Study on the Appearance Elements of Tea Trays Based on Charm Engineering

Yike Gao[1*], Yuanyuan Zhang[2], Xiangyuan Sun[3]

{812075818@qq.com[1*], 2531049403@qq.com[2], 254402449@qq.com[3]}

Fuzhou University, Xiamen 36100, Fujian Province, China

Abstract. Objective: In the innovative design of traditional artifacts, it is very important to understand the different feelings and intentions of consumers about the products and translate them into specific design elements. This paper aims to study the relationship between the emotional factors of consumer psychology and the appearance design elements of tea tray, determine the design elements, so as to carry out innovative design of tea tray, and contribute to the enhancement of the value added of tea tray. Methods: Taking the traditional Chinese tea tray as an example, firstly, 8 tea tray experts were interviewed, and the charm factors were sorted out and extracted by the evaluation structure method in the charm engineering, and a questionnaire survey table was designed; then, based on the interview content, the questionnaire survey method was used to obtain the public's charm evaluation of the tea tray, and 92 valid questionnaires were collected; finally, the quantitative theory was used to analyze the influence weight of the charm factors of the tea tray. Results: A quantitative statistical table was obtained, and the charm factors with large influence factors were selected as the style adjustment considerations before the design of the tea tray. Conclusion: The feasibility of the theory is proved by the research case of tea tray, which provides more diversified and novel design basis for the design of traditional artifacts in the future.

Keywords: traditional artifacts; tea tray; glamour engineering; evaluation structure method; quantitative theory

1 Introduction

A tea tray is a daily necessity for brewing and savoring tea, constituting an essential element of Chinese tea culture. Since the beginning of the 21st century, the Chinese tea culture industry has experienced rapid development. Tea trays, as crucial carriers of tea culture, have gained increasing favor among consumers. Many experts and scholars have utilized tea trays as a medium to explore the cultural background and social demands behind the tea tray economy. For instance, Wang Gang, considering resource utilization, points out that the stone industry relies on and wastes resources, generating a considerable amount of industrial surplus. Tea culture, representing a refined and unhurried lifestyle, aligns seamlessly with the inherent attributes of stone—its solidity, stability, and tranquility. Using stone to shape peripheral tea-related products possesses unique material advantages [1].Jin Ling employs Dongyang woodcarving tea utensils as a design medium, applying the principles and methods of cultural narration. In various narrative elements, Jin Ling refines and innovatively redesigns Dongyang woodcarving products [2]. Wang Jian and others, driven by user demands for innovation,

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embark on design to help companies establish corresponding quality priorities, thereby enhancing the efficiency of designers [3].By reviewing literature, it is evident that current research on tea trays primarily focuses on product materials, product appearance, cultural art, and demand transformation. However, there is a lack of emphasis on the consumer's tea tray usage experience and satisfaction. Currently, many sectors are augmenting the commercial prospects and market worth of their products by delving into customer consumption preferences and aesthetic inclinations. Wang E'peng and Shi Zeyu employ a combination of review mining and the Mixed-logit model to excavate consumer predilections, with the objective of refining design strategies for Bluetooth earphones[4]. Dong Xiaoxuan examines the packaging design approaches for small-grain coffee by assessing users' cognition levels and purchase willingness concerning it[5]. Xu Linlang and Lu Fudong, from the viewpoint of the SOR model, probe into the influence that novel book cover designs exert on consumers' buying intentions[6].

For the market, tea tray design needs to closely align with the current needs of consumers to enhance their economic attachment. For businesses, improving the performance and comfort of tea trays can effectively elevate consumer loyalty and reputation, promoting brand construction and development. For consumers, satisfaction with product demands is a fundamental consideration in purchasing decisions, and meeting and enhancing usage demands can effectively elevate the product's user experience. In summary, the user experience of tea trays has become a crucial factor in consumers' choices. This study, using the renowned design-driven brand—WuShi Design as an example, explores the relationship between the usage elements of tea trays and consumer satisfaction. By analyzing the current demands of consumers regarding tea trays, this research aims to guide the subsequent design and optimization of WuShi Design's tea trays.

2 Research Methods and Process

2.1 Research Methods

Miryoku Engineering is a user-preference-oriented product design method that creates highly attractive products by collecting and analyzing user evaluations of likes and dislikes [7]. This method commonly employs two techniques: the Evaluation Grid Method (EGM) and Quantitative Type I Theory[8], to study the relationship between the attractiveness factors of a product and user preferences, thus intuitively reflecting the product's appeal to users. This method commonly employs two techniques: the Evaluation Grid Method (EGM) and Quantitative Type I Theory[9], to study the relationship between the attractiveness factors of a product and user preferences, thus intuitively reflecting the product's appeal to users. The Evaluation Grid Method (EGM) is a qualitative research technique based on in-depth interviews[10]. It constructs qualitative relationships between the research subject and the aesthetic preferences of interviewees by acquiring their likes and dislikes and subjective evaluations of the research subject[11].Subsequently, based on the interviewees' subjective evaluation content, it categorizes them into three types: original evaluation, abstract semantics, and specific elements, and then draws the appearance evaluation construction diagram for the research subject. Quantitative Type I Theory is a quantitative research technique based on multiple regression[12]. It analyzes the relationship between qualitative data (explanatory

variables) and quantitative data (response variables) by establishing mathematical models, thus assisting researchers in drawing conclusions about the factors influencing consumer preferences for appearance [13].

2.2 Research Process

This paper adopts the research method of Miryoku Engineering. Due to the multifaceted nature of the tea tray usage experience, the respondents are divided into a smaller professional group and a larger consumer group. Initially, in-depth interviews are conducted with the professional group to obtain their experiences and evaluations of WuShi tea trays. This process aims to establish a qualitative relationship between the usage elements of WuShi tea trays and consumer satisfaction. Subsequently, a questionnaire survey is conducted with the consumer group to analyze the quantitative relationship between multiple usage elements and satisfaction levels[14].The specific research process is shown in Figure 1.

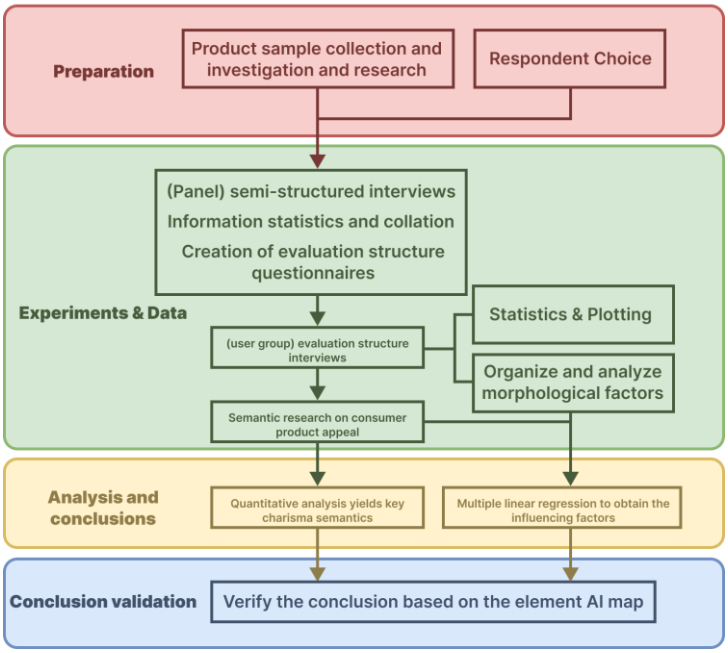

Fig.1. Research flow chart

The entire process is divided into the following five stages:

Conduct research and analysis on the tea tray market and consumers, and select WuShi tea tray samples through interviews with the professional group.

At the start of the interviews, participants from the professional group first select satisfactory tea trays from the WuShi tea tray samples and provide initial evaluations. Subsequently, in-depth interviews are conducted based on the selected tea trays to obtain insights into the usage elements and the user experience of WuShi tea trays that participants are concerned about.

Classify, organize, and simplify the results of in-depth interviews. Based on the interview records, create an evaluation construction diagram of the usage elements of WuShi tea trays.

Using Quantitative Type I Theory, establish a multiple linear regression model based on the various usage elements obtained during in-depth interviews and the average satisfaction levels of different abstract semantics. Identify the significant factors that impact satisfaction levels.

Finally, conduct a comprehensive analysis and summary of the research results.

3 Research Content and Process

3.1 Selection of Experimental Samples

The experiment focuses on WuShi tea trays available for sale on Taobao. Due to the diverse design styles and materials of WuShi tea trays, which exhibit good representativeness and consumer coverage, various WuShi tea tray products with different styles and materials are selected as experimental samples. As tea culture possesses strong tradition and continuity, this study selects WuShi tea trays that were introduced to the market from January 2020 to December 2023 as experimental samples. Initially, 88 experimental samples were identified through official online sales channels such as Taobao's online mall. To ensure the purity and feasibility of the study, it is necessary to screen and process the samples. Firstly, eliminate WuShi tea tray samples with interference from other factors: exclude 28 samples with co-branded designs with other brands, exclude 30 samples with festival-themed elements, and remove samples with unclear display effects. Uniformly process the selected 30 experimental samples: present them with a white background, consistent viewing angles, and a 360° display animation of the same tea tray size. This ensures that respondents can clearly and directly observe each experimental sample from all angles. Finally, after a second screening by 8 professionals, exclude samples based on pre-existing styles and those influenced by personal factors such as price and brand. Compile a comprehensive list of the most representative 15 experimental samples.

3.2 Experimental Participants

The subjects of the experiment were divided into professional and consumer groups. The professional group consisted of tea enthusiasts who had long-term usage and a higher level of tea tasting. A total of 20 professionals from various industries were recruited. Through preliminary screening and pre-interviews, eight tea enthusiasts with rich experience and comprehensive expression were selected as members of the professional group. The final members of the professional group were all aged between 30 and 40 years old, including three senior tea enthusiasts (who owned at least 10 different styles or materials of tea trays or had the habit of collecting a complete set) who were all male; among the five regular tea enthusiasts (with 3 to 5 years of tea brewing experience), there were three male and two female tea enthusiasts. The consumer group consisted of 92 consumers who had purchased tea trays through various channels. The questionnaire survey for this consumer group was mainly conducted through online and offline teahouses.

3.3 In-Depth Interviews

In an undisturbed indoor environment, one-on-one interviews were conducted with participants from the professional group. This is shown in Figure 2.The process of in-depth interviews is as follows:

Participants first observed 360° display animations of WuShi tea trays on a tablet (each animation can be viewed from any angle with no time limitations). Participants then made judgments based on their preferences, marking trays they found satisfying and eliminating those they found unsatisfactory. Participants were allowed to observe the trays in sequence and could backtrack to modify their markings.

Based on the trays marked as satisfying by participants, the researcher sequentially asked participants about the original reasons for their satisfaction with each tray.

Following the participants' responses, the researcher asked them to continue elaborating on their perceptions of the usage elements and abstract psychological experiences related to each tray. During this process, participants were encouraged to use descriptive adjectives for their abstract psychological experiences. Before each interview, the order of WuShi tea trays was randomly shuffled, and the entire interview process was recorded in both audio and necessary written records for subsequent information organization. The WuShi tea tray samples are depicted in Figure 2, representing images marked as satisfying by multiple participants.

Fig.2. Examples of experimental samples during the interview

3.4 Construction of the Appearance Evaluation Diagram for WuShi Tea Trays

Before drawing the construction diagram for usage element evaluation, combine the characteristics of the research objects, participants' original evaluations of WuShi tea trays, and the usage element experiences of tea trays. Converge the original evaluations into four aspects: color, material, form, and structure. Then, using the A-type graphic interpretation method, preliminarily classify and organize the information obtained from the interviews

based on the inherent affinity of language[15-17]. For example, in abstract semantics, expressions like "primitive," "generous," "calm," and "appropriate" can be categorized together. Simultaneously, eliminate expressions with low relevance to usage elements, such as "expensive" or personal preferences. Next, according to the "Modern Chinese Dictionary," merge and simplify synonymous expressions for each category of abstract semantics, reducing unnecessary redundancy. For instance, expressions like "traditional" and "Chinese style" are merged into "antique." Finally, organize the most frequently mentioned expressions for each category as representative semantics. The classified and simplified table is shown in Table 1.

Tab 1. Consolidation and simplification of abstract semantics

Type	Total number of times	Simplified formulation and its frequency
Naturally generous	30	12 Raw 8Generous 5Calmly 5Decent
Sophisticated and elegant	26	9Exquisite 7Elegant 5Graceful 5Fine
Simple and modren	24	10Simple 5Modern 5Regular 4Minimalist
With an antique feel	23	7Tradtional 6Chinese-style 5Cultural 5Connotative

The final original evaluation of the blind box toys favored by the professional group includes four aspects: color, material, form, and structure. The convergent abstract semantics are "natural and generous," "exquisite and elegant," "simple and modern," and "antique," with 14 specific elements. Combining the in-depth interview records, the construction diagram of the appearance evaluation for WuShi tea trays is shown in Figure 3. The numbers represent the frequency of each phrase being mentioned.

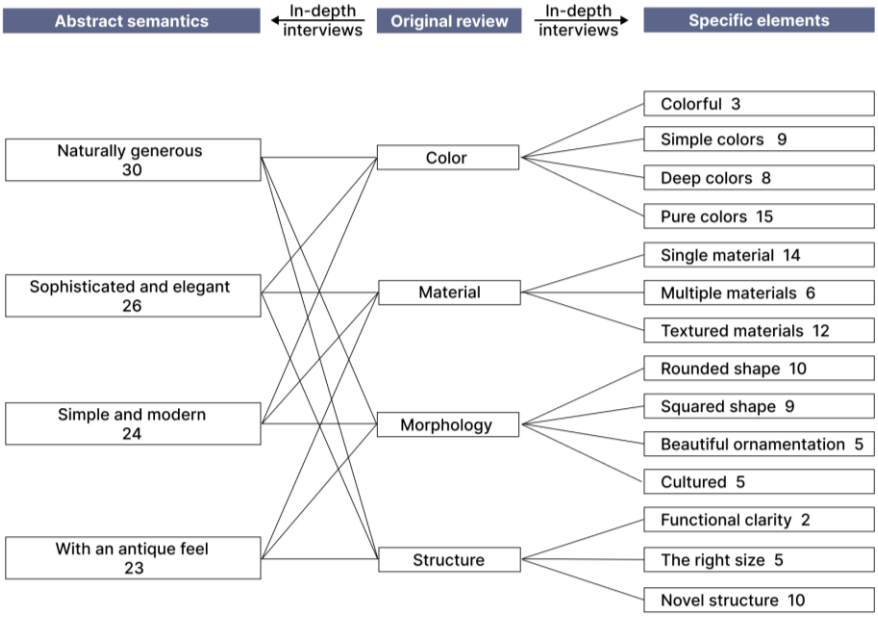

Fig.3. Evaluation structure diagram of Wu Shi

3.5 Questionnaire Construction and Analysis

Firstly, we organized the collection of tea trays that satisfied the professional group, categorized them by style and material, and arranged the tea trays with higher selection rates from left to right. Due to the inconsistent number of tea trays in various styles and materials, which could lead to a guided bias in the questionnaire, we supplemented the sequence with tea trays that had lower selection rates to ensure an equal number of tea trays in each group. We ultimately obtained 15 images of tea trays from the consumer group's questionnaire survey. Furthermore, we created a 7-point Likert scale questionnaire based on four abstract semantic categories—naturally generous, sophisticated and elegant, simple and modern, and with an antique feel—to measure users' cognitive preferences and strengths regarding specific tea tray styles. To reduce the impact of respondent fatigue on the questionnaire, we divided the questionnaire into two versions: Form A and Form B (the order of tea trays in Form A is the reverse of that in Form B). A total of 92 questionnaires were distributed, and ultimately, 92 valid questionnaires were collected.

Summarize and compile the rating results from consumers, obtaining the mean satisfaction score for each of the 15 WuShi tea trays under different abstract semantics. This mean score will be used as the dependent variable when analyzing the corresponding abstract semantics. Then, in conjunction with the construction diagram of WuShi tea tray usage elements evaluation, use the various usage elements corresponding to the abstract semantics as independent variables. According to the interview records of the professional group, assign a value of 1 to the usage element mentioned most frequently for each different original evaluation, and 0 to the others. Conduct a multiple linear regression analysis, and the statistical data is shown in Table 2. Finally, import the mean satisfaction scores for each abstract semantics obtained from the questionnaire and the data statistical table into the SPSS 26.0 software for regression analysis.

Table 2. Quantitative type I statistics

Type	Specific elements													
	A1	A2	A3	A4	B1	B2	B3	C1	C2	C3	C4	D1	D2	D3
Y1	0	1	0	0	0	1	0	0	1	0	0	0	0	1
Y2	0	1	0	0	0	1	0	0	1	0	0	0	0	1
Y3	0	0	1	0	0	1	0	0	1	0	0	0	0	1
Y4	0	1	0	0	0	1	0	1	0	0	0	0	0	1
Y5	0	1	0	0	0	1	0	0	1	0	0	0	0	1
Y6	0	0	1	0	1	0	0	0	0	0	1	1	0	0
Y7	0	0	1	0	0	1	0	1	0	0	0	0	0	1
Y8	1	0	0	0	0	1	0	0	0	1	0	0	0	1
Y9	0	0	0	1	0	1	0	0	0	1	0	0	0	1
Y10	1	0	0	0	1	0	0	0	0	1	0	0	0	1
Y11	1	0	0	0	0	0	1	0	1	0	0	0	1	0
Y12	1	0	0	0	1	0	0	0	0	1	0	0	1	0
Y13	0	0	0	1	0	1	0	0	0	0	1	0	1	0
Y14	0	0	0	1	0	0	1	0	0	0	1	0	0	1
Y15	0	0	0	1	0	0	1	0	1	0	0	0	1	0

4 Research Results and Conclusions

4.1 Questionnaire Data Analysis Results

The questionnaire data was subjected to mathematical analysis to identify the significant impact of different semantics on the usage elements of WuShi tea trays. Utilizing SPSS 26.0 statistical software, the mean satisfaction scores for "natural and generous," "exquisite and elegant," "simple and modern," and "antique" were taken as dependent variables. The specific elements corresponding to each abstract semantics were used as independent variables, and a WuShi tea tray usage elements evaluation matrix was constructed in conjunction with Table 2.Linear regression analysis was performed using SPSS, and the "Enter" method was chosen to establish the mathematical model, followed by collinearity diagnosis. Since the VIF values in the collinearity diagnosis were all less than 5, there was no issue of multicollinearity among variables. Taking "convenience and practicality" and "modern sense" as examples for analysis, the data analysis results of consumer ratings for the usage experience of WuShi tea trays are shown in Table 3-4[18].

Table 3. Data analysis results of mean value of antique semantic evaluation

Abstract semantics	Original review	Specific elements	Regression coefficients	Sig.
With an antique feel	B Material	B1 Single material	0.392	0.171
		B2 Multiple materials	0.869	0.006
		B3 Textured materials	0	-
	C Morphology	C1 Rounded shape	-0.060	0.867
		C2 Squared shape	0.080	-
		C3 Beautiful ornamentation	0.080	0.778
		C4 Cultured	0.877	0.015
	D Structure	D1 Functional clarity	0.032	0.949
		D2 The right size	0	-
		D3 Novel structure	-0.647	0.031

Table 4. Refined and elegant semantic evaluation mean data analysis results

Abstract semantics	Original review	Specific elements	Regression coefficients	Sig.
Sophisticated and elegant	A Color	A1 Colorful	0.645	0.238
		A2 Simple colors	0	-
		A3 Deep colors	0.255	0.242
		A4 Pure colors	0.989	0.002
	B Material	B1 Single material	0.455	0.113
		B2 Multiple materials	0	-
		B3 Textured materials	0.509	0.036
	D Structure	D1 Functional clarity	-1.017	0.039
		D2 The right size	0	-
		D3 Novel structure	-0.293	0.129

In Tables 3 and 4, R represents the correlation coefficient. A positive value for R indicates a positive correlation between variables, while a negative value indicates a negative correlation. R-squared (R^2) is the coefficient of determination, which represents the degree to which the specific elements in the model explain the abstract semantics; a larger R^2 value indicates a better fit. The regression coefficient represents the extent to which specific elements affect the abstract semantics, with positive and negative values indicating positive and negative correlations, respectively. Sig. denotes the significance level; when Sig. < 0.05, the specific element has a significant impact on the abstract semantics.

From Table 3 and Table 4, it can be observed that in the multiple regression analysis for the "antique" semantics, R is 0.932, and the adjusted R^2 is 0.737, indicating a model fit of 73.7%; in the multiple regression analysis for the "exquisite and elegant" semantics, R is 0.936, and the adjusted R^2 is 0.872, indicating a model fit of 87.2%.Furthermore, the results indicate that the linear regression significance of the studied abstract semantics is all less than 0.05. Therefore, the regression equations have statistical significance, indicating a linear relationship between the dependent and independent variables[19].

4.2 Research Conclusions

Combining the content of in-depth interviews with the results of the questionnaire analysis, it is evident that consumers have varying focal elements for WuShi tea trays under different semantics. Additionally, the satisfaction levels for the four types of WuShi tea trays also differ among different consumers, with "convenience and practicality" and "modern sense" being universally favored types. Furthermore, the aesthetic preferences of WuShi tea tray consumers are also related to their age. The following are the specific analytical conclusions of the study.

Consumers have different focal elements for WuShi tea trays under different semantics. The aesthetic preferences of WuShi tea tray consumers can be divided into "natural and generous," "exquisite and elegant," "simple and modern," and "antique" based on different subjective feelings. For the "natural and generous" type of tea tray, consumers pay more attention to exterior design elements such as material and color, with the form not being a key factor. Through interviews, it was found that consumers are more concerned about the texture and environmental friendliness of the tea tray, rather than just the design of the shape. For the "antique" type of tea tray, consumers place more emphasis on exterior design elements such as form, ornamentation, and cultural connotations, with cultural elements being particularly important. Therefore, when designers engage in the exterior creation or new design of WuShi tea trays, they can refer to the four semantic categories preferred by consumers and the corresponding exterior design elements. The detailed exterior design elements for different types of WuShi tea trays are shown in Table 5 (using "exquisite and elegant" and "antique" as examples).

Tab 5. Design elements for different types of WuShi tea trays

Type	Design Elements	Design recommendations
Sophisticated and elegant	Color	a.Colors:Choose colors with higher saturation b.The overall number of colors should not be too much,and the color matching should be harmonious c.The purity of the colors accentuates the minimalist design style

	Morphology	a.Exquisite surface texture,emphasizing process treatment b.Emphasize the connotation of the craftsmanship behind it
	Structure	a.The size is well proportioned and coordinated
With an Antique feel	Material	a.Use a variety of materials to add depth and heaviness b.The rough texture of the surface highlights the vicissitudes of life
	Morphology	a.Pay attention to the details of the story's culture b.Emphasize the connotation of the craftsmanship behind it
	Structure	a.The function and product form are better integrated

Looking at the background of the times, with the improvement of living standards, people's interest and pursuit of tea culture are also growing, living in an era of individuality and diverse quality. Therefore, through the aesthetic preferences of consumers in different age groups for WuShi tea trays, it is found that the younger consumer groups tend to have more diverse aesthetic orientations and a stronger sense of self-expression. Contemporary young people have more exploration, innovation, and enjoyment of tea culture. In addition, in this questionnaire survey, there were a total of 70 respondents under the age of 40, with 41.3% in the 15-25 age group and 34.78% in the 26-35 age group. Through the questionnaire, it was found that WuShi tea trays scored higher among younger consumers, and younger consumers are more easily influenced by the internet and social media, tending to purchase innovative and functional WuShi tea trays. In summary, the consumption motivation of WuShi tea trays is mainly influenced by aesthetic preferences, interests, and consumption capacity.

4.3 Expansion of Research Conclusions

With the revival of tea culture, the aesthetic value of tea utensils is also increasingly valued. Practicality has become a basic requirement for products, and the aesthetic sense of products is the focus of modern tea enthusiasts. As a typical tea utensil, WuShi tea trays are an effective medium to understand the current preferences of young people in tea culture. Therefore, the research conclusions of this paper can also be extended to the exterior design of small tea art decorations, small tea art creative products, and so on. Through this study, it is known that WuShi tea trays favored by young tea enthusiasts mainly fall into four categories: "natural and generous," "exquisite and elegant," "simple and modern," and "antique." These can serve as references for the exterior design of products such as small tea art decorations and small tea art creative products targeted at young audiences, thereby attracting more young tea enthusiasts. The elements of aesthetic appeal in appearance change with the times. Therefore, the samples for research need to be continuously updated and expanded to obtain more accurate preferences of WuShi tea tray consumers in tea culture. In conclusion, this study has obtained the tea preferences and underlying emotional appeals of WuShi tea tray consumers. The research conclusions can guide designers in grasping the design elements of the appearance of WuShi tea trays and assist in selecting solutions. Additionally, they can serve as references for launching new images of WuShi tea trays in the market and designing products such as small tea art decorations and small tea art creative products.

4.4 Expansion of Research Conclusions

Based on the above conclusions, the product intent map is generated by combining the Midjourney keywords, as shown in Figure 4.

Fig.4. Product idea generation diagram

5 Conclusions

This paper takes the non-stone tea tray as the research object and conducts qualitative and quantitative research based on relevant theories of sensory engineering. The study obtained consumers' sensory evaluations, emotional responses, and specific attributes of the non-stone tea tray. By establishing linear relationships between multiple attributes and consumers' emotional satisfaction, the paper achieved the transformation of consumers' emotional satisfaction into attributes. It identified the key design attributes of non-stone tea trays under four categories of sensory semantics. Additionally, it explored the preference levels of consumers of different genders and age groups for the four categories of non-stone tea trays. Studying the emotional satisfaction of non-stone tea tray consumers provides insights into the current demands of tea culture consumers. The conclusions of this study can also be applied to the design of other tea utensils, tea art supplies, etc. thereby enhancing the appeal of these products to consumers of tea culture. During the research process, the non-stone tea tray market is still undergoing continuous innovation and development. Numerous designers are actively involved in the design and production of non-stone tea trays. During this period, the introduction of new products in the non-stone tea tray market may affect consumers' emotional satisfaction. Consequently, it could lead to changes in the design attributes of non-stone tea trays. Therefore, the research samples need to be continuously updated, iterated, and expanded to obtain a more accurate understanding of the emotional satisfaction of non-stone tea tray consumers. In summary, this study obtained the emotional satisfaction of non-stone tea tray consumers and their implicit demand appeals. The conclusions of the study can guide designers in understanding the design attributes of non-stone tea trays and assisting in the selection of solutions. Additionally, it can provide reference for the market launch of new images of non-stone tea trays and the design of other tea utensils, tea art supplies, etc.

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