humid environments, which will reduce the service life of folding furniture. Not flexible enough: Metal materials are usually complex and need the flexibility of wood or plastic, so they are not suitable for making some furniture that needs to be folded and unfolded frequently. Therefore, although metal materials have particular strength and stability, they are unsuitable for the production of folding furniture due to high manufacturing cost, heavy weight, ease of rust, and insufficient flexibility. Therefore, the clock only has some simple folding functions in the design process. So, in the end, wood was chosen as the primary material for the next design, as shown in Figure 56. (Xiong et al., 2017)

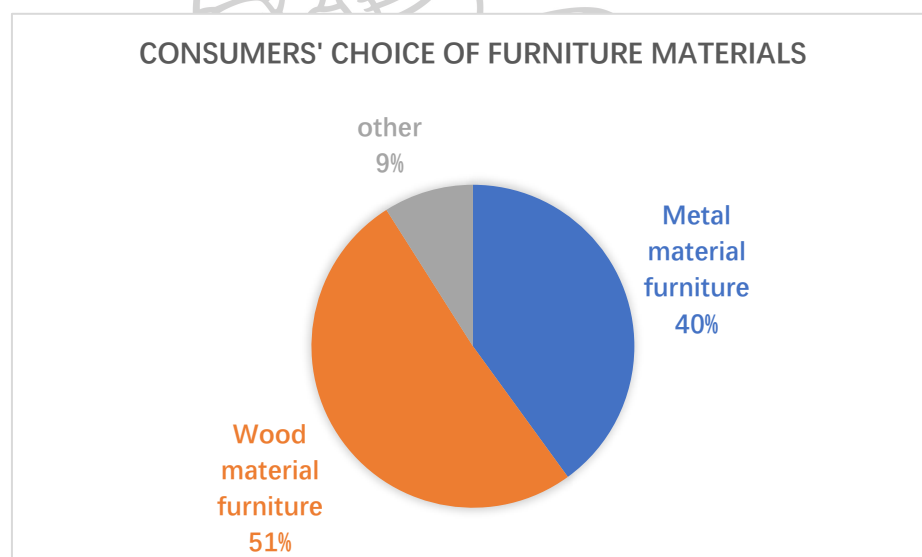


Figure 56 Consumers' choice of materials

Design by : Chen Yanbin,(2023)

According to the data of China Statistics Network, the attention to Chinese brands in the ten years from 2009 to 2019 has increased from 38% to 70%, which shows that Chinese people, including foreigners, have significantly improved their recognition of Chinese brands. As a large part of

Chinese brands, contemporary Chinese furniture will have a broader market in the future. The data also shows that from 2009 to 2019, people in the 20-39 age group paid the most attention to Chinese brands and were willing to pay for them. From this, two keywords can be drawn: young consumer groups and contemporary Chinese brand furniture, as shown in Figure 57.(Zhou et al., 2021)



Figure 57 Chinese brand attention data

Design by : China International Furniture Expo Data,(2020)

According to the data of China Media Data Center in 2020, the proportion of the main scenarios of products and the use scenarios of purchasing furniture is mainly concentrated in the three significant spaces bedroom, living room and study. Bedrooms and living rooms accounted for the highest proportion, with bedrooms accounting for 31% and living rooms accounting for 42%. From this, two keywords are obtained: bedroom furniture and living room furniture, as shown in Figure 58.(Zhou et al., 2021)

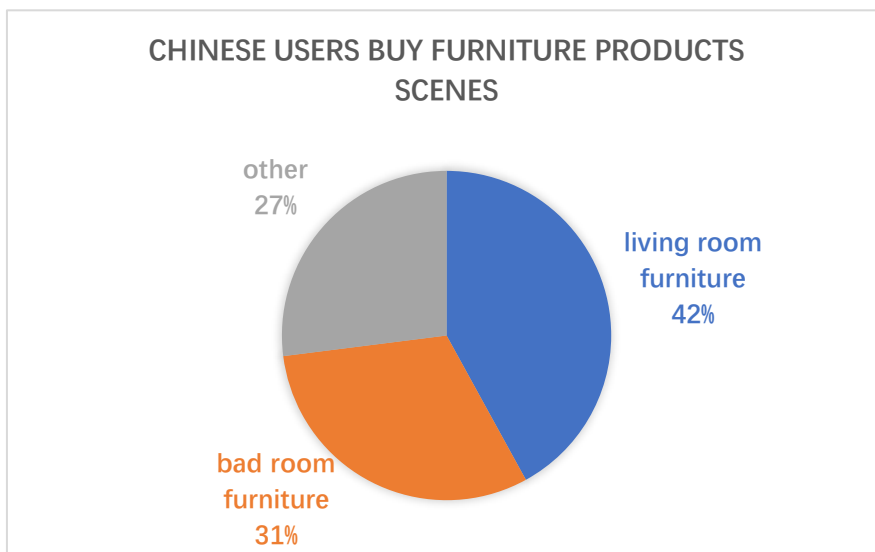


Figure 58 Data on users' attention to furniture usage scenarios

Design by : Chen Yanbin,(2023)

According to the information from China Statistics Network, Chinese residents' per capita living area is 39.8 square meters. The living area in first-tier cities is lower than average, such as 32.5 square meters in Beijing, 37.2 square meters in Shanghai, 22.6 square meters in Shenzhen, and 34.5 square meters in Guangzhou, as shown in Figure 54. Second-tier cities such as Suzhou, Wuhan, Nanjing, and Jinan are the same as the national per capita living area. From this, it can be concluded that the living space of small apartments will gradually increase later, as shown in Figure 59.(Cao et al., 2004)



Figure 59 Per capita living area in first-tier cities in China

Design by : www.stats.gov.cn, (2020)

Through this data collection and analysis, seven keywords related to the later design were screened out, and a reference basis was provided for the later design, as shown in Figure 60.

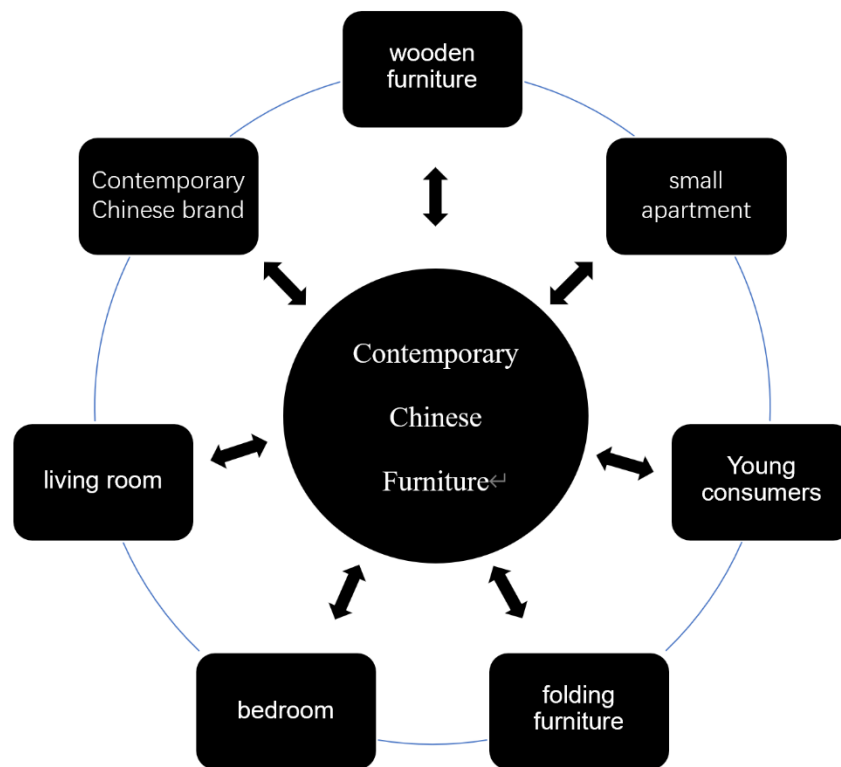


Figure 60 Reference keywords for screening after data statistics

Design by : Chen Yanbin,(2023)

4.1.3 The results of the data analysis generate the design requirements.

A. The design part will refine the elements of Ming-style furniture, retain the classic elements of Ming-style furniture, combine these classic styling elements with modern aesthetics for young consumer groups, and integrate some modern design elements, such as Popularity, etc., make the shape of furniture more in line with the aesthetic needs of modern people, more concise, smooth, and more three-dimensional and texture.

B. The furniture of small apartments is a significant trend in the future. The design will be designed according to the characteristics of the apartment's apartment. The design of the living room and the bedroom space will be designed according to the characteristics of the apartment's units. Practical, designed products should include chairs, tables, beds, cabinets, etc.

C. In the material part, the design continues the wooden materials of Ming-style furniture. The wood material can meet the Chinese Ming-style tenon -and -mortise structure. At the same

time, the use of folding furniture is flexible. You can also use some new environmental protection based on retaining traditional materials. Material comparison to determine the optimal choice.

D. Economically, consider the value of investment to obtain appropriate returns. (1) Design must be implemented in small industrial systems to become guidelines for cultivating new entrepreneurs. (2) Use some sharing parts in the design to use in the design of the same type of products, thereby reducing production costs. (3) When considering the structural process, simplify the structural process as much as possible and reduce the cost of production.

4.2 Experimental part design

In this section, researchers create design guidelines based on keyword summaries divided into two steps. Design guideline 1 is to create two sets of design guidelines for different scenarios based on keyword summaries, namely living room space and bedroom space. The group is divided into three design sections. The first product design for the living room space is the furniture design for the bar cabinet, the second is the furniture design for the dining table, and the third is the furniture design for the dining chairs and bar stools. The first product design for the bedroom space is the makeup table furniture design, the second is the mirror cabinet furniture design, and the third is the bed furniture design. Then according to the design of the three parts of these two groups, experts in different fields make decisions and select a suitable and best product and research method for further design development.

Design guide 2 summarises the problems of the products designed in the first part and improves the design method to re-innovate the design. The design takes the Chinese contemporary style folding wood furniture as the critical word and designs 3 product prototypes with different structures and processes. Finally, based on the three product prototypes, experts in different fields and target consumers will make decisions and choose a suitable and best product and research method for in-depth design.

4.2.1 Design Guide 1: Contemporary Chinese Furniture Design of Wood Materials and Contemporary Chinese Furniture Design of Metal Materials

According to the previous market research data, a series of keywords were obtained by selecting suitable data. Keywords include Ming-style furniture features, wood furniture, young consumers, small apartments, and folding furniture. Through the refinement of critical words, formulate

the design framework, and carry out the research on design practice according to the framework, as shown in Figure 61.

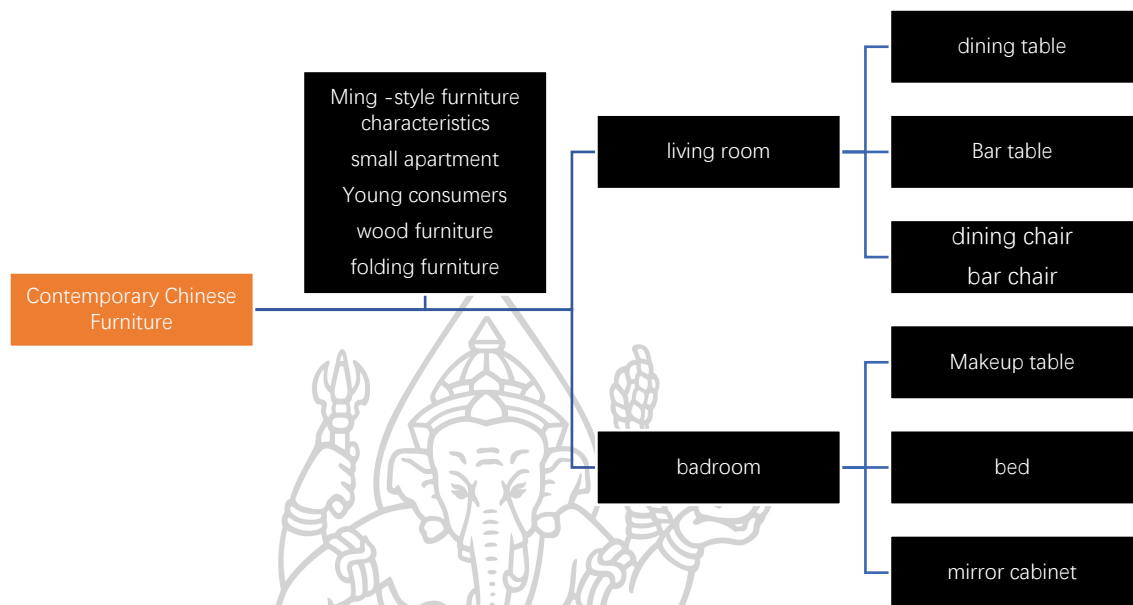


Figure 61 Frame diagram of designed experiment

Design by : Chen Yanbin,(2023)


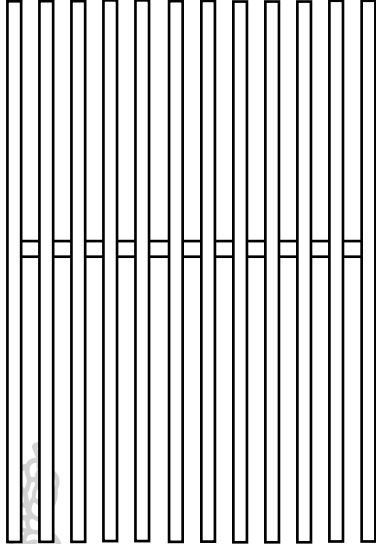
The design scheme is based on contemporary Chinese furniture. The common problem in the design is that it needs to consider the characteristics of Ming Dynasty furniture in China, and the consumer group of the designed products is relatively young people aged 20 to 39. This group of people likes simple shapes; decorate with less furniture.

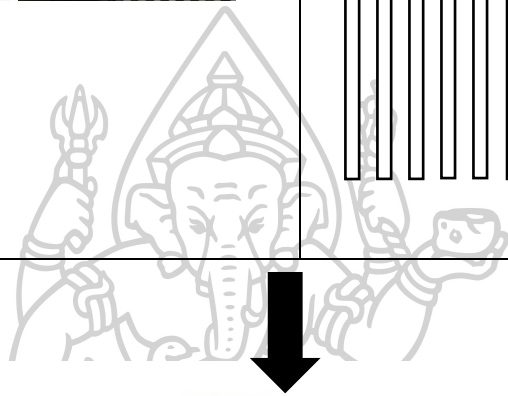
In addition to previous data statistics, wood furniture also has the following advantages:

Structural: Due to the characteristics of the material itself, wood is the most suitable material for making Chinese mortise and tenon furniture structures, and it has high variability in structure. **Aesthetics:** Wooden furniture has natural aesthetics, rich colours and textures, and can bring a natural and warm atmosphere to the indoor environment. **Good hand feeling:** The surface of wood furniture has a delicate touch, more smooth than the surface of furniture made of other materials. This makes the wooden furniture more comfortable and gives people a better feeling of use. **Durability:** Wood furniture is usually very durable with proper treatment and maintenance. High-quality wood furniture has a longer service life and can maintain its original beauty and texture. **Eco-friendliness:** Wood furniture can be an eco-

friendly choice as they are often sourced from sustainable forests, and as wood is a renewable resource, it reduces your environmental impact. Plasticity: Wood can be carved, carved and processed into various shapes and designs so that wood furniture can have rich shapes and designs. To sum up, wood furniture has the advantages of aesthetics, good feel, durability, environmental protection and plasticity, so it is widely used in home decoration and welcomed by consumers. (Cao & Hansen, 2006)

Then, according to the design experiment framework of the first step and combined with the wood materials' characteristics, furniture with mortise and tenon structure is designed. This scheme includes foldable bar tables, dining tables, bar chairs and dining chairs with mortise and tenon structures. The first is the design of the bar table. In the use of elements, this traditional grille design element is adopted. The grille is a symbol of traditional Chinese culture. It is also used more in Ming-style furniture. It is full of cultural heritage. The grid element is extracted from the Ming-style cabinet and used in the design. Moreover, it is made of ash wood, which takes up less space in the contracted state and can be used for storage and other functions. After unfolding, it is highly ergonomic, providing consumers with an excellent leisure experience. In terms of structure, the mortise and tenon structure is used to build the furniture itself, and the design of the metal hydraulic bar is added to make the folding function more durable, and the traditional and contemporary structures are integrated. A hidden USB charging socket is also designed under the bottom plate of the bar chair, which is convenient for consumers to recharge the collection when enjoying the bar. The bar chair design is also made of ash wood, spliced with the mortise and tenon structure. The angle of the backrest is designed to be 105 degrees in line with ergonomics, providing consumers with a comfortable sitting experience, as shown in Figure 62.(Han et al., 2009)

Ming-style furniture prototype	Elemental refinement
	



Mode A: Contracted state

Mode B: Expanded state

Grille aesthetics, hidden USB interface

Figure 62 Bar counter design scheme

Design by : Chen Yanbin,(2022)

The dining table's design also uses ash wood, which takes up less space in the contracted state and can be used as a sideboard for storage and other functions. It becomes a dining table when unfolded, as shown in Figure 63.



Figure 63 Dining table design scheme

Design by : Chen Yanbin,(2022)

The design of dining chairs and bar chairs is also made of ash wood material, using the mortise and tenon structure for straight insertion and splicing, and the backrest angle is designed to be 105 degrees in line with ergonomics, providing consumers with a comfortable sitting experience. The shape of the official hat chair of the Ming Dynasty furniture is refined, and the traditional upward shape is changed. From the perspective of the armrest, the armrest is built in an embracing way, and high-quality comfort is created while inheriting. In addition, a sponge cushion made of cotton and linen is added to provide a comfortable and loose experience for the body even if you sit for a long time, as shown in Figure 64.



Figure 64 Bar stools, dining chairs design

Design by : Chen Yanbin,(2022)

The second plan chooses bedroom space furniture. According to the design experiment framework and combined with the characteristics of wood materials, a set of furniture suitable for bedroom space is designed. This plan includes a dressing table, a mirror cabinet, and a bed. Using modern aesthetics to improve the design of the classic furniture of the Ming Dynasty. It is suitable for families of young people in today's society so that they can feel the classical beauty even in modern times.

The dressing table continues to adopt the folding function suitable for small apartments in terms of design and function. It can be a folded cabinet and a dressing table in the unfolded state, as shown in Figure 65.



Figure 65 Design scheme of dressing table

Design by : Chen Yanbin,(2022)

The design and shape of the mirror cabinet continue to draw on the streamlines of traditional Ming Dynasty furniture. The function of the full-length mirror can be combined with the functions of storing and hanging clothes by rotating, as shown in Figure 66.



Figure 66 Mirror Cabinet Design Scheme

Design by : Chen Yanbin,(2022)

The design of the bed is also made of wood, which is matched with the mirror cabinet of the bedside table, as shown in Figure 67.



Figure 67 Bed Design Scheme

Design by : Chen Yanbin,(2022)

In the end I put the 3 pieces of furniture together. Make it match as a whole, and have a good visual effect, in line with the current aesthetic trend, as shown in Figure 68.



Figure 68 Overall design scheme of bedroom furniture

Design by : Chen Yanbin,(2022)

Several product design schemes were finally formed through the two sets of product prototypes in the first guideline. In the next step, expert committee members will be convened to conduct a questionnaire evaluation on the two design schemes.

Expert questionnaire evaluation is a market research method designed to understand the views and opinions of experts on a specific field or topic. The method usually includes preparing questionnaires, issuing survey invitations to experts, and collecting and analyzing data. The primary purpose of expert questionnaire evaluation is to understand the opinions and opinions of experts to provide enterprises or organizations with information and suggestions on industries or fields. Expert questionnaire evaluation is an effective market research method which can provide enterprises or organizations with relevant industry or field information. Information and insights to help it make better decisions and strategic plans. Experts usually have extensive experience and knowledge in related fields, such as academics, industry experts, business executives, etc. This time, the members of my expert committee include well-known scholars in the Chinese design field and researchers related to Chinese furniture culture. The following is the list of my expert committee and their profiles. They will help me choose the right furniture for the next step of the design operation. (Zhang et al., 2016)

For this purpose, I applied for the expert committee members' forum exchange and online video communication. The committee members positively responded to my products, as shown in Figure 69. They believed that the direction of researching contemporary Chinese furniture is of great significance to current China. Great practical significance. However, it also pointed out a series of problems, which I need to pay attention to in the later research and design to improve efficiency, as shown in Figure 70.



Figure 69 Communication with members of the expert committee

Design by : Chen Yanbin,(2022)



Figure 70 Show products to the expert committee

Design by : Chen Yanbin,(2022)

By exchanging and presenting these two solutions, I summarized the evaluation opinions of each expert on my product and made a table to sort out and summarize their evaluation opinions, as shown in Table 10.

Table 10 Summary of Communications with Expert Committee Members

<p>He Renke (Expert 1)</p>	<p>One of the characteristics of contemporary Chinese furniture design is a strong sense of modernity. Based on retaining traditional Chinese furniture elements, furniture designers have injected modern design concepts and technical means, making Chinese furniture more concise, light, natural, fashionable, and more suitable for the needs of modern home space. Your two pieces of furniture should be combined. The Chinese traditional form of steel furniture is perfect, but the functionality needs to be improved and the furniture of wood furniture has the function, but the appearance is ordinary, and the feeling of traditional Ming Dynasty furniture needs to be improved. Therefore, it should be created in conjunction with the two advantages.</p>
<p>Tong Huiming (Expert 2)</p>	<p>It is recommended to inherit Chinese culture and traditional forms, materials and craftsmanship and consider and design the lifestyle of the modern environment and people. So contemporary Chinese folding furniture should be studied in traditional styles; this will be significant research. The perspective of the folding function is excellent. From the technology and structure, wooden materials are the first choice for folding furniture. It can make the folder have more possibilities.</p>
<p>Wen Hao (Expert 3)</p>	<p>Contemporary Chinese furniture incorporates traditional Chinese culture and art elements during the design and production, showing solid national cultural characteristics. For example, the shape and decoration of furniture often use the furniture elements of the Ming Dynasty in China, as well as traditional flowers, birds, landscapes and other patterns, showing the unique charm of Chinese furniture. The furniture made of steel materials is more in line with the aesthetics of contemporary people.</p>
<p>Wu Hongmin (Expert 4)</p>	<p>The production technology and materials of contemporary Chinese furniture are becoming more and more superb and advanced. When building furniture, Chinese manufacturers pay more attention to quality and technology. They use high-quality wood and other raw materials and are equipped with fine processing technology and advanced production equipment to produce high-quality, durable furniture. The first plan's wooden furniture can be designed backwards, continue to use wooden materials, and uses the traditional Chinese essence of the tenon-and-mortise processes to design, making folding furniture that conforms to contemporary wood.</p>

Zhang wen (Expert 5)	The types and styles of contemporary Chinese furniture are becoming increasingly diverse, which can meet the needs and tastes of different consumers. Some designers cleverly combine traditional Chinese furniture and modern style to create unique and unique furniture. It must be a degree of fusion of the folding function of the first plan and the typical characteristics of the Ming Dynasty furniture.
Tao xiaojun (Expert 6)	Contemporary Chinese furniture focuses on sustainable development and pursue the concept of green environmental protection. For example, in the process of furniture, pay attention to choosing environmental materials and production processes to reduce the waste of environmental pollution and waste. At the same time, it also pays attention to the functionality and practicality of furniture, and provides consumers with a healthier, comfortable and environmentally friendly home life. The two schemes have their own advantages, and they can use modern materials to improve the production of contemporary Chinese sustainable folding furniture.
Ma guodong (Expert 7)	Modern Chinese furniture focuses on the choice of details and materials, which not only fully shows the charm of traditional furniture but also has a sense of fashion and personalization of modern furniture. For example, in furniture production, high-quality wood and unique craft technology are often used so that the furniture has a transparent texture, high gloss, and comfortable feel. The direction of folding furniture for the first solution is excellent.

From Table 11, it was found that according to the statistics of experts' opinions, most experts believe that my design continues the concept of folding furniture, but the appearance of these two schemes is still relatively ordinary. Combining the typical modelling features of Ming Dynasty furniture is necessary to design a style or element of the Ming Dynasty. The contemporary folding design of, as shown in Figure 71.

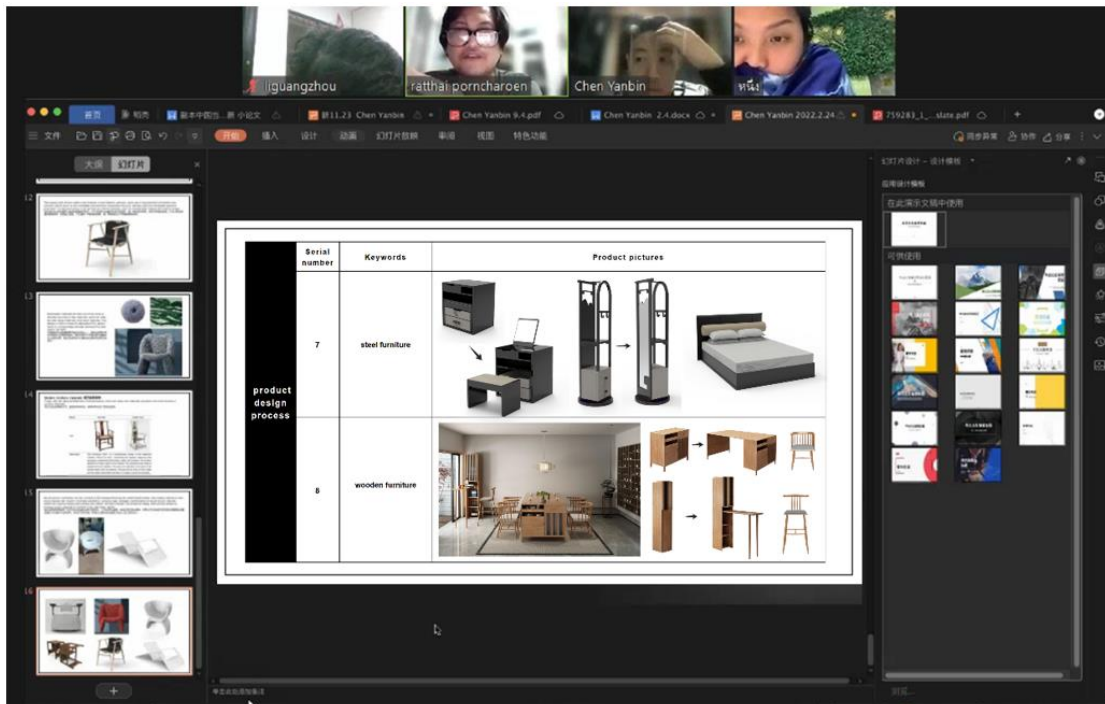


Figure 71 Records of online communication with tutors

Design by : Chen Yanbin,(2022)

At the same time, I communicated with my instructor many times during the online process. The instructor also believes that folding furniture with furniture elements from the Ming Dynasty in China may be a better research angle. He will continue to strengthen the typical characteristics of the Ming Dynasty style and make three wooden materials. The main products are in different structural ways.

4.2.2 Design Guide 2: Design 3 contemporary Ming-style folding chairs mainly made of wood with different craft structures

Design Guide 2 is an extension of the product prototype of Design Guide 1. According to the summary of Design Guide 1, the next step is to make a contemporary Ming-style folding chair made of wood. Folding furniture is a common form of furniture in modern home life. Ming Dynasty furniture is famous for its exquisite craftsmanship and elegant style. Combining Ming furniture styles with folding furniture can create a unique piece that combines traditional and modern elements. Contemporary folding furniture can use the simple shapes and details of Ming Dynasty furniture to create a unique style. Combining the Ming Dynasty furniture style with folding furniture can create a unique

and modern furniture style which not only retains the essence of traditional culture but also meets the needs of modern life. The main reason for the final design of the contemporary folding chair in the Ming Dynasty style also includes the collection and analysis of literature.

There are five aspects in total. Comfort: Folding chairs are often designed to provide a high level of comfort that other folding products do not. For example, they usually have comfortable seat cushions and backrests that provide good support and comfort to the user. Stability: Since folding chairs are usually designed with stability in mind, users can sit on them with more peace of mind. The structure of the folding chair is usually optimized to ensure its stability when in use. Versatility: The folding chair can be used on many different occasions, such as home use, outdoor activities, offices, restaurants, meeting rooms and more. These occasions call for different types of folding chairs, but in general, folding chairs can serve a variety of functions. Portable: Folding chairs are usually lighter than other furniture and easier to fold and carry. This makes the folding chair ideal for travel and outdoor activities. Security: Folding chairs usually have well-designed locking mechanisms to keep them secure. This makes the folding chair a much safer folding product. Folding chairs have many advantages over other folding products, including comfort, stability, versatility, portability, and safety. (Kim, 2018)

The Ming Dynasty-style contemporary folding chair designed in Scheme 1 mainly extracts some essence from the style of the Ming Dynasty armchair, such as explaining the continuation of the streamlined shape of the armrest of the Ming Dynasty armrest, and the retention of the S-shaped backrest in ergonomics, as shown in Figure 72 shown.

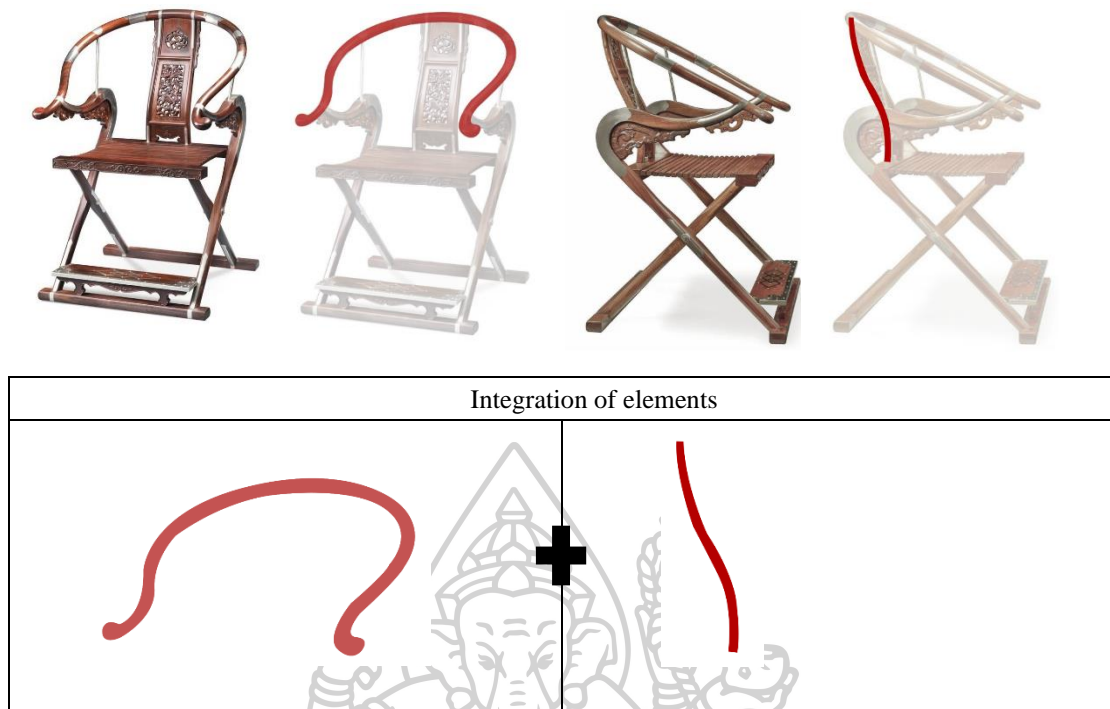


Figure 72 Show products to the expert committee

Design by : Chen Yanbin,(2022)

In the end, Three series of schemes have been formulated, with chairs as the main product and cabinets, lamps and other furniture to form a series. Scheme 1 includes chairs and cabinets. The various elements of Ming-style chairs were combined, mainly made of wood and metal materials used to build the overall skeleton of the furniture and a retractable and foldable support frame was customized. The seat surface was made of scroll-type walnut wood. Symbiosis, as shown in Figure 73.



Figure 73 Scheme 1 shows the effect

Design by : Chen Yanbin,(2022)

These are the two modes in the contracted and expanded states. In the unfolded state, the bottom relies on the telescopic tripod as a strength support, as shown in Figure 74.



Figure 74 Display effect in two states of scheme 1

Design by : Chen Yanbin,(2022)

Here, the folding process of the folding chair in Scheme 1 will be illustrated through pictures. The first step is to fold the scroll-type chair surface by rotating the switch, as shown in Figure 75.

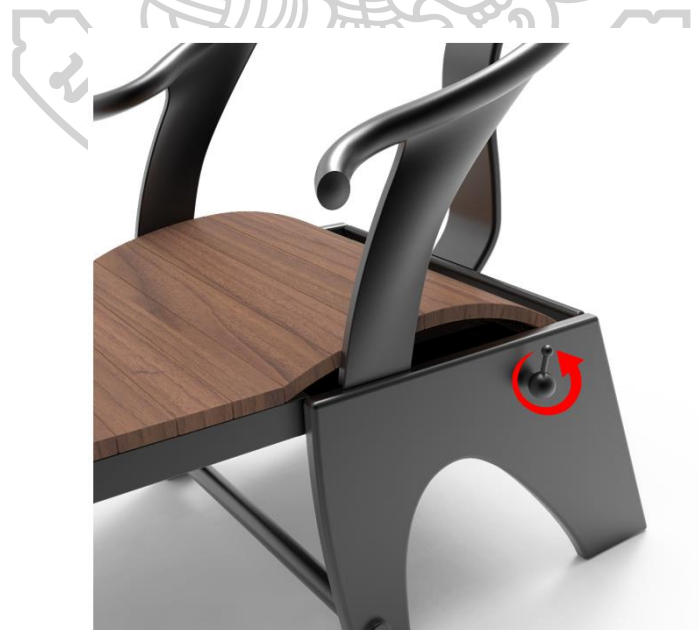


Figure 75 Scheme 1 contraction flow chart

Design by : Chen Yanbin,(2022)

The second step is to fold the support frame at the bottom. Keep it level with the crossbar, as shown in Figure 76.

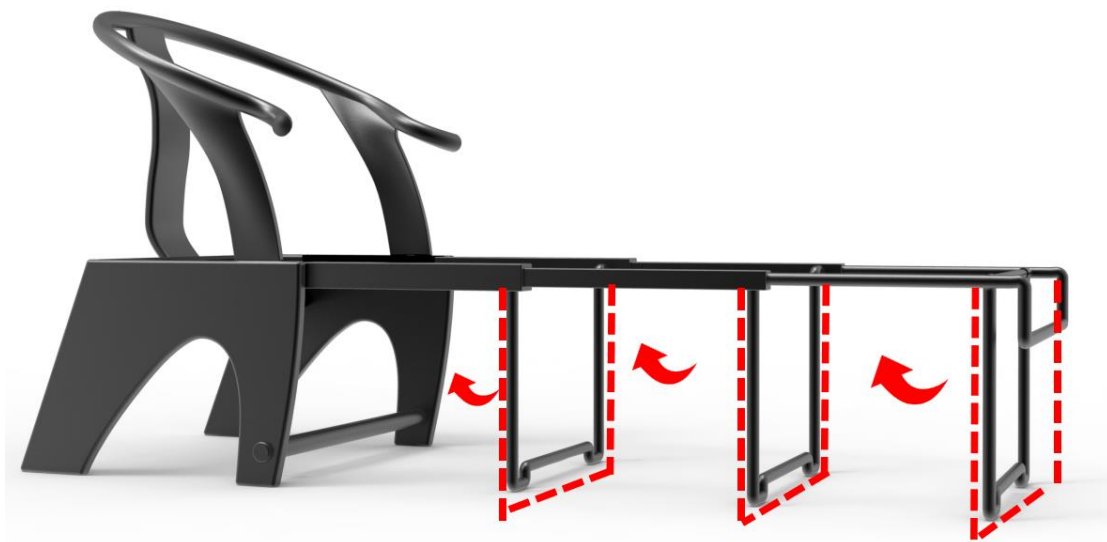


Figure 76 Scheme 1 contraction flow chart

Design by : Chen Yanbin,(2022)

The third step is to completely retract the bottom support by shrinking the crossbar, as shown in Figure 77.

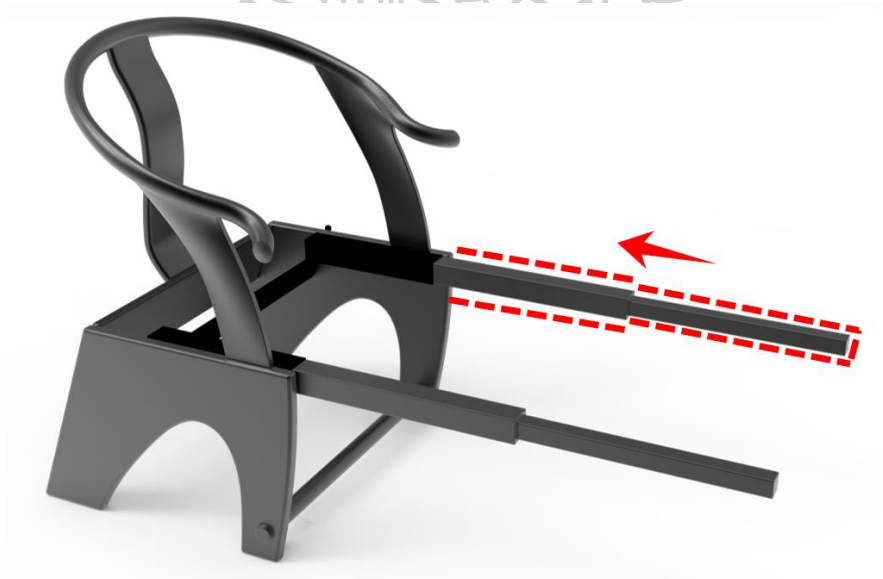


Figure 77 Scheme 1 contraction flow chart

Design by : Chen Yanbin,(2022)

The cabinet body adopts the same material and technology, and the cabinet body is made of two modules of furniture, which are unfolded through the same scrolling process as the chair. The unfolded furniture can be used as a desk or a dressing table and other functions, as shown in Figure 78.

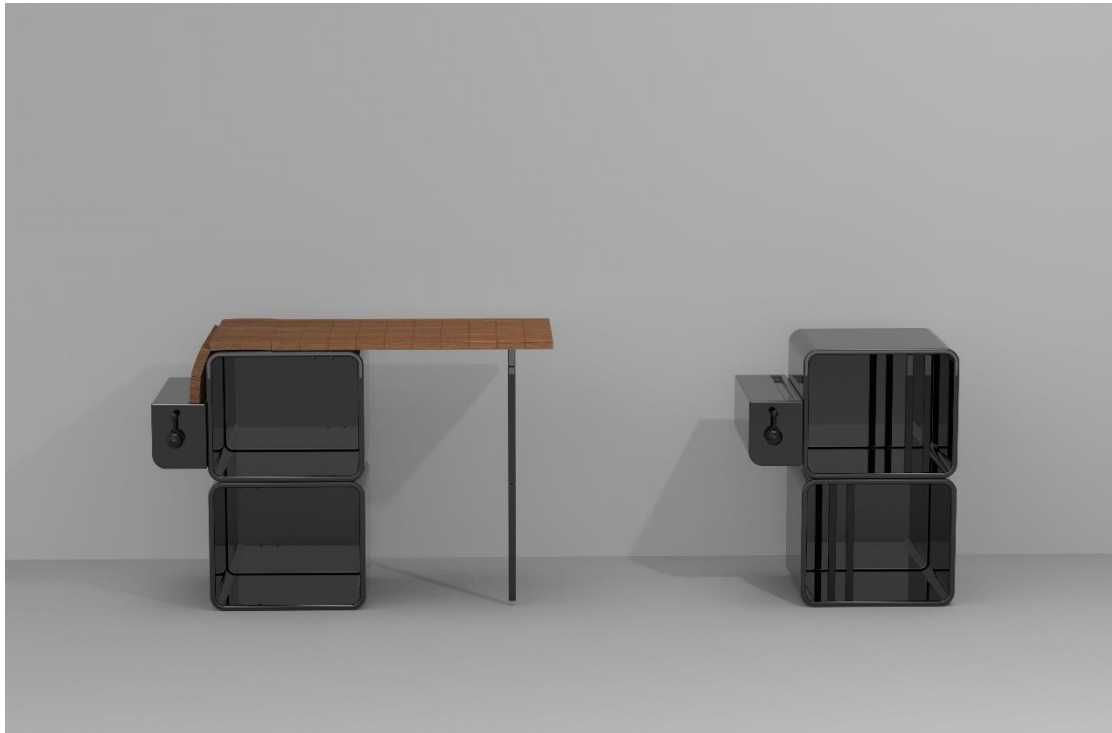


Figure 78 Cabinets in two states

Design by : Chen Yanbin,(2022)

In the unexpanded state, it consists of two single cabinets, which take up very little space and can be used as a small table for storage, as shown in Figure 79.

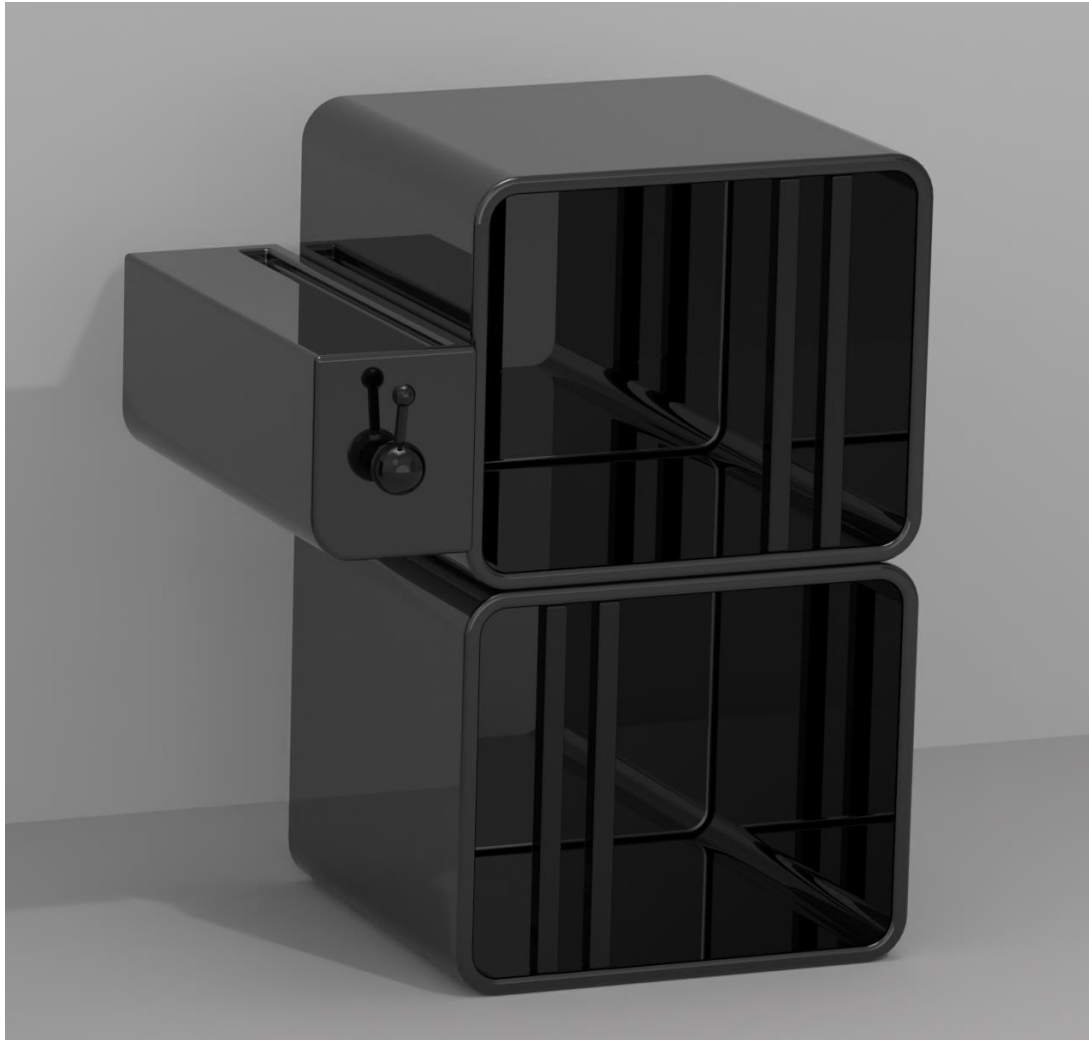


Figure 79 Cabinets in retracted state

Design by : Chen Yanbin,(2022)

Under the rotation of the pull rod, the scroll-type desktop can be unfolded, connected and supported by the support frame at the bottom, and finally form a desk or a makeup table, as shown in Figure 80.



Figure 80 Cabinets in unfolded state

Design by : Chen Yanbin,(2022)

The table legs of the dressing table are built and assembled through the supports inside the cabinet, which can quickly and portably change the functions of the cabinet to meet different needs, as shown in Figure 81.



Figure 81 Cabinet attachable supports

Design by : Chen Yanbin,(2022)

The design of Scheme 2 continues to use the style of the Ming Dynasty but simplifies the structure and craftsmanship and reserves a storage space at the bottom. Cancel the scroll-type wooden cushion in Scheme 1, and adjust the rotary scroll switch mode to a flat unfolding type. This aims to facilitate operation, simplify processing difficulty, and achieve cost savings in production. In terms of materials, the overall skeleton of the folding chair uses contemporary plastic materials, while the seat surface continues to retain wood materials, as shown in Figure 82-84.



Figure 82 Display effect in two states of scheme 2

Design by : Chen Yanbin,(2022)



Figure 83 The internal display effect of scheme 2

Design by : Chen Yanbin,(2022)

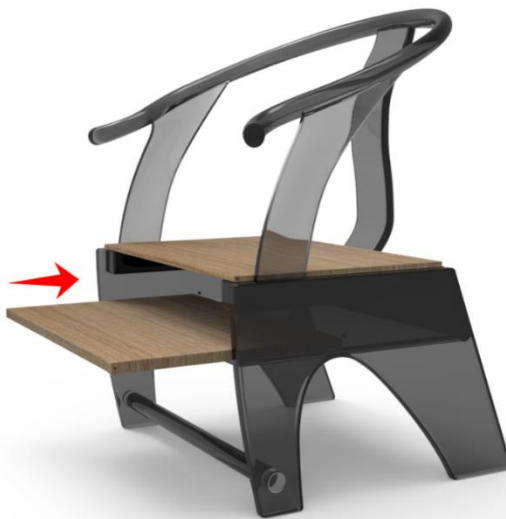


Figure 84 Scheme 2 contraction flow chart

Design by : Chen Yanbin,(2022)

The seat cushion is designed to be splicable, which can further save space during use, as shown in Figure 85.



Figure 85 Scheme 2 contraction flow chart

Design by : Chen Yanbin,(2022)

The lamps are also made of the same material, and the shape follows the same concept of Ming-style classic elements. A small cabinet is added at the bottom, which can store things and realize the function of sitting. It can be pulled out at any time. It can be used for sitting or as a small cabinet table use. The cabinet at the bottom of the lamp is not fixed, it does not take up space when placed at the bottom, and it can also be pulled out to separate it from the lamp. The cabinet at the bottom of the lamp is flipped through the panel on the top, which can be a stool or a small table, and has a storage function, as shown in Figure 86.



Figure 86 Two states of lamps

Design by : Chen Yanbin,(2022)

A folding bracket with the same process is added to the support of the lamp, which can be unfolded at any time according to the needs. After unfolding, some objects that require a certain height can be placed, such as projectors, humidifiers, etc., and can also be used for hanging clothes, as shown in Figure 87.



Figure 87 Expanded and retracted support frame in two states

Design by : Chen Yanbin,(2022)

The design of Scheme 3 still follows the style of the Ming Dynasty, and the structure has been readjusted. This furniture series includes chairs, cabinets, lamps, and coffee tables. They all use the same material and similar construction. The chair telescopic form is replaced by the pull-in and folding method of the panel, and storage space is reserved at the bottom to store the disassembled panel. This solution dramatically simplifies the processing difficulty and achieves the most cost-effective production, as shown in Figure 88.



Figure 88 Scheme 3 display effect

Design by : Chen Yanbin,(2022)

These are the two modes in the contracted state and in the expanded state, as shown in Figure 89.



Figure 89 The display effect in the two states of Scheme 3

Design by : Chen Yanbin,(2022)

This is a splicable and movable stool, which can be easily assembled by inserting the panels, so as to achieve the purpose of stretching, as shown in Figure 90-91.



Figure 90 The stool display effect of Scheme 3

Design by : Chen Yanbin,(2022)

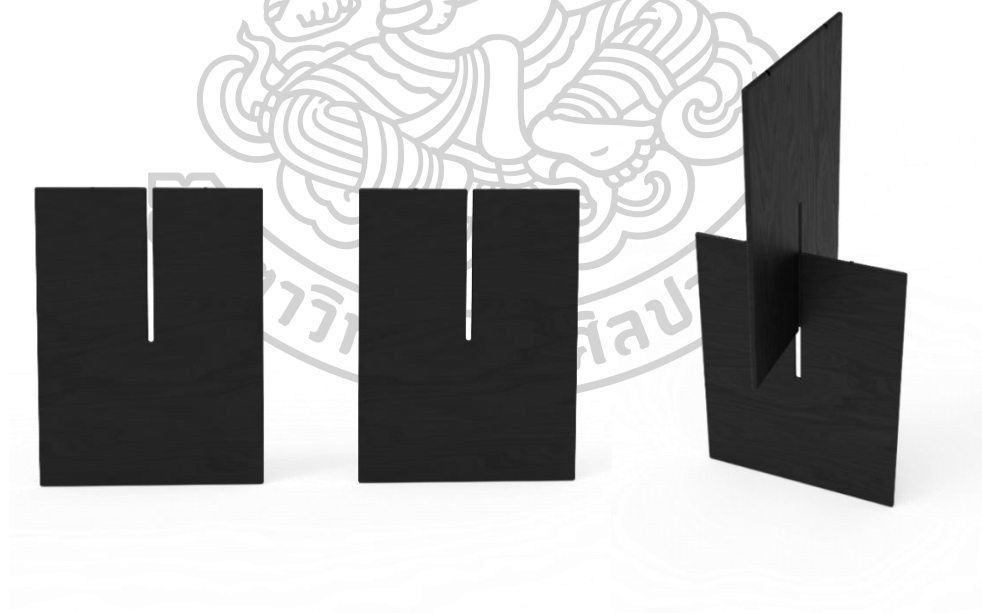


Figure 91 Scheme 3 stool assembly process display

Design by : Chen Yanbin,(2022)

The space at the bottom of the chair surface and the space on both sides of the chair feet can store the detachable panel without taking up any other space and can be unfolded when needed and retracted when not needed to achieve the foldable. The effect is shown in Figure 92.

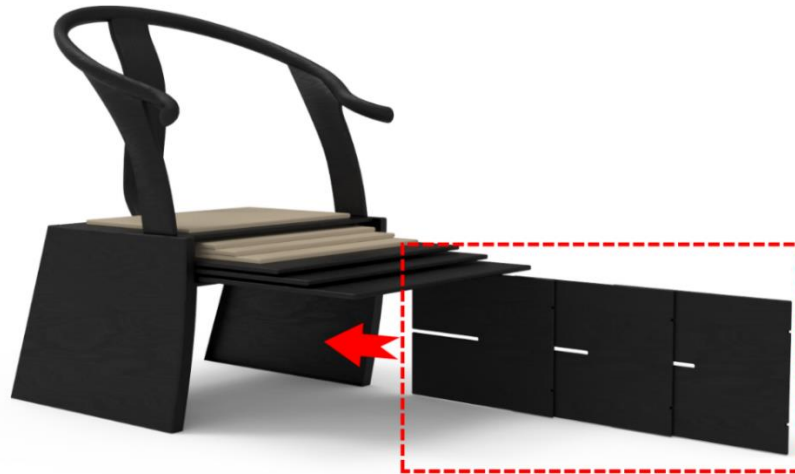


Figure 92 Scheme 3 Shrinkage process display

Design by : Chen Yanbin,(2022)

After unfolding, the chair can be separated from the stool to form a space for four chairs to support chatting among multiple people, as shown in Figure 93.



Figure 93 Effect drawing of scattered seats in plan 3 deployment mode

Design by : Chen Yanbin,(2022)

The cabinet is designed in a modular and foldable way, and the material is also made of the same wood material as the chair and supports a variety of placement methods. The square and round shape elements make the whole more unified and match the chair harmoniously, as shown in Figure 94.



Figure 94 Option 3 cabinet

Design by : Chen Yanbin,(2022)

The cabinet body is composed of different modules, the purpose is to better transform functions, and by adjusting the combination, it can have more shapes and more functions, as shown in Figure 95-97.



Figure 95 Various modules for cabinets

Design by : Chen Yanbin,(2022)



Figure 96 Various cabinet placement methods

Design by : Chen Yanbin,(2022)



Figure 97 Various cabinet placement methods

Design by : Chen Yanbin,(2022)

It is also possible to change the function of use through the combination of different modules, making it a dressing table, as shown in Figure 98.



Figure 98 makeup table function

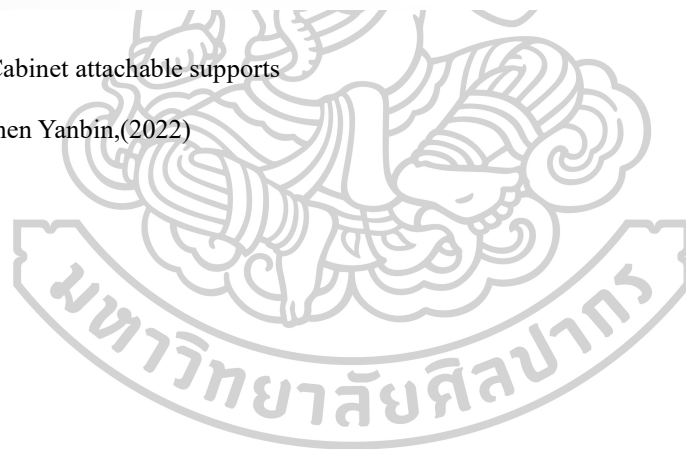
Design by : Chen Yanbin,(2022)

The table legs of the dressing table are built and assembled through the supports inside the cabinet, which can quickly and portably change the functions of the cabinet to meet different needs, as shown in Figure 99.



Figure 99 Cabinet attachable supports

Design by : Chen Yanbin,(2022)



The lamps are also made of the same material, and the shape follows the same concept of Ming-style classic elements. A small cabinet is added at the bottom, which can store things and realize the function of sitting. It can be pulled out at any time. It can be used for sitting or as a small cabinet table use, as shown in Figure 100.



Figure 100 Two modes of lamps

Design by : Chen Yanbin,(2022)

The cabinet at the bottom of the lamp is not fixed, it does not take up space when it is placed at the bottom of the lamp, and it can also be pulled out as needed to separate it from the lamp, as shown in Figure 101.



Figure 101 Removable cabinet at the bottom of the light fixture

Design by : Chen Yanbin,(2022)

The cabinet at the bottom of the lamp is flipped through the panel on the top of the cabinet, which can be a stool or a small table, and has the function of storage, as shown in Figure 102.



Figure 102 Cabinet with reversible top

Design by : Chen Yanbin,(2022)



This is the overall furniture series effect of scheme 3, mainly composed of chairs, lamps and cabinets. The overall design idea is Ming-style foldable furniture designed for small apartment space, as shown in Figure 103.



Figure 103 Series furniture for scheme 3

Design by : Chen Yanbin,(2022)

This is a product that I have redesigned. I have differentiated designs mainly from different structural processes and different materials. The purpose is to make the final effect achieve the research purpose, and verify the research results.

According to the design, the expert committee evaluation will be reconvened to conduct a questionnaire evaluation on the first three schemes. For this reason, I again applied for the forum and online video communication of the expert committee. The committee members gave me a positive attitude towards my product design process. At the same time, we conducted discussions and exchanges on these three solutions, as shown in Figure 104.

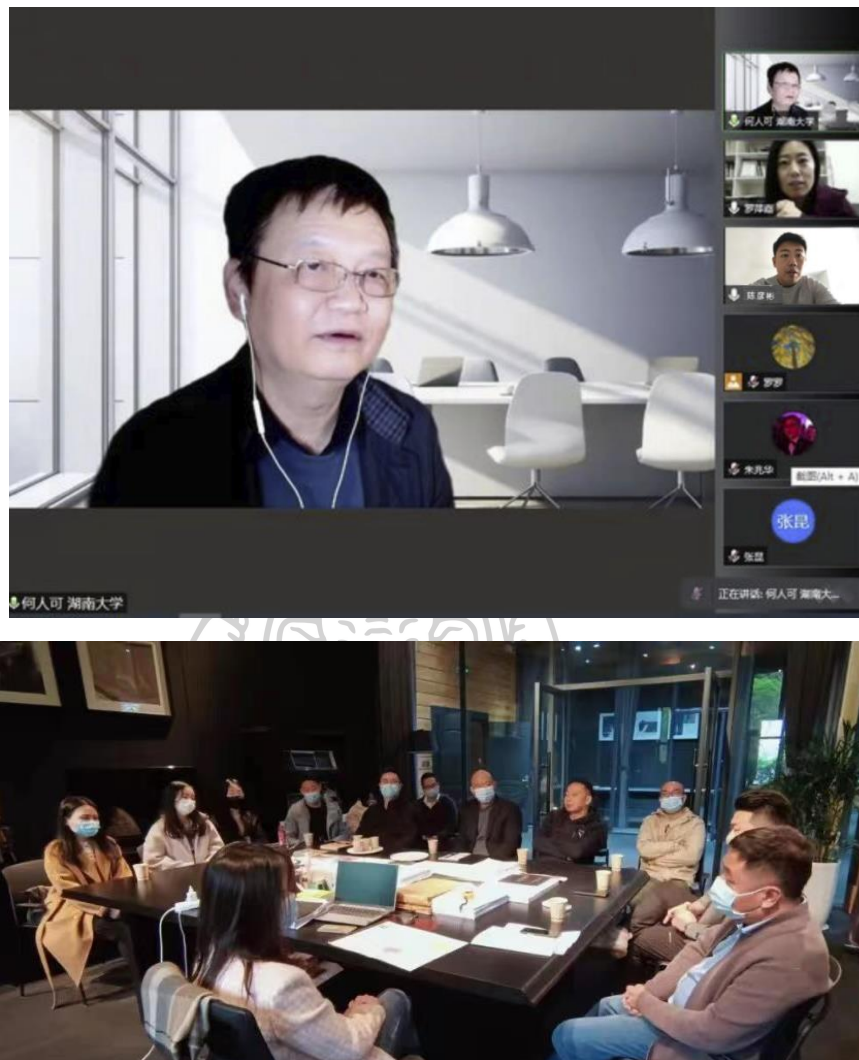


Figure 104 Online and offline expert assessment seminars

Design by : Chen Yanbin,(2022)

And communicated repeatedly, I summarized the evaluation opinions of each expert on my product, and made a table to sort out and summarize their evaluation opinions, as shown in Table 11.

Table 11 Summary of online and offline expert assessment workshops

<p>He Renke (Expert 1)</p>	<p>The product design has a cycle. The three significant design, production, and marketing systems are interconnected and complete system engineering. If you do not consider production or market, you only consider it immediately, and you will ignore the product's design cycle. The production cycle of your Solution one and Solution 2 is long, and Plan 3 is appropriate.</p>
<p>Tong Huiming (Expert 2)</p>	<p>Contemporary Chinese furniture needs to think about combining traditional culture with contemporary lifestyle. There is plenty of furniture in China, but it is lacking in products with spiritual and aesthetic tastes. Just as the Chinese do not lack material, what is lacking is spiritual richness, so art and culture must be integrated into the contemporary lifestyle to make characteristic furniture. These schemes have been done. Plan 1 is the highest in combination.</p>
<p>Wen Hao (Expert 3)</p>	<p>Many designers pursue extreme personalization and ignore the mainstream product forms that the public and everyone recognize and use. We should see the mainstream and reduce the extreme personalization of the pursuit of products. Your work is in line with the mainstream trend to me. Scheme 3 is the most suitable from the mainstream and production difficulty perspective.</p>
<p>Wu Hongmin (Expert 4)</p>	<p>Now is contemporary, and now life is called contemporary life. How to integrate the contemporary lifestyle into the design, think about, look at, and learn more, and have been walking in an exploration attitude. Society is diverse, looking at furniture with an inclusive attitude. Plan One and Plan 3 are good.</p>
<p>Zhang wen (Expert 5)</p>	<p>The development of new products should be considered. The mainstream of our era is modern styling, materials, and craftsmanship, including marketing. Not only furniture but the appearance form of various utensils in society is also the same. This is the ultimate goal of the design of the new Chinese product design. Considering scheme three from these perspectives is the most suitable.</p>
<p>Tao xiaojun (Expert 6)</p>	<p>The environmental protection of contemporary Chinese culture also needs to be considered. Contemporary Chinese people pay more and more attention to this part. Plan 2 is most suitable.</p>

From Table 11, it was found that through summarizing the statistics of experts' opinions, among the six experts, three experts think that the third plan is better, two experts say that the first plan is better, and one expert says that the second plan is better. Okay, so, most experts are more inclined to

the third option and think that the third option is more in line with the needs and trends of current consumers as a whole, as shown in Figure 105.



Figure 105 Selection of expert assessment workshops

Design by : Chen Yanbin,(2022)

Table 12 Satisfaction data of users for these three schemes

Satisfaction data of users for these three schemes					
	Very dissatisfied	Dissatisfied	normal	satisfy	very satisfied
Plan 1	0	2	14	66	18
Plan 2	0	6	30	51	13
Plan 3	0	1	8	71	20
<p>In addition, I also conducted a consumer questionnaire evaluation survey on these three schemes, introduced these three schemes to them, and asked them to vote for their choice. A total of 180 questionnaire results were collected, and those who submitted the questionnaire included designers, students, teachers, furniture marketers, etc. The results of the questionnaire are shown in Table 12.</p>					

During this period, many production cost investigations were also carried out, and many manufacturers were visited to inquire about the production prices of the products on the spot, and the cost reference chart below was made. In the end, it was found that wood furniture is proficient in production and product supply is guaranteed, and the production cost is relatively low.

Table 13 Production Cost Estimation Chart.

Serial number	1	2	3	4
Picture				
materials	wood	Bamboo	Stainless steel	Plastic
Price estimation	140 \$	150 \$	560 \$	210 \$

During this period, many production cost investigations were also carried out, and many manufacturers were visited to inquire about the production prices of the products on the spot, and the cost reference chart below was made. In the end, it was found that wood furniture is proficient in production and product supply is guaranteed, and the production cost is relatively low. The results of the questionnaire are shown in Table 13.

The third scheme may be the most suitable for the deepening design. Finally, an in-depth design is carried out according to the selected third scheme, which includes engineering design drawings, production cost estimation drawings, product video drawings, etc., as shown in Figures 106-108.

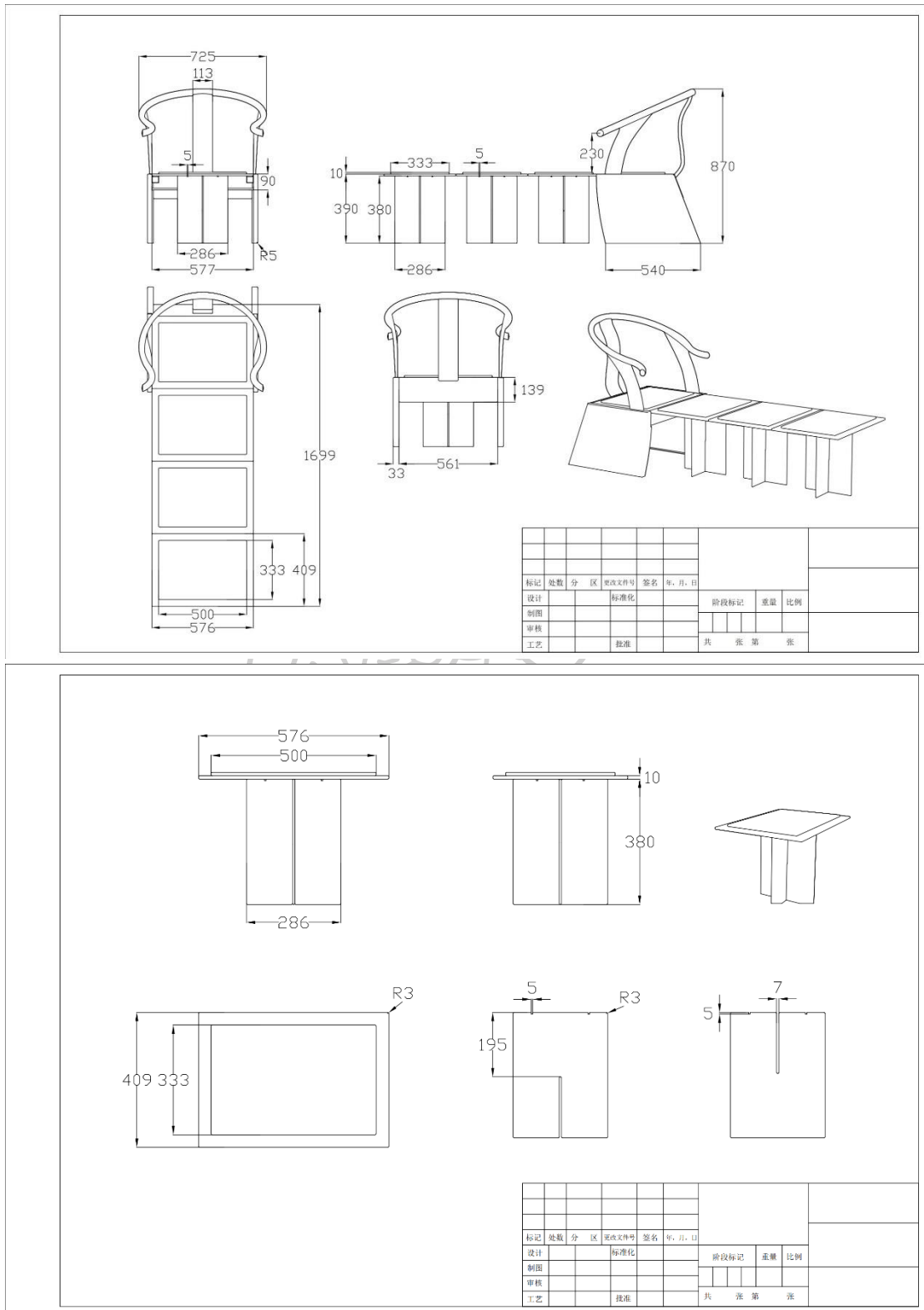


Figure 106 Product Engineering Drawing 1

Design by : Chen Yanbin,(2022)

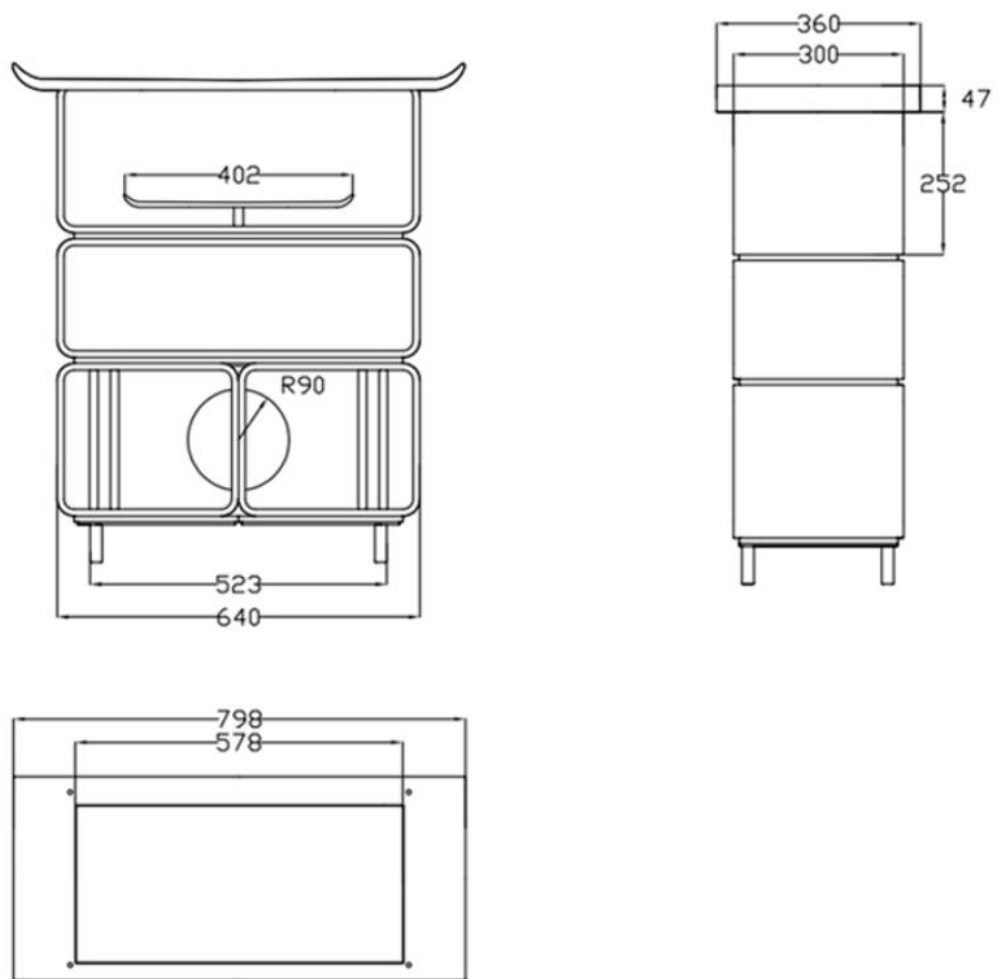


Figure 107 Product Engineering Drawing 2

Design by : Chen Yanbin,(2022)

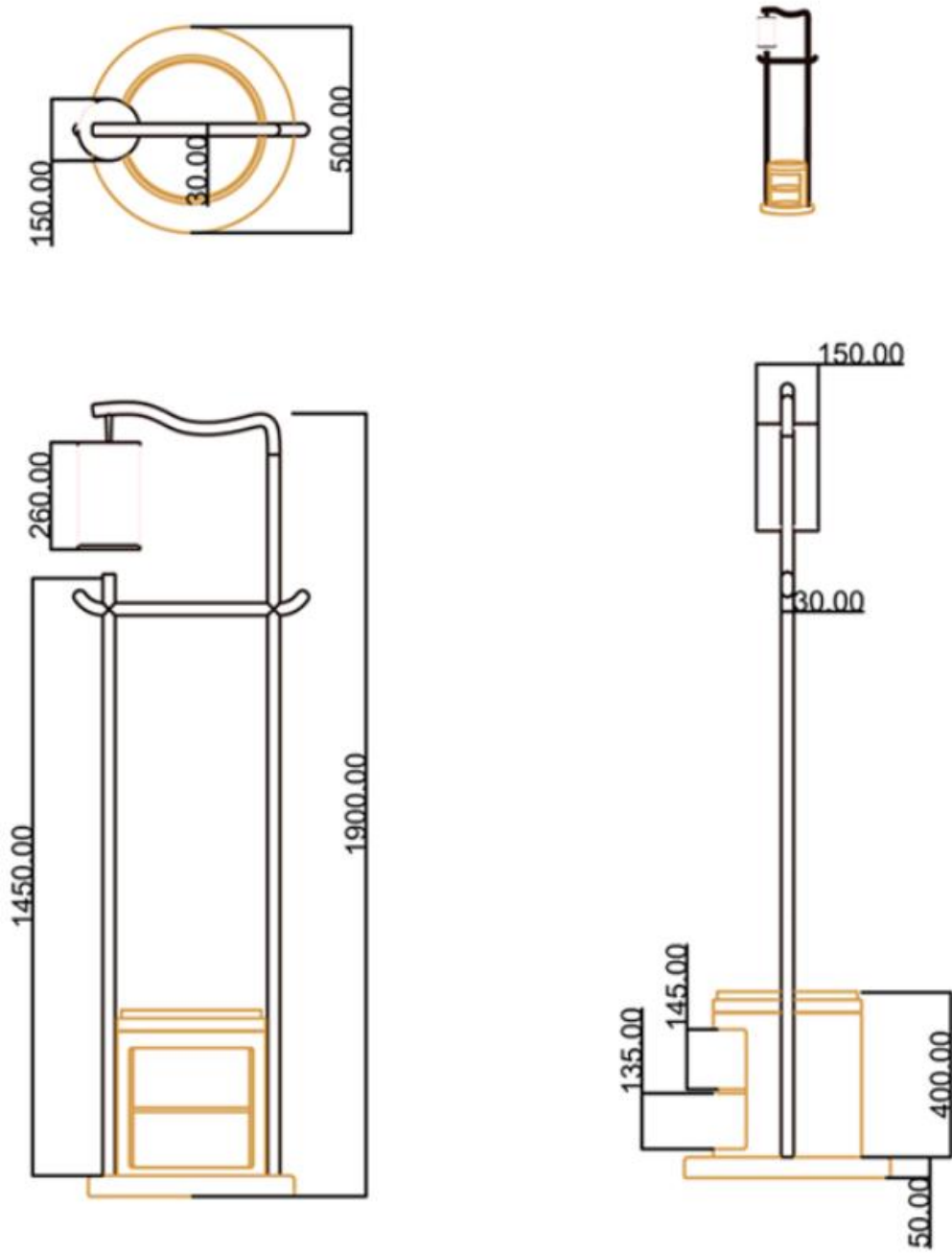


Figure 108 Product Engineering Drawing 3

Design by : Chen Yanbin,(2022)

In this design, a total of two design guidelines have been experienced, from formulating the design framework based on the keywords of the previous research to carrying out the first round of product design according to the framework and conducting expert questionnaire evaluation according to the effect of the previous design, and determining the final design direction. Then, according to the second design guide, the following design step is carried out according to the suggestions of the expert committee and the mentor, and then the expert and consumer questionnaire evaluation is carried out. The finalized plan is carried out with in-depth engineering design drawing, product explosion drawing, production cost estimation drawing, product video map, exhibition map and other designs. Through continuous improvement and optimization in these stages, products that genuinely meet the needs of consumers are designed.

4.3 Product Display and Target Consumer Satisfaction Survey

Both product display and targeted consumer satisfaction questionnaires are significant because they can help designers better understand consumer needs and feedback to improve product quality and meet consumer expectations. First, product display can allow potential consumers to better understand the product's functions and characteristics and then generate a desire to buy. A good product display can attract the attention of consumers and allow consumers to have a deeper understanding of the product, thereby increasing their trust and satisfaction. Therefore, product presentation is crucial for product sales and marketing. In addition, target consumer satisfaction questionnaires can help designers understand consumer needs and feedback. Through questionnaires, designers can obtain opinions and suggestions from consumers and understand their perceptions and experiences of products to improve product design and services and increase consumer satisfaction. In a highly competitive market environment, consumer satisfaction is one of the critical factors for a designer's success. Therefore, regular satisfaction surveys can help designers better meet the needs of consumers and increase consumer loyalty and word of mouth. To sum up, both product display and target consumer satisfaction questionnaires are significant; they can help designers better understand consumer needs and feedback to improve product quality and meet consumer expectations. (Ponder, 2013)

Therefore, a product demonstration and a satisfaction survey were carried out, and the exhibition was located in Suzhou, China. One hundred eighty satisfaction data were collected, as shown in Figure 109.



Figure 109 Domestic display of products

Design by : Chen Yanbin,(2023)

The table summarizes the respondents' data, a total of 180 people. Statistics are made from the four aspects of gender, education, occupation, and income, as shown in Table 8. Among them, 98 were men, accounting for 54%, and 82 were women, accounting for 46%. Education, bachelor's degree or below 50, accounting for 28%, 105 undergraduates, accounting for 58%, master's 22, accounting for 12%, and three doctors, accounting for 2%. In terms of occupation, there are 21 government employees, accounting for 12%, 69 enterprise employees, accounting for 38%, 33 personal affairs, accounting for 18%; and 20 students. 11%. Regarding income (per month), 48 people under 3,000 yuan, accounting for 27%, and 82 people with 3001-6000 yuan, accounting for 46%. Thirty-five people from 6001-10,000

yuan, accounting for 19%, and 15 people with more than 10,000 yuan, accounting for 8%, as shown in Table 14.

Table 14 Profile of Respondents

List	Number of people (people)	Percentage(%)
1.gender		
man	98	54
woman	82	46
total	180	100
2. Education		
Bachelor degree or less	50	28
undergraduate	105	58
Master	22	12
Doctor	3	2
total	180	100
list	Number of people (people)	Percentage(%)
3. Occupation		
Government employees	21	12
Corporate employees	69	38
Personal matters	33	18
student	37	21
other	20	11
total	180	100
4. Income (per month)		
Less than3,000 RMB	48	27
3001-6000 RMB	82	46
6001-10000 RMB	35	19
More than1,0000 RMB	15	8
total	180	100
total	180	100

A total of 180 questionnaire surveys were collected according to the status of the target consumer group. The questionnaire is divided into four levels: product quality, product functions, product production and sales, and product innovation. Moreover, extend nine score points at these four levels. The score points under the quality of the product are the appearance, materials, and reliability. The

evaluation points are innovative for price, transportation convenience, and innovation. The score of the 180 data is divided into the proportion of satisfaction, satisfaction standards, and satisfaction, And obtain the average value of satisfaction, standard deviation, and the proportion of attention.

After data statistics, you can get it from the questionnaire assessment, as shown in Table 15.

1) The average value (X) of consumers for product appearance satisfaction is 4.14, and the standard deviation (SD) is 0.49, which pays attention to 15%, indicating that consumers attach great importance to this, and they are satisfied with the overall;

2) The average value of consumers' rich product functional evaluation is 4.10 (x), and the standard deviation (SD) is 0.44, which pays attention to 10%.

3) The average value (X) of consumers' satisfaction evaluation of product materials is 4.02, and the standard deviation (SD) is 0.65, which pays attention to 15%, indicating that consumers attach great importance to this item and are satisfied with the whole;

4) The average value (X) of consumers' convenient and satisfactory assessment of the product is 3.88, and the standard deviation (SD) is 0.37, which pays attention to 10%.

5) The average value (X) of consumers' satisfaction evaluation of product creativity is 3.88, and the standard deviation (SD) is 0.47, which pays attention to 10%.

6) The average value (X) of consumers' satisfaction assessment of structural crafts is 3.86, and the standard deviation (SD) is 0.56, which pays attention to 10%.

7) The average value (X) of consumers' satisfaction evaluation of product prices is 3.82, the standard deviation (SD) is 0.6 , and the degree of importance is 10%, indicating that consumers attach great importance to this, and they are more satisfied with the overall;

8) The average value (X) of consumers' satisfaction with product transportation convenience is 3.80, the standard deviation (SD) is 0.5, and the degree of importance is 5%. Items

9) The average value (X) of consumers' satisfaction assessment of product reliability is 3.75, and the standard deviation (SD) is 0.52, which pays attention to 10%, indicating that consumers pay more attention to this, and the overall satisfaction is average.

Table 15 Satisfaction degree of target consumer groups

	Evaluation Criteria	N=180		
		$\bar{\chi}$	SD	Total (%)
quality	appearance	4.14	0.49	15
	material	4.02	0.65	15
	reliability	3.75	0.52	10
function	Easy to use	3.88	0.37	10
	Feature-rich	4.10	0.44	15
	Structural processes	3.86	0.56	10
Production and sales	Price	3.82	0.61	10
	Convenient transportation	3.80	0.50	5
Innovative	devise	3.88	0.47	10

From the perspective of overall satisfaction, consumers are delighted with the three levels of product appearance, rich product function, and product materials. Four aspects of product convenience, product creativity, product structure technology, and product price are relatively satisfactory. The two levels of product transportation convenience and product reliability are generally satisfied.

From the perspective of questionnaire standard deviation, the higher the score value, the greater the volatility of the score. The high standard difference between product materials and product prices indicates that consumers' scores fluctuate vastly, and consumers have more significant differences in the evaluation of the product; that is, some consumers have a high evaluation of the product, while others consume. The evaluation of the person is relatively low. The difference in this evaluation can reflect the significant differences in consumers' cognition, demand and preferences for the product. The effects of various factors such as consumption power. The fluctuation of consumer scores with product structure, product reliability, and transportation convenience shows that consumers have specific differences in product evaluation, but this difference could be more apparent. In other words, most consumers' product evaluation is relatively consistent, but some consumer evaluations still need to be higher or higher. Consumers with product appearance, innovation, functional richness, and convenient use of convenience fluctuations are slight, indicating that consumers' evaluation of the product is relatively consistent, and

the differences in evaluation are relatively small. Most consumers' evaluation of the product is closer to the product's Essence.

From the perspective of attention, consumers attach great importance to product appearance, product materials, and functions. They pay more attention to product reliability, convenience, structural process, price, and innovation. The assessment is average, and there is room for progress.



CHAPTER 5

SUMMARY OF RESEARCH FINDINGS DISCUSSION AND SUGGESTIONS

From the study of contemporary Chinese furniture design of integration and symbiosis. Researchers have conducted an in-depth study of Ming Dynasty furniture until the design to create a new dimension of the needs of today's consumers. The information can be summarized according to the objectives into three parts.

1. Study data to create design requirements.
2. Stage of design Product development and prototyping.
3. A study of the satisfaction of the target group of consumers toward the product.

5.1 Summary of research results.

In summarizing the research results, the researcher divided the work into three parts: data study to create design specifications, Then design, create a prototype, and bring it back to collect the results from the target group again with the following conclusions.

5.1.1 Study data to create design requirements.

A. The design of contemporary Chinese furniture is inseparable from the traditional reference and integration of tradition, especially for Chinese Ming-style furniture.

1) Styling culture: The design of contemporary Chinese furniture can continue or refine the classic shape and classic, streamlined lines of Ming-style furniture, such as the chair in the circle chair, the handrail part, the brain part of the official hat chair, etc. Classic styling is the interpretation of culture, the inheritance of Chinese culture, and the eternal modelling element. It combines these classic styling elements with a modern aesthetic. It integrates modern design elements, such as simplicity, popularity, etc. Ming-style furniture often has tedious details and carvings in traditional styling. It can be appropriately removed, some extra decorations, streamlined shape, and made more concise and generous. Ming-style furniture focuses on simple and balanced lines, which can be further strengthened in this regard, making its lines smoother and more concise, more in line with modern people's pursuit of simple aesthetics. You can also add some modern elements to the traditional styling of Ming-style furniture, such as simple metal handlers, glass panels, etc., to enhance its modern sense. The proportion of Ming-

style furniture is usually relatively solemn. It can increase its modern sense by appropriate adjustments, such as narrowing the volume of the furniture to make it lighter and more agile. In this way, it can be more in line with the needs of contemporary consumers, allowing traditional culture to glow new vitality and charm in modern society, in line with modern people's aesthetic needs and lifestyle. At the same time, it can also promote the inheritance and development of traditional culture. The shape of the furniture is more in line with the aesthetic needs of modern people, more concise and smooth, and also more three-dimensional and textured.

2) ergonomics: The design of contemporary Chinese furniture also needs to continue the application of ergonomics in Ming-style furniture, such as the height of the seat height, the back of the back, the height of the handrail, etc. The morphological characteristics and basic needs, various components and constituent relationships between them fully reflect the needs of human sitting and its comfort and health. Ming-style furniture often has tedious details and carvings in traditional styling. It can be appropriately removed, some extra decorations, streamlined shape, and made more concise and generous. Ming-style furniture focuses on simple and balanced lines, which can be further strengthened in this regard, making its lines smoother and more concise, more in line with modern people's pursuit of simple aesthetics. You can also add some modern elements to the traditional styling of Ming-style furniture, such as simple metal handlers, glass panels, etc., to enhance its modern sense. The proportion of Ming-style furniture is usually relatively solemn. It can increase its modern sense by appropriate adjustments, such as narrowing the volume of the furniture to make it lighter and more agile. In this way, it can be more in line with the needs of contemporary consumers, allowing traditional culture to glow new vitality and charm in modern society, in line with modern people's aesthetic needs and lifestyle. At the same time, it can also promote the inheritance and development of traditional culture.

3) In terms of materials, contemporary Chinese furniture design can also continue the traditional materials used by Ming-style furniture, such as rosewood, Huanghuali, chicken wings, etc. Use such as bamboo, metal, PVC and other environmentally friendly materials. These new materials are environmentally friendly and sustainable and have better performance, such as strength, waterproof, anticorrosive, etc.

4) In terms of function, Ming-style furniture has good essential functions. Contemporary Chinese furniture design must also continue and pay attention to the functionality and practicality of furniture. The design of contemporary Chinese furniture also needs more practicality to meet the diverse needs of modern people. In furniture design, the consideration of function can be divided into two aspects: the primary function of furniture and the other is the additional function of furniture. While meeting the essential functions, it is also necessary to consider making the furniture design more in line with actual needs and adding additional functions or characteristics, such as storage, mobile, and folding functions. These additional functions can not only meet the diverse needs of modern people but also improve the practicality and value of the furniture.

5) Structure: The structure part of the contemporary Chinese furniture design can continue and retain the tenon-and-mortise structure of traditional furniture and consider introducing modern process technology, such as CNC machinery, 3D printing, etc. These new technologies have improved the production efficiency and quality of furniture. The application of modern technology can make the production of furniture structures more accurate and efficient. At the same time, it can also improve the reliability and stability of the furniture structure and provide users with higher-quality products.

B. Emphasize humanized design. While contemporary Chinese furniture design emphasizes aesthetics, it also focuses more on humanized design. Designers pay attention to starting from human needs, put people's experience at the core of the design, and provide users with a more comfortable, convenient, safe, and healthy experience.

C. Focus on environmental protection and sustainable development. With the continuous improvement of global environmental protection awareness, contemporary Chinese furniture design also pays more and more attention to environmental protection and sustainable development. Many furniture designers use renewable materials to focus on environmental protection, energy conservation, and emission reduction. At the same time, the design concept is also transformed into practical actions to promote the industry's sustainable development through design.

D. This study conducted a data survey for the target consumer group to analyze the design of contemporary Chinese furniture and meet the current demand status. A total of 4 data have been

collected. The Internet and consumers survey these four data. The source of the Internet data and the China Statistics Bureau, including consumers' preference data for materials, attention to Chinese brands, users' attention to furniture use scenarios, and consumer questionnaires. A total of 158 copies were collected, with 156 valid data. The data included the proportion of consumers interested in contemporary Chinese furniture.

5.1.2 Stage of design Product development and prototyping.

Studies create design guidelines based on keyword summaries, mainly divided into two steps. Design Guide 1 is a design guide to create two set keyword scenarios. Design products. The first product design of the living room space is the furniture design of the bar, the second is the furniture design of the dining table, and the third is the furniture design of the dining chair and bar chair. The first product design of the bedroom space is the design of makeup table furniture, the second is the mirror cabinet furniture design, and the third is the bed furniture design. Then decide by experts in different fields, based on the design of the three parts of these two groups, select a suitable and best product and research method for further development and design the design of the first guide is mainly based on the early data and consumer questionnaire survey. The purpose is to test the feasibility of the design and whether the consumer needs match, and finally select the appropriate prototype from design guide 1 for summary and improvement. Provide method support for Design Guide 2.

Design Guide 2 summarises the problems of the first part of the product and improves the design method for -innovative design. The design from the contemporary Chinese style furniture as the design keywords, a total of three different structures and crafts products are designed. Plan 1's design combines the various elements of the bright chair. It is mainly made of wood. The surface of the seat is made of scroll-shaped walnut wood and uses metal materials to build the overall skeleton of the furniture. For folding, the price of the furniture is about \$ 560. The design of scheme 2 continues the style of the Ming Dynasty, simplifies the structure and process, and can also be expanded and folded according to the needs. Storage space is reserved at the bottom and placed on the folding cushion. This aims to facilitate operation, simplify processing difficulties, and achieve production cost savings. In terms of materials, the overall skeleton of the folding chair uses modern plastic materials. At the same time, the surface of the seat continues with wood material, and the product price is about \$ 210. The design of Plan

3 still follows the style of the Ming Dynasty, and the structure has been readjusted. The panels replace telescopic and folding methods, and storage space is reserved at the bottom to store the disassembly panel. The material is used for the convenience of mortise and mortar processing. The solution dramatically simplifies the processing difficulty and achieves the most cost-effective production, and the product price is about \$ 140. According to these three product prototypes, experts and target consumers in different fields are decided. Finally, one appropriate and best product and research method is selected to deepen the product.

5.1.3 A study of the satisfaction of the target group of consumers toward the product.

The consumer satisfaction survey mainly conducted questionnaires from the four aspects: quality, function, production and sales, and innovation. A total of 180 questionnaires were collected. After statistics from data, it can be obtained from the high evaluation. The average value of consumers' appearance evaluation X is 4.14, and the standard deviation SD is 0.49; The average value of consumers for reliability evaluation is 3.75, and the standard deviation SD is 0.52; the average value of consumers on the use of convenient evaluation X is 3.88, the standard deviation SD is 0.37; the average value of consumers' wealthy evaluation X is the average value of functional evaluation X is to be the average evaluation of functional evaluation x is the average function X is the functional enrichment evaluation. 4.10, the standard deviation SD is 0.44; the average value of the consumer's structural evaluation X is 3.86, and the standard deviation SD is 0.56; the average value of the consumer's evaluation of the price is 3.82, and the standard deviation SD is 0.61; the consumer's convenient evaluation of transportation for transportation The average X is 3.80, the standard deviation SD is 0.50; the average value of consumers for innovative evaluation X is 3.88, and the standard deviation SD is 0.47. As a result, consumers are relatively satisfied with the product's appearance, materials, functions, and innovation. The evaluation of the reliability, convenience, structure, price, and convenient transportation of the product is average, and there is room for progress.

5.2 Research results discussion

Study design and manufacturing prototypes, including research on consumer satisfaction. The new way to develop contemporary Chinese furniture design is to refine the essence of traditional Ming-style furniture.

In the thesis "Research on Chinese Modern Furniture in Design Principles," the author Jing Nan mentioned in-depth research on traditional furniture design principles and their inheritance, performance, and pathway in modern Chinese furniture. It has crucial promotional significance for the modern Chinese furniture industry's transformation and design development. The main conclusions include: 1) The design principles of traditional furniture are familiar with modern furniture design. 2) The research model of modern Chinese furniture from the inheritance of design principles must follow the system's research mode research model: to extract advanced design principles in traditional furniture. It has sorted out the inheritance evolution of modern Chinese furniture from attack and confusion to innovation since the 1980s; combined with comparing and evaluating related furniture research, it highlights the feasibility and characteristics of design principles inheritance. 3) Traditional furniture design principles that conform to the perspective of modern design mainly exist in function, structure and form, as well as the overall view of iodization. The study of instances, verifying the research theory and methods of traditional furniture inherited from design principles, is feasible. (Jing Nan, 2015). The research in this article is also about the inheritance of contemporary Chinese furniture, and it is consistent with the conclusion from related research.

The author Ye Lu's "Inheritance and Innovation of Modern Furniture Design in China" mentioned that In the process of transforming traditional elements, we must fully consider the lifestyle and use needs of modern people, grasp the contemporary pulse of the times, respect and understand the connotation of traditional elements, and extract elements that conform to modern furniture design. For example, the elegant and simple design concept of furniture in the Ming Dynasty, a superficial appearance of the appearance, beauty of the atmosphere this design form makes it worth studying and scrutinizing modern furniture design. In addition to seeking inspiration from traditional furniture design, you can also seek brand-new ideas from other Chinese art forms. The above point of view simultaneously emphasises the essence of modern Chinese furniture design and then emphasizes the importance of

integration with the times. (Ye Lu, 2018). The research in this article also mentions the design of the needs of contemporary consumers, which is consistent with the conclusions in related research. The author Liang Zhizhen's "The Research on the Design of Modern Product Design in China" mentioned that.1. According to the analysis and understanding of the furniture shape of the Ming Dynasty, the application of the Ming Dynasty style in the design of modern product design has the basis and shape basis. 2. After analysis of the structure and shape of the various parts of the furniture of the Ming Dynasty, the characteristics contained in the furniture are discussed and summarized. Simple, smooth, proportional and rounded characteristics can be widely used in modern product design. After the results obtained from this design research, we can see that the Ming Dynasty style is designed in modern product design, which can present different previous product modelling designs, which provides us with a new product design creative development thinking model. The Chinese culture has a long and profound history, but because of such a complex and substantial cultural system, there has not been a complete "Chinese culture" design.

After locking in the study of the Ming Dynasty style of cultural ideas and craftsmanship in Chinese history, whether it is the living habits, philosophical trends, craft product design and the style characteristics of the furniture of the Ming Dynasty, it shows the resources contained in ancient Chinese culture. Fortune is waiting for us to dig and apply. (Liang Zhizhen, 2012). The research in this article also mentioned the discussion of shapes in Ming-style furniture and the importance of Ming-style furniture in Chinese culture, which is consistent with the conclusions in related research.

5.3 Research Suggestions.

1) Incorporate more local cultural elements: Contemporary Chinese furniture designers should use traditional Chinese culture and art elements to create more distinctive and unique furniture designs, bringing a more robust Chinese cultural atmosphere to furniture design and Improving its competitiveness in the international market.

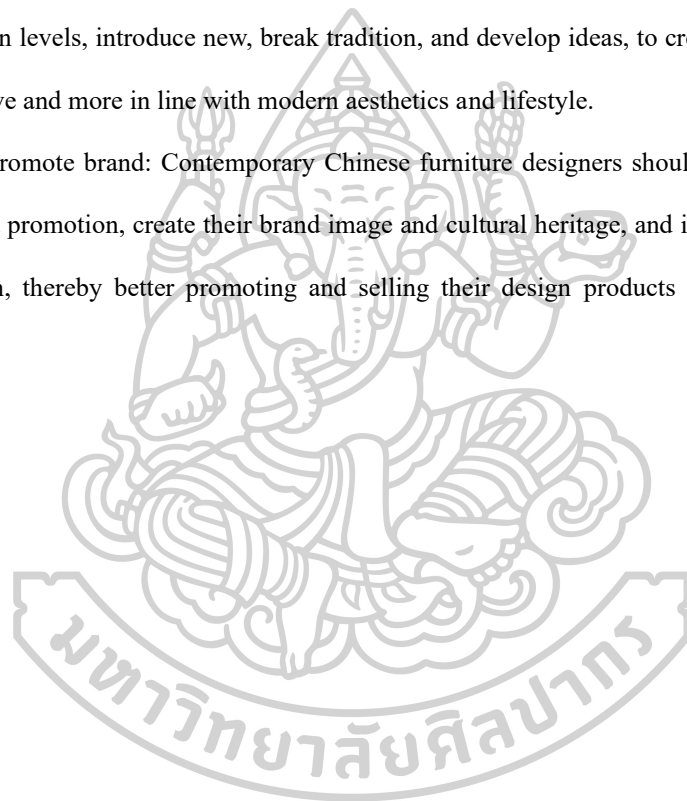
2) People-oriented: Contemporary Chinese furniture designers should pay attention to ergonomic and humanized design, put user needs and experience first, and create more comfortable, practical and ergonomic furniture design. From the perspective of small apartments, your design is good from the perspective of folding furniture. This point is good. You can also consider more. For example,

it is designed to be portable, can be used on-site, and supports mobile or storage, providing consumers with better product portability.

3) Promote sustainable development: Contemporary Chinese furniture designers should pay attention to environmental protection, sustainability and social responsibility and adopt sustainable development design concepts and materials—the benefits. Especially in the application of materials in design, you can consider low-priced and more environmentally friendly materials.

4) Innovation design: Contemporary Chinese furniture designers should continue to innovate, improve design levels, introduce new, break tradition, and develop ideas, to create furniture design that is more creative and more in line with modern aesthetics and lifestyle.

5) Promote brand: Contemporary Chinese furniture designers should pay attention to brand marketing and promotion, create their brand image and cultural heritage, and increase brand awareness and reputation, thereby better promoting and selling their design products in domestic and foreign markets.



REFERENCES

- Barbaritano, M., & Savelli, E. (2021). How consumer environmental responsibility affects the purchasing intention of design furniture products. *Sustainability*, 13(11), 6140.
- Boming, X. (2022). Creating the "meta-language" of contemporary Chinese furniture design. *Furniture and Interior Decoration*.
- Bovea, M. a. D., & Vidal, R. (2004). Materials selection for sustainable product design: a case study of wood based furniture eco-design. *Materials & design*, 25(2), 111-116.
- Cai, Z., & Aguilar, F. X. (2013). Consumer stated purchasing preferences and corporate social responsibility in the wood products industry: A conjoint analysis in the US and China. *Ecological economics*, 95, 118-127.
- Cao, X., & Hansen, E. N. (2006). Innovation in China's furniture industry. *Forest Products Journal*, 56(11/12), 33.
- Cao, X., Hansen, E. N., Xu, M., & Xu, B. (2004). China's furniture industry today. *Forest Products Journal*, 54(11), 14.
- Chen, Y., & Porncharoen, R. (2022). Reference and Innovation of Chinese Contemporary Furniture on the Basis of Chinese Ming Dynasty Furniture. *Learning & Education*, 10(8), 241-242.
- Chen, Z. (1981). Function and styles of Ming-style furniture. *Cult Relies Chin*, 3, 83-90.
- Chéry, O., & Marcandella, E. (2008). Innovation and Sustainable Development in Wood Furniture Design. Management of Technology Innovation and Value Creation: Selected Papers from the 16th International Conference on Management of Technology,
- Dehua, Y. (2018). Study on the Art Style of Ming Style Furniture.
- Ellsworth, R. H. (1998). *Essence of Style:: Chinese Furniture of the Late Ming and Early Qing Dynasty*. Asian Art Museum of San Francisco.
- Han, X., Wen, Y., & Kant, S. (2009). The global competitiveness of the Chinese wooden furniture industry. *Forest Policy and Economics*, 11(8), 561-569.
- Heping, Z. (2009). Review of "Theoretical Research on Contemporary Furniture Design". *Furniture and Interior Decoration*(5), 72-73.
- Huang, W., & Zhang, M. (2015). Wu Jian-feng Influences Of The Ming Literati'S Design On The Ming-Style Furniture Style Formation. *Packaging Engineering*, 10, 80-84.
- Jiang, M., Liu, S.-F., Lin, J.-Y., & Zhang, Y. (2018). Study of visual evaluations for Ming-style furniture-A case study of Ming official hat chair. *Journal of Interdisciplinary Mathematics*, 21(2), 361-368.
- Jie, W. (2018). Innovative research on mortise and tenon structure. *Journal of Nanjing University of the Arts (Art and Design)*, 5, 165-168.

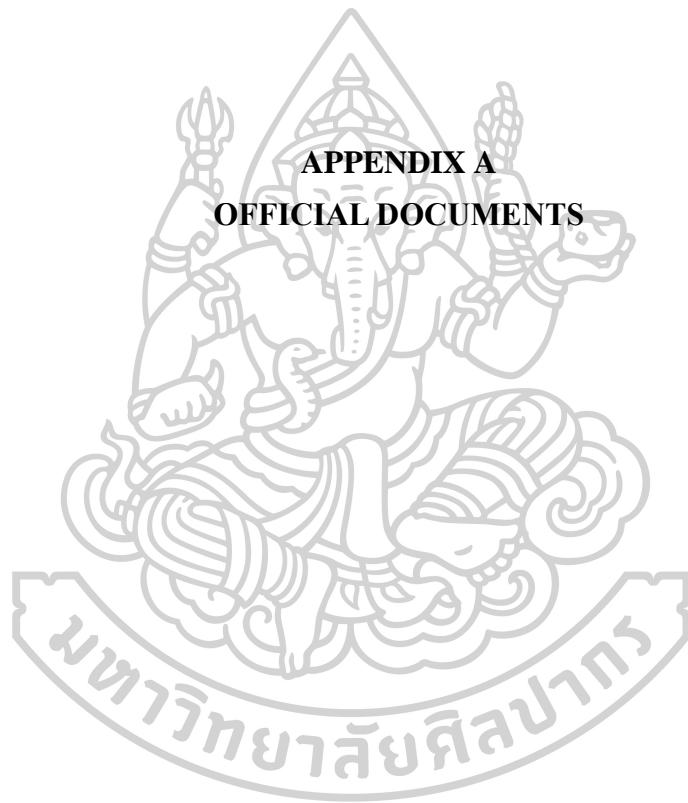
- Jifeng, X. (2009). *Research on Harmonious Design System of Modern Chinese Furniture* Jiangnan University].
- Jingbin, L. (2020). A Brief Talk on the Rhythm Beauty of Ming-Style Furniture [J]. *Agricultural Staff*, 2020 (23), 157.
- Kayizzi, J. (2021). *Fusion of culture through furniture* Makerere University].
- Kim, J. (2018). *Folding mechanism in furniture design* University of Iowa].
- Kun, X. (2009). Exploration on modern transformation of mortise and tenon structure. *furniture*(6), 60-63.
- Li, Y., Li, X., Zhang, Z., Zhang, G., & Gong, M. (2020). Understanding consumers online furniture purchase behavior: An updated UTAUT perspective. *Journal of Forest Economics*, 35(4), 267-303.
- Liang, P. (2013). Furniture Design in Contemporary China. *creative design source*(2), 22-27.
- Lihra, T., & Graf, R. (2007). Multi-channel communication and consumer choice in the household furniture buying process. *Direct Marketing: an international journal*, 1(3), 146-160.
- Lingyu, X. (2011). *On the Enlightenment of Ming-style Furniture to Modern Furniture Design* Jingdezhen: Jingdezhen Ceramic Institute].
- Liu, Q. (2020). Analysis on the Contemporary Emotional Design of Chinese Traditional Furniture. 4th International Conference on Culture, Education and Economic Development of Modern Society (ICCESE 2020),
- Liu, X. (2008). Cultural symbols in furniture design: A research on the evolution path of Ming furniture's molding design. 2008 9th International Conference on Computer-Aided Industrial Design and Conceptual Design,
- LIU, X. Y., TIMAR, M. C., & YI, S. L. (2013). A STUDY ON THE HISTORY AND MATERIALS OF TRADITIONAL CHINESE FURNITURE. *Pro Ligno*, 9(4).
- Liu, Y. (2020). INTEGRATION OF CHINESE AND WESTERN CULTURE TO PROMOTE INNOVATION OF FURNITURE DESIGN CONCEPT. *MESSAGE from the President of Suan Sunandha Rajabhat University*, 502.
- Lu, Y. (2018). Inheritance and innovation of Chinese modern furniture design. *Furniture and Interior Decoration*(7), 2.
- Mirka, G. A. (2005). Development of an ergonomics guideline for the furniture manufacturing industry. *Applied Ergonomics*, 36(2), 241-247.
- Muhammad Suandi, M. E., Amlus, M. H., Hemdi, A. R., Abd Rahim, S. Z., Ghazali, M. F., & Rahim, N. L. (2022). A Review on Sustainability Characteristics Development for Wooden Furniture Design. *Sustainability*, 14(14), 8748.
- Nan, J. (2015). Research on Chinese Modern Furniture from the Perspective of Inheritance of Design Principles. *Jiangnan University*.
- Ponder, N. (2013). Consumer attitudes and buying behavior for home furniture. *Report prepared for the furniture outreach program at Franklin Furniture Institute*,

Starkville, Mississippi, USA.

- Qi, W. (2017). *Redesign Ming Furniture*. Rochester Institute of Technology.
- Ratnasingam, J. (2022a). Automation Technology in Furniture Manufacturing. In *Furniture Manufacturing: A Production Engineering Approach* (pp. 155-167). Springer.
- Ratnasingam, J. (2022b). *Furniture Manufacturing: A Production Engineering Approach*. Springer Nature.
- Septiani, M., Putri, N., Verma, G., & Sasongko, N. (2022). Eco-design practice towards sustainable furniture: A Review. IOP Conference Series: Earth and Environmental Science,
- Shikui, L. (2016). On the Innovative Design Ideas of Contemporary Chinese Furniture. *Furniture and Interior Decoration*(9), 12-13.
- Shuang, G., & Ismail, A. R. B. (2021). A Review on Furniture Design Cases Embedded with Chinese Elements. International Conference on Business and Technology,
- Smardzewski, J., & Smardzewski, J. (2015). Ergonomics of Furniture. *Furniture Design*, 97-184.
- Sun, X., & Hammett, A. (1999). Hardwood Use in China's Furniture Industry. *Forest Products Journal*, 49.
- Wang, S. (2008). Appreciation of Ming Style Furniture. In: Cultural Relics Publishing House Bei Jing.
- Wang, X., & Yin, J. (2019). Mortise and Tenon and Its Practice on Contemporary Furniture Design. 2019 4th International Conference on Humanities Science and Society Development (ICHSSD 2019),
- Wu, E. (2015). *What Does Design Expose?: A Comparative Study of Finnish Modern Furniture and Chinese Ming-style Furniture*. University of Eastern Finland.
- Wu, S., & Liu, W. (2019). Discussion on the Aesthetic Concept of Chinese Traditional Culture in Modern Furniture Design. IOP Conference Series: Materials Science and Engineering,
- Xi, W., & Quiet. (2009). Thinking about the new thinking concept of contemporary Chinese furniture design from the traditional Chinese furniture design. *Science and Technology Innovation Herald*(32), 200-200.
- Xiong, X.-q., Guo, W.-j., Fang, L., Zhang, M., Wu, Z.-h., Lu, R., & Miyakoshi, T. (2017). Current state and development trend of Chinese furniture industry. *Journal of Wood Science*, 63, 433-444.
- Xiong, X., Ma, Q., Wu, Z., & Zhang, M. (2020). Current situation and key manufacturing considerations of green furniture in China: A review. *Journal of Cleaner Production*, 267, 121957.
- Xu, J. F., & Zhang, H. N. (2013). Modern office furniture design based on ergonomics. *Advanced Materials Research*, 628, 57-62.
- Yang, D. (2023). *Design for environmentally sustainable furniture systems—the knowledge and know-how of furniture life cycle design and furniture sustainable*

- product-service system design* Taylor & Francis].
- Yang, Y. (2002). Research on Ming-style furniture. *China Architecture and Building Press, Beijing*, 28-31.
- Yantao, W., & Zhongwu, J. Application of Creative Soft Decoration in New Chinese Furniture Design.
- Ye, C. (2013). Study on Furniture Product Configuration Design from perspective of Traditional Pattern Symbols. 2013 International Conference on Advances in Social Science, Humanities, and Management (ASSHM-13),
- Ye, J., Zhang, J., Gao, L., Zhou, Y., Liu, Z., & Han, J. (2022). Neo-Chinese Style Furniture Design Based on Semantic Analysis and Connection. *KSII Transactions on Internet & Information Systems*, 16(8).
- Yiqing, L. (2009). Talking about the traditional Chinese mortise and tenon structure. *Shanxi Architecture*, 35(24), 25-27.
- Yu, D.-h. (2014). Research on Human Factors Engineering of Ming-Style Furniture. Proceedings of 2013 4th International Asia Conference on Industrial Engineering and Management Innovation (IEMI2013),
- Yun, J. J., Zhao, X., Kim, S. A., & Sadoi, Y. (2022). Open innovation dynamics of furniture design and function: The difference between IKEA and Nitori. *Science, Technology and Society*, 27(2), 172-190.
- Zhang, H. N., & Xu, J. F. (2010). Application of Maslow's Hierarchy of Needs to Modern Chinese Furniture. *Applied Mechanics and Materials*, 37, 185-189.
- Zhang, J. Z., Xu, J., & Bai, W. D. (2014). Furniture design and fractal geometry-the fractal art in traditional furniture. *Advanced Materials Research*, 933, 655-661.
- Zhang, L., Zhao, J., & Zheng, L. N. (2016). The Application of Confucianism in Modern Furniture Industry. 2016 International Conference on Education, Management and Computer Science,
- Zhang, S., Zhu, J., Wang, G., Reng, S., & Yan, H. (2022). Furniture Online Consumer Experience: A Literature Review. *BioResources*, 17(1).
- ZHAO, Y. (2011). The study and evolution of the Chinese traditional furniture in contemporary China.
- Zhenhan, W. (2011). *Research on Chinese Traditional Design Thinking Mode and Furniture Style Evolution* Nanjing Forestry University].
- Zhou, M., Huang, J., Wu, K., Huang, X., Kong, N., & Campy, K. S. (2021). Characterizing Chinese consumers' intention to use live e-commerce shopping. *Technology in Society*, 67, 101767.
- Zhu, L., Yan, Y., & Lv, J. (2023). A Bibliometric Analysis of Current Knowledge Structure and Research Progress Related to Sustainable Furniture Design Systems. *Sustainability*, 15(11), 8622.

APPENDIX A
OFFICIAL DOCUMENTS





No. 8606/ 1111

Graduate School
Silpakorn University
Boromarachachonnani Road,
Taling Chan, Bangkok 10170

July ๒๗, 2022

Subject: Invitation to be an inspector of research tool quality

Dear Professor Dr. He Renke,

Mr. Chen Yanbin is a graduate student ID 620430041 in Design Program at Graduate School, Silpakorn University. Currently, he is conducting his thesis study entitled: The Design of New Chinese Furniture Based on the Concept of Integration and Symbiosis. In this regard, Graduate School, Silpakorn University would like to invite you to inspect the quality of research tools for the student.

Your kind assistance and academic contribution is much appreciated.

Sathit Niratisai

(Asst. Prof. Sathit Niratisai, Ph.D.)

Dean of Graduate School, Silpakorn University (Acting)

The Secretariat of Graduate School, Silpakorn University (Taling Chan)

Tel: 0-2849-7502

Fax: 0-2849-7503

Expert Invitation



No. 8606/ 1112

Graduate School
Silpakorn University
Boromarachachonnani Road,
Taling Chan, Bangkok 10170

July ๒๗, 2022

Subject: Invitation to be an inspector of research tool quality

Dear Professor Tong Huiming,

Mr. Chen Yanbin is a graduate student ID 620430041 in Design Program at Graduate School, Silpakorn University. Currently, he is conducting his thesis study entitled: The Design of New Chinese Furniture Based on the Concept of Integration and Symbiosis. In this regard, Graduate School, Silpakorn University would like to invite you to inspect the quality of research tools for the student.

Your kind assistance and academic contribution is much appreciated.

Sathit Niratisai

(Asst. Prof. Sathit Niratisai, Ph.D.)

Dean of Graduate School, Silpakorn University (Acting)

The Secretariat of Graduate School, Silpakorn University (Taling Chan)

Tel: 0-2849-7502

Fax: 0-2849-7503



No. 8606/ 1113

Graduate School
Silpakorn University
Boromarachachonnani Road,
Taling Chan, Bangkok 10170

July ๑๗, 2022

Subject: Invitation to be an inspector of research tool quality

Dear Professor Wen Hao,

Mr. Chen Yanbin is a graduate student ID 620430041 in Design Program at Graduate School, Silpakorn University. Currently, he is conducting his thesis study entitled: The Design of New Chinese Furniture Based on the Concept of Integration and Symbiosis. In this regard, Graduate School, Silpakorn University would like to invite you to inspect the quality of research tools for the student.

Your kind assistance and academic contribution is much appreciated.

Sathit Niratisai

(Asst. Prof. Sathit Niratisai, Ph.D.)

Dean of Graduate School, Silpakorn University (Acting)

The Secretariat of Graduate School, Silpakorn University (Taling Chan)

Tel: 0-2849-7502

Fax: 0-2849-7503



No. 8606/ 1114

Graduate School
Silpakorn University
Boromarachachonnani Road,
Taling Chan, Bangkok 10170

July ๑๗, 2022

Subject: Invitation to be an inspector of research tool quality

Dear Professor Wu Hongmin,

Mr. Chen Yanbin is a graduate student ID 620430041 in Design Program at Graduate School, Silpakorn University. Currently, he is conducting his thesis study entitled: The Design of New Chinese Furniture Based on the Concept of Integration and Symbiosis. In this regard, Graduate School, Silpakorn University would like to invite you to inspect the quality of research tools for the student.

Your kind assistance and academic contribution is much appreciated.

Sathit Niratisai

(Asst. Prof. Sathit Niratisai, Ph.D.)

Dean of Graduate School, Silpakorn University (Acting)

The Secretariat of Graduate School, Silpakorn University (Taling Chan)

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No. 8606/1115

Graduate School
Silpakorn University
Boromarachachonnani Road,
Taling Chan, Bangkok 10170

July ๑๗, 2022

Subject: Invitation to be an inspector of research tool quality

Dear Dr. Zhang Wen,

Mr. Chen Yanbin is a graduate student ID 620430041 in Design Program at Graduate School, Silpakorn University. Currently, he is conducting his thesis study entitled: The Design of New Chinese Furniture Based on the Concept of Integration and Symbiosis. In this regard, Graduate School, Silpakorn University would like to invite you to inspect the quality of research tools for the student.

Your kind assistance and academic contribution is much appreciated.

Sathit Niratisai

(Asst. Prof. Sathit Niratisai, Ph.D.)

Dean of Graduate School, Silpakorn University (Acting)

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No. 8606/ 1116

Graduate School
Silpakorn University
Boromarachachonnani Road,
Taling Chan, Bangkok 10170

July ๑๗, 2022

Subject: Invitation to be an inspector of research tool quality

Dear Associate Professor Tao Xiaojun,

Mr. Chen Yanbin is a graduate student ID 620430041 in Design Program at Graduate School, Silpakorn University. Currently, he is conducting his thesis study entitled: The Design of New Chinese Furniture Based on the Concept of Integration and Symbiosis. In this regard, Graduate School, Silpakorn University would like to invite you to inspect the quality of research tools for the student.

Your kind assistance and academic contribution is much appreciated.

Sathit Niratisai

(Asst. Prof. Sathit Niratisai, Ph.D.)

Dean of Graduate School, Silpakorn University (Acting)

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No. 8606/ 1117

Graduate School
Silpakorn University
Boromarachachonnani Road,
Taling Chan, Bangkok 10170

July ๗, 2022

Subject: Invitation to be an inspector of research tool quality

Dear Associate Professor Dr. Ma Guodong,

Mr. Chen Yanbin is a graduate student ID 620430041 in Design Program at Graduate School, Silpakorn University. Currently, he is conducting his thesis study entitled: The Design of New Chinese Furniture Based on the Concept of Integration and Symbiosis. In this regard, Graduate School, Silpakorn University would like to invite you to inspect the quality of research tools for the student.

Your kind assistance and academic contribution is much appreciated.

Sathit Niratisai

(Asst. Prof. Sathit Niratisai, Ph.D.)

Associate Dean for Administration Acting for
Dean of Graduate School, Silpakorn University

The Secretariat of Graduate School, Silpakorn University (Taling Chan)

Tel: 0-2849-7502

Fax: 0-2849-7503

APPENDIX B
RESEARCH PROCESS



关于当代中国家具设计的消费调查问卷

尊敬的先生/女士：本项目探索当代中国家具市场的消费行为，并邀请您自愿参与此项目。问卷为匿名问卷，我向您保证问卷中的信息仅用于本次学术研究并受到严格保密。请在知情和自愿的前提下，根据您本人的消费实际情况回答以下问题。非常感谢您的参与和支持！

- *1. 您的年龄是：
 - 20岁以下
 - 20-29岁
 - 30-40岁
 - 40岁以上
- *2. 您的性别是：
 - 男
 - 女
- *3. 您的受教育程度是：
 - 中学及中专毕业
 - 专科毕业
 - 本科毕业
 - 研究生及以上
 - 其它
- *4. 您的职业是：
 - 企业人员
 - 公职人员
 - 学生
 - 自由职业者
 - 退休人员
- *5. 您的居住状况是：
 - 单身独居
 - 单身与父母同住
 - 单身与朋友同住
 - 已婚无小孩
 - 已婚有小孩居住
 - 其它
- *6. 您所居住的城市规模：
 - 一线城市
 - 二线城市
 - 三四线城市
 - 其它
- *7. 您居住的房屋面积有：
 - 50平方米以内
 - 50-80平方米
 - 80-120平方米
 - 120-150平方米
 - 150平方米以上
- *8. 您多久会购买一次家具？
 - 六个月一次
 - 一年一次
 - 三年一次
 - 五年一次
 - 10年一次或更久
- *9. 您通常会选择什么渠道购买家具？
 - 线上渠道
 - 线下实体店
 - 都会考虑
- *10. 您在选购家具时更倾向单件家具还是套系家具？
 - 单件家具
 - 套系家具
 - 都会选择
- *11. 您觉得一件家具最在乎的是：【最多选择3项】
 - 外观
 - 材质
 - 价格
 - 品牌
 - 环保
 - 质量
 - 舒适
 - 其它

*12. 您更倾向选择什么风格的家具？【最多选择3项】



当代中国家具风格



欧式家具风格



美式家具风格



北欧家具风格



现代家具风格

其它风格

*13. 您认为目前市场上的家具存在哪些缺陷？【最多选择3项】

- 外观没有创新
- 质量没有保障
- 功能单一
- 价格不合理
- 不能有效利用空间
- 其它

*14. 下列家具中, 您喜欢哪件家具: 【最少选择1项】



1



2



3



4



*15. 您了解当代中国家具吗?

- 了解
- 了解一点
- 不了解

*16. 您以后是否有意愿购买当代中国家具?

- 是
- 否

*17. 您能接受的单件当代中国家具的价格是多少?

- 500元以内
- 500-1000元
- 1000-3000元
- 3000元以上

*18. 同等价位家具是否会优先考虑当代中国家具?

- 是
- 否

*19. 您希望当代中国家具可以采用以下哪种材料: 【最多选择3项】

- 木质
- 金属
- 玻璃
- 陶瓷
- 塑料
- 纺织品
- 其它

*20. 您认为家具设计的未来趋势可能有哪些? 【最多选择3项】

- 现代环保材料在家具中的使用
- 针对小公寓空间设计的家具
- 单一家具的使用功能更加全面
- 人体工学深入研究下更加舒适的家具研发
- 家具的外观设计更符合现代审美
- 其它

*21. 您对当代中国家具的设计有什么想法和意见?

*22. 以下3件折叠家具, 你喜欢哪件?



1






2



3

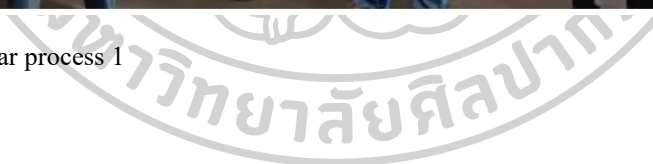
	<p>He Renke</p> <p>Dean, professor and doctoral supervisor of the School of Design and Art of Hunan University. Chairman of the Industrial Design Teaching Guidance Sub-committee of the Ministry of Education of China, and a member of the Discipline Evaluation Group of the Academic Degrees Committee of the State Council. Chairman of the Academic Committee of the School of Design and Art of Hunan University, Chairman of the Hunan Design Artists Association, Invited Vice Chairman of the China Industrial Design Association, Chairman of the Industrial Design Teaching Committee of the China Machinery Industry Education Association, German Red Dot Design Award, IF Design Award, Japan G - MARK Design Award, American CORE77 Design Award Judge, Chairman of China Industrial Design Red Star Award Judge. He has won the first prize of national teaching achievement award, the first prize of national teaching material, and the honor of national teaching teacher.</p>
	<p>Tong Huiming</p> <p>Dean, professor and postgraduate tutor of the School of Design, Guangzhou Academy of Fine Arts. In June 1983, he graduated from the Central Academy of Arts and Crafts with a bachelor's degree in literature; in June 1986, he graduated from the Guangzhou Academy of Fine Arts with a master's degree in literature. Member of Industrial Design Art Committee of China Artists Association, executive director of China Industrial Design Association, vice president of Guangdong Industrial Design Association, director of Industrial Design Teaching Steering Committee of Guangdong Higher Education Institutions. Expert of the Experience Design Professional Committee of Guangdong Industrial Design Association, Chairman of the Jury Committee of the 5th and 6th "Governor's Cup" Industrial Design Competition of Guangdong Province, Chairman of the Expert Committee of Guangzhou "Kapok Design Award", and judge of many domestic and foreign design awards. In the past ten years, design research has focused on design strategy, brand creation, brand design image, product innovation design and other fields.</p>

	<p>Wen Hao Well-known creator, curator, scholar, dean of Guangzhou Academy of Fine Arts Furniture Research Institute, postgraduate tutor, founder of Chinese culture-driven design brand "Haostyle", chief curator of CIFF "Spring of Design" Contemporary Chinese Furniture Design Exhibition He is the deputy director of the Design Working Committee of China Furniture Association, and the deputy director of the Professional Committee of Display Art of China Interior Decoration Association.</p>
	<p>Wu Hongmin Professor, Master Tutor, Dean of the Academy of Fine Arts of Gannan Normal University, Director of the Provincial Industrial Design Center of Gannan Normal University, Jiangxi Province Hundred Thousand Talents Project, Young and Middle-aged Academic Leader of Jiangxi Province Colleges and Universities, and Young and Middle-aged Backbone Teachers of Jiangxi Province Colleges and Universities, China Design Industry Outstanding Contribution Award. National Member of China Packaging Federation, Deputy Director of Design Committee of Jiangxi Packaging Federation, Director of Industrial Design Branch of China Mechanical Engineering Society, Vice President of Jiangxi Industrial Design Society.</p>
	<p>Zhang Wen Ph.D., Deputy General Manager of National Industrial Design Center (Ganpu Design), Deputy Director of Jiangxi Provincial Industrial Design Center. The works range from furniture to technological products and interior spaces. Judge of the 4th and 5th Central China Furniture Design Competition, and judge of Jiangxi University Student Industrial Design Competition.</p>

	<p>Tao Xiaojun</p> <p>Associate professor, collector, senior engineer. Chairman of Ganzhou City Collectors Association, Vice Chairman of Jiangxi Folk Literature and Artists Association, Chairman of Ganzhou Folk Literature and Artists Association, and Curator of Hakka Folk Museum of Gannan Normal University. He has been engaged in the collection, protection, research and teaching of furniture and ceramic cultural relics for more than 20 years, and has collected more than 20,000 pieces (sets) of various cultural relics.</p>
	<p>Ma Guodong</p> <p>Ph.D., associate professor, majoring in Chinese traditional literature and Chinese cultural history. He has written works related to Chinese furniture culture many times. Mainly responsible for the teaching of Chinese literature history, Chinese cultural history, Han Fu research, calligraphy, and other courses. Participated in the compilation and publication of 2 classical literatures and the compilation of 2 textbooks.</p>

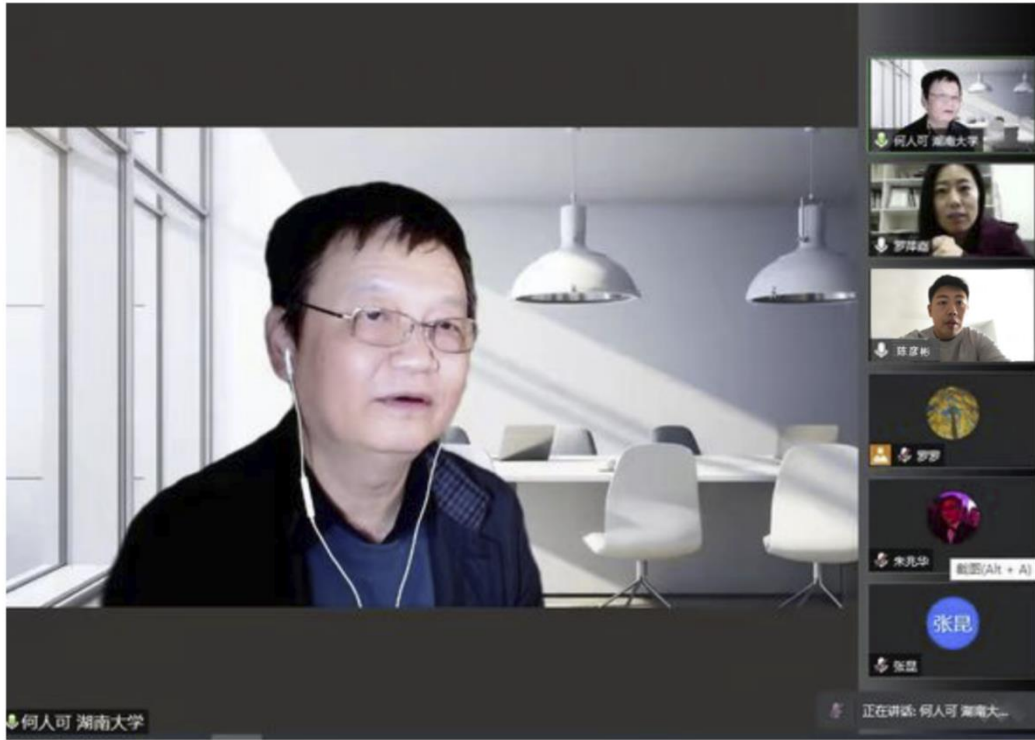


Research seminar process 1



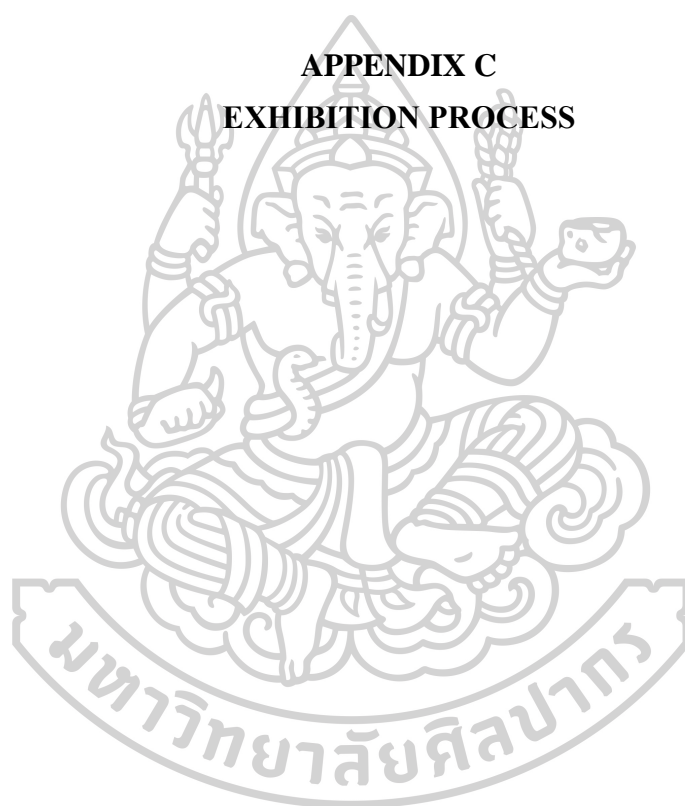


Research seminar process 2



Research seminar process 3

APPENDIX C
EXHIBITION PROCESS





陈彦彬

1993年生，江西赣州人，博士在读，本科、硕士毕业于广州美术学院，现为湖南师范大学专任教师，国家级工业设计中心（湖南设计）展示部总监，江西省工业设计学会会员，主持和参与国家级、省级的课题10余项；设计作品多次入选参加国家级、省部级展览，并在全国数字艺术大赛等多项国家级、省部级赛事中获奖；论文在国内、国际期刊发表近20余篇；申请国家专利10多项；指导學生参加全国大学生数字艺术大赛及省部级竞赛活动获奖近10余项。



陈彦彬

1993年生，江西赣州人，博士在读，本科、硕士毕业于广州美术学院，现为湖南师范大学专任教师，国家级工业设计中心（湖南设计）展示部总监，江西省工业设计学会会员，主持和参与国家级、省级的课题10余项；设计作品多次入选参加国家级、省部级展览，并在全国数字艺术大赛等多项国家级、省部级赛事中获奖；论文在国内、国际期刊发表近20余篇；申请国家专利10多项；指导學生参加全国大学生数字艺术大赛及省部级竞赛活动获奖近10余项。



Exhibition process 1



Exhibition process 2



Exhibition process

VITA

NAME	Chen Yanbin
INSTITUTIONS ATTENDED	Silpakorn University Faculty of Decorative Arts
PUBLICATION	<ol style="list-style-type: none">1. Reference and Innovation of Chinese Contemporary Furniture on the Basis of Chinese Ming Dynasty Furniture. (Journal of Fine Arts Research and Applied Arts)2. The contemporary Chinese furniture design of Intergration and symbiosis. (Journal of Fine Arts Research and Applied Arts).
AWARD RECEIVED	<p>In June 2023, the work won the second prize in the concept group of the 2nd Starting Point Design Competition in China;</p> <p>In June 2023, the work won the Excellence Award in the Concept Group of the Second Starting Point Design Competition in China;</p> <p>In May 2023, the work was selected for the 9th China (Ganzhou) Furniture Industry Expo;</p> <p>In March 2023, the works were selected to participate in the 51st China (Guangzhou) International Furniture Fair;</p> <p>In August 2022, the work won first prize in the Jiangxi Division of the Tenth National College Digital Art Design Competition;</p> <p>In August 2022, the work won the second prize in the Jiangxi Division of the Tenth National College Digital Art Design Competition;</p> <p>In August 2022, the works were selected for the Fifth China International Industrial Design Expo;</p> <p>In May 2022, the work was selected for the 8th China (Ganzhou) Furniture Industry Expo;</p> <p>In December 2021, the work won the first prize in the 3rd Jiangxi University Space Design Competition;</p> <p>In March 2021, the work was selected for the 49th China (Guangzhou) International Furniture Fair;</p> <p>In June 2021, won the honour of excellent instructor at the 2nd Starting Point Design Competition of China (Ganzhou);</p> <p>In May 2021, he was rated "Senior Talent in Industrial Design Professional Technology" by the Ministry of Industry and Information Technology of China;</p>