Neo-Chinese Style Furniture Design Based on Semantic Analysis and Connection

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Abstract

Lately, neo-Chinese style furniture has been frequently noticed by product design professionals for the big part it played in promoting traditional Chinese culture. This article is an attempt to use big data semantic analysis method to provide effective design research method for neo-Chinese furniture design. By using big data mining program TEXTOM for big data collection and analysis, the data obtained from typical websites in a set time period will be sorted and analyzed. On the basis of "neo-Chinese furniture" samples, key data will be compared, classification analysis of overall data, and horizontal analysis of typical data will be performed by the methods of word frequency analysis, connection centrality analysis, and TF-IDF analysis. And we tried to summarize according to the related views and theories of the design. The research results show that the results of data analysis are close to the relevant definitions of design. The core high-frequency vocabulary obtained under data analysis, such as popular, furniture, modern, etc., can provide a reasonable and effective focus of attention for the designs. The result obtained through the systematic sorting and summary of the data can be a reliable guidance in the direction of our design. This research attempted to introduce related big data mining semantic analysis methods into the product design industry, to supply scientific and objective data and channels for studies on design, and to provide a case on the practical application of big data analysis in the industry.

Keywords: neo-Chinese style furniture, big data analysis, product design, semantic analysis

1. Introduction

Nowadays, new Chinese furniture with neo-Chinese style features inherits and promotes traditional Chinese furniture styles and culture, and is concerned by users for their differences from other modern furniture. In modern designs of Chinese furniture, neo- Chinese furniture has been widely used in indoor and outdoor spaces. In different environments, it relies on the characteristics of shape, structure, and pattern to build products in brand-new forms and shapes that conform to the cognitive habits of modern users. New Chinese-style furniture has been gradually accepted by many users in recent years, but still exist the contradictions between its products and users' needs and its aesthetics and practicality. Therefore, this article hopes that the application of big data analysis may provide a convenient way to tease out users' concerns and dig deeper for users' potential needs.

2. Neo-Chinese Style Furniture

Chinese style is a genre of style of art that rooted in traditional Chinese folk culture, expressed in many form such as artifact, painting, architecture, music, and literature. The mixture of its expression in traditional artifacts and the design of modern furniture is the focus of the in-depth study in this paper [1]. Such inheritance and development of the Chinese style with the help of modern thinking and technology is the essence of neo-Chinese style. Therefore, it highlights the material, shape, structure, craftsmanship, customs, implication, usage and other aspects of traditional Chinese artifacts. With modern technologies and design approaches, it is purposefully optimized to create new products without losing its inherent characteristics to meet the quantitative needs of the market and the habits of modern users, before entering the consumer market to interact with users [2].

Fig. 1. Traditional Ming Dynasty style furniture and Neo-Chinese Style Furniture.

Neo-Chinese style furniture still spreads Chinese traditional culture under the constraints of modern product standards. Traditional Chinese products are recognized by the East and the West for their exquisite structure, selected materials, refined processing, and durable quality. Their long-standing ancient and mysterious impressions provide an important access to Chinese culture. In the middle of the 18th century, it has been won critical acclaim in the West as in "Chinese style is true noble". The aesthetic characteristics of Confucianism and Zenism retained in neo-Chinese style become its central idea of the design.

In the current design of neo-Chinese style furniture still can see the research and exploration of the ways and methods of traditional product design. It goes in three directions: ① Starting from traditional artifacts: transforming the representative features of traditional artifacts into elements, and making new products by superposing or mixing these elements [3]; ② Starting from user behavior: paying attention to the user's using habits and needs, changing the way in which traditional Chinese furniture was used, and creating modern products that not only take the shape of traditional artifacts traditional meet the requirements of modern users [4]; ③ Focus on market demand: replacing the most popular products or fashionable elements in the market with the symbolic characteristics of traditional Chinese artifacts, so as to follow the capricious trends the market [5]. Today more thoughts are given to the design of neo-Chinese style and related products, such as the studies on the inheritance, development, and application of the styles of traditional artifacts, studies on their usage and folk custom, and studies on the auspicious cultural connotation in their shapes and decoration. It follows that professional designers and cultural researchers are attaching increasing importance to the neo-Chinese style furniture. In-depth research and exploration in multi-directions and Wide-span fields provide many possibilities for neo-Chinese style furniture design [6,7]. However, the exploration and research from the perspective of the general public is not sufficient, and big data analysis provide a scientific and feasible way for it.

3. Big Data and Product Design Analysis

People are creating legions of information on daily basis, and in this information-based society, many data technologies are developed and come to maturity. Cloud computing-based distributed processing, distributed database, cloud processing and virtualization, and other big data technologies involving distributed computing architecture are gradually replacing traditional estimation and calculation using human brains. As a result, open programs that using cloud computing are being widely used [8]. The application of big data has also been popularized and appeared in many aspects such as government work plans, business operation and management, and teachings in schools. Substantial research and analysis results have come out after continuous experience accumulation.

Semantic analysis is an important analytical tool in the text mining technique. Text mining, also known as text data mining, is the process of transforming unstructured text into a structured format to identify meaningful patterns and new insights. Text mining is a combination of information extraction, information retrieval, natural language processing, and data mining technology. It can extract new and unknown knowledge from the original text. It is a text-based knowledge exploration. It uses word frequency statistics, latent semantic analysis, semantic network analysis, and group analysis to realize in-depth text mining, so as to obtain knowledge and information from fields that have never been entered, and interpret data that was too large to analyze before. Natural language text mining is used to process content that is not interfered by subjective consciousness. It can applies an objective, accurate and scientific analysis of the relationship background of the language, emotion, opinions, mood, behavior, attitude, etc. in the data source, so as to discover potential behaviors or ideas that were once unknown. Today's big data and text mining technologies are widely used in many disciplines and are increasingly perfected as innovative and effective research methods [9]. However, it is rarely used in the field of modern product design, and the related cases of application and methodological research are also meager.

In books such as The Nature of Big Data (Che Pinjue), Market Research and Data Analysis

(Zhang Xihua) and The Era of Big Data (Victor Mayer-Schönberg), scholars have mentioned that big data technology should be taken seriously by modern merchandise design and manufacturing and other related industries, and that big data technology will become a reliable tool for design innovation in future business design [10,11,12]. This suggests that the application of big data technology in the design industry has not now reached the state expected by data scientists, and there is still much space for development. Searching in the authoritative materials related to information technology, the papers on the design application of big data technology occupy a relatively small proportion. Reading the relevant papers retrieved reveals that the main research is divided into two directions. Most of the articles focus on the study of individual cases of design, using data technology to solve problems in specific designs, such as: market environment analysis [13], visualization comparison [14], continuity analysis [15], etc. The research focuses on the application of data analysis tools. There are also some articles that apply data technology to build databases and establish analytical systems to guide design in design directions related to Internet technology, such as: service design [16], intelligent and intelligent design [17], and Internet of Things technology [18]. There has been limited research into design styles from the perspective of data mining and semantic analysis.

Big data analysis can be a reliable tool for product design, helping designers find problems and optimize and update their products [19,20]. In the current product design field, the application of big data analysis focus on two areas, product data monitoring and user behavior preference analysis. These methods usually track, collect and analyze data of important indicators at both ends of the products and the users, which will be used to guide, evaluate and optimize products. Generally, experience data analysis, user data analysis, operation data analysis, and development stability data analysis are the mostly applied [21]. The commonly used methods of PSAT (Product Satisfaction) and HEART model directly obtain data from users or related people with contact to products. This kind of big data analysis method is relatively expensive and takes longer periods [22]. The analysis method from the perspective of text mining is ignored, but it can quickly and directly obtain a large amount of text information closely related to the users, that is accurate and instructive [23]. This article hopes to use semantic analysis, visualization analysis and other big data analysis methods to apply research in the context of neo-Chinese furniture product design, using this study as a case study to complement and improve the relevant content of big data analysis applications in a design perspective.

4. Semantic Analysis method

In this article, semantic analysis is carried out by the program TEXTOM for relevant text mining. The data collection was set for the period from 1 January 2020 to 31 December 2020, using the keyword "neo-Chinese style furniture". The world's largest Chinese academic literature retrieval platform "CNKI" and the world's largest Chinese search engine "Baidu" are set as the sources. The original text materials collection covers academic materials, news updates, and online documents, etc. The statistical analysis of related words was carried out in three directions: word frequency, connection centrality, and TF-IDF value.

Word frequency is used to evaluate the degree of repetition of a single word in a certain file or file set of a certain domain in a corpus, and its commonly used weighting technology can used for information retrieval and text mining. The results obtained from the word frequency analysis can show the relevant information terms that have a strong relationship with the retrieved content [24].

"Connection Centrality" refers to a shortest path through which a point is connected to other points, which means that the point is closer to the center. In sociological theory, the words that express the furthest distance from the central point are also the weakest in terms of information resources, power, and influence. Therefore, center closeness is an important social network analytical method [25].

TF-IDF (Term Frequency-Inverse Document Frequency) is a commonly used weighting technique for information retrieval and data mining. The values it produced can be used to evaluate the importance of the words. When the frequency of a word in the documents rises, with also its high freshness, that is when its popularity is low, the TF-IDF value of the word increases. We can say that when a word is of high-frequency in a certain document, but it appears with low-frequency in the entire corpus, and then the TF-IDF value of this word rises, which also indicates that this word is a key word or core word in the document [26].

The search for the term " neo-Chinese furniture" was achieved with the help of the text data mining programme TEXTOM, which allowed a quick extraction of relevant terms. This study focused on the top ranked terms with high values. Removal of invalid data from the results of the three analysis methods, such as: numbers, single charecters, repetitions or synonyms and irrelevant words, etc. and the top 30 words were selected for in-depth analysis. The results of each analysis are categorised by the change in the value of the words, and the reasons for the aggregation of the words in the different categories are investigated. The results of the three analyses are also compared horizontally, with a focus on the changes in the ranking of individual words, and the reasons for the fluctuations or stability of the ranking of words in the different analysis modes are analysed and interpreted in depth.

5. Experiments and Results

5.1 Focus of Attention Analyze

With the help of the text data mining programme TEXTOM, the term " neo-Chinese style furniture" was searched in terms of word frequency, and a total of 14,231 related terms were extracted, from which invalid data were eliminated, and 30 core terms were sorted in a way that at least as many as possible were associated with each other, as shown in **Table 1**.

Table 1. Word Frequency Analysis Table

Rank	Word	Rank	Word
1	Modern	16	Combination
2	Furniture	17	Color
3	Design	18	Tradition
4	Neo- Chinese style	19	Nature
5	China	20	History
6	Culture	21	Mix-and-match
7	Modeling	22	Designer
8	Function	23	Ming and Qing Dynasties
9	Space	24	Plant
10	Decoration	25	Behavior
11	Innovation	26	Implication
12	Aesthetic	27	Smart
13	Customization	28	Craft
14	Material	29	Module
15	Visual	30	Healing

The data in **Table 1** are presented in a bar graph, as shown in **Fig. 2** The analysis showed that the top-ranked word "modern" (1237 times) appeared far more frequently than the rest of the words, which reveals the time when the new Chinese style came into being, and it is also the period in which the neo-Chinese style furniture first appeared and defined. It is the social background of this period that a lot of subsequent word reflects the cultural, demand, industry and occupational aspects of [27]. Words that ranked second through seventh are furniture (931 times), design (907 times), new Chinese style (824 times), China (733 times), culture (581 times), modeling (479 times). Their bars run downward gradually, indicating their stepped declining frequency. It means the attentions they attract are obviously in a sequential order, so they may be put together as the representative group. Most of these words describe the characteristics of neo-Chinese furniture, that is to say, the order of these words reflects how much attention people have paid to features of neo-Chinese furniture. Function (305 times), space (299 times), and decoration (278 times) are lined the eighth through tenth. From the diagram, we can see that the occurring frequency of these words is relatively low. They are in a clear distance from the foregoing and the following groups of data, and so are grouped together themselves. Judging from the diagram, these words attract is relatively same amount of attention. The three words are the basic elements that must be considered when selecting and using common modern furniture, and are the key factors that must be paid attention to at every phase of the design [28]. The subsequent words are innovation (113 times), aesthetic (67 times), customization (52 times), and material (30 times), and vision (28 times), etc. This group of words appears much less frequent than the previous group. They present a gentle and steady decline in the graph, therefore are classified into one group. In this group, innovation appears most frequently, and most of the subsequent words are related to the innovation of neo-Chinese furniture, so can be seen as divergently associated words to design innovation [29].
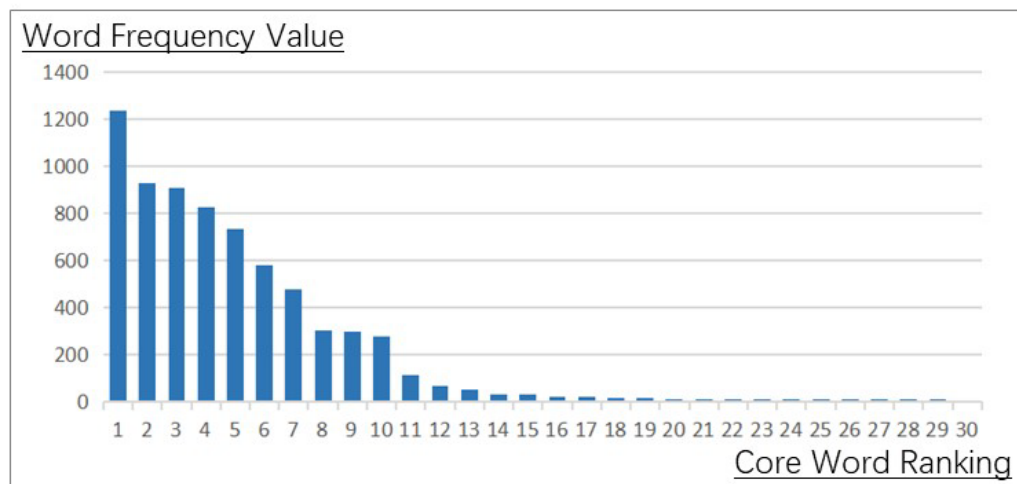

Fig. 2. Word Frequency Analysis Diagram

By sorting the top 30 core words in the word frequency analysis, we reach the following conclusions: the word with the highest appearing frequency is "modern" reflecting the temporal context. The next group of words describes the sequential relationship of the characteristics of Neo- Chinese furniture. Following it is a set of words that embodies the basic elements of modern furniture. The rest of the vocabulary is mostly diffusion-related vocabulary for design innovation.

5.2 Demands Analysis

We used TEXTOM to calculate the center connectedness of each word, and extracted 30 words related to the neo-Chinese style furniture for further analysis in **Table 2**.

Table 2. Connection Centrality Analysis Table

Rank	Word	Center Closeness	Rank	Word	Center Closeness
1	Furniture	0.231	16	Popularity	0.016
2	China	0.21	17	Tradition	0.016
3	Design	0.172	18	Combination	0.015
4	Neo- Chinese style	0.154	19	Designer	0.015
5	Modern	0.108	20	Nature	0.014
6	Culture	0.099	21	Plant	0.013
7	Function	0.067	22	History	0.012
8	Modeling	0.053	23	Craft	0.012
9	Space	0.047	24	Smart	0.011
10	Aesthetics	0.045	25	Simplistic	0.011
11	Decoration	0.041	26	Texture	0.011
12	Style	0.037	27	Customization	0.011
13	Innovation	0.029	28	Habit	0.011
14	Vision	0.02	29	Inheritance	0.01
15	Color	0.016	30	Module	0.01

The top 30 words in terms of the connection centrality analysis are visualized in **Fig. 3**. According to the diagram, they can be divided into 6 groups for analysis. The first group consists of 2 words, furniture (0.231) and China (0.21), whose connection centrality value is above 0.2, much higher than the rest of the words. "Furniture" with the strongest connection centrality resides at the center of the text in this analysis, and is a common carrier for the neo-Chinese style. The second word "China" is the birthplace of neo-Chinese style, and it is also the center point that the connotation and appearance of the style should point to. This word, although not a constituent word in this search entry, can still exceed the connection centrality of the constituent words. That is why the importance of the two words for neo-Chinese furniture design can be inferred from the numerical value of their connection centrality [30]. The second group of words is those between 0.15 and 0.2: design (0.172) and neo-Chinese style (0.154). As a word not in the entry, "design" comes before the word "neo-Chinese style", indicating that it is closer to the center. The neo-Chinese style comes into being during the development of modern design, so this ranking is logically comprehensible. The third group is comprised of two words with values close to 0.1: modern (0.108) and culture (0.099). "Modern" ranks first in terms of word frequency, but its ranking descends in terms of connection centrality, which indicates that the word has a high degree of attention, but it is not closely connected with the entry, not the primary resource information of the entry, and has less directionality to the entry than the previous words. "Culture" ranks the same in both analyses, indicating that it is equally important in both analyses. The fourth group of words are function (0.067) and shape (0.053) with values between 0.99 and 0.05. Their rankings in terms of connection centrality and word frequency analysis are roughly the same, only change of place between each other. These two terms are two key elements that designers need to balance. In the aspect of connection centrality, more attentions are on the practical functions, while the need for aesthetic appeal of modeling is weakened. The fifth group of words is

between 0.5 and 0.2, among which 6 words show a stepwise downward trend: space (0.047), aesthetics (0.045), decoration (0.041), style (0.037), innovation (0.029), and visual (0.02). The sixth group is the remaining words below 0.2, showing a steady decline in the graph. These two groups of words are mostly the elements of the manifestation modes and design methods. From the ranking of the words in the fifth group, we can be seen that the degree of connection centrality of these words has an obvious precedence relationship, and their priority is also higher than that of the last group. The connection centrality values of the words in the last group are relatively close, indicating that they have relatively small gap between each other in terms of precedence and importance. In the connection centrality analysis, the word with the highest numerical value is furniture, indicating that "furniture" is at the center of various texts. The words that follows it shows the close relationship between the design aesthetic, design approach and form of furniture around the center. From this, we know that the attribute of neo-Chinese style furniture as a furniture are the core of people's attention, that is to say, their practical appeal of the key role, the cultural manifestation and aesthetic value shall be built around the core appeal, and be the direction of further appeals [31].
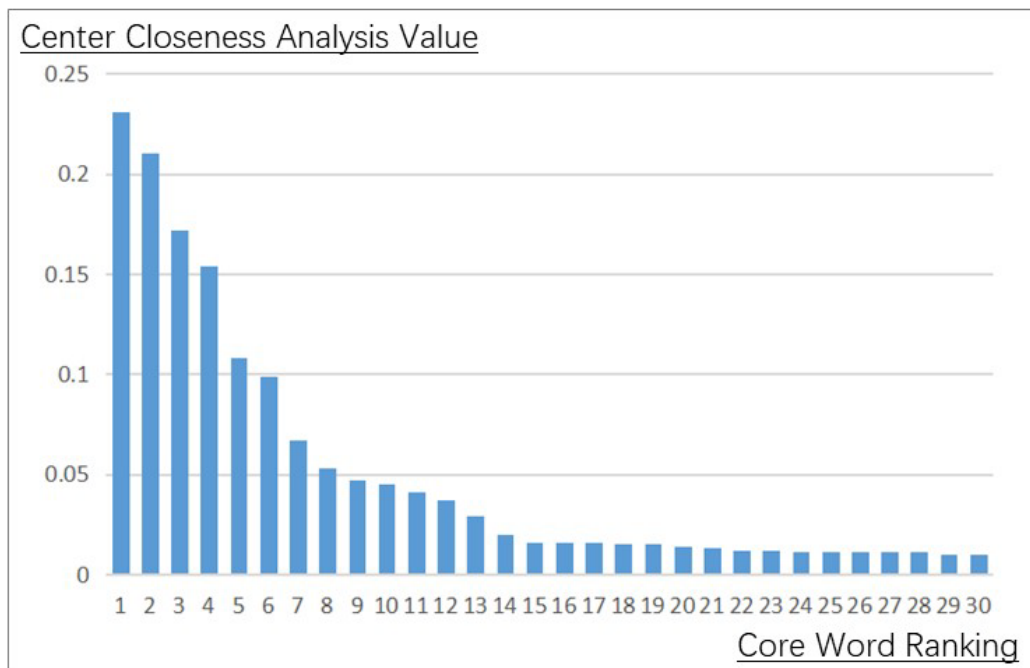

Fig. 3. Connection Centrality Analysis Diagram

5.3 Use and Transmission

The top 30 words are listed in **Table 3**, which was analysed using TF-IDF analysis with the help of the program TEXTOM.

Table 3. TF-IDF Analysis Table

Rank	Word	TF-IDF	Rank	Word	TF-IDF
1	Culture	349.2742	16	Environment	78.1481
2	Modeling	315.1139	17	Smart	75.3465
3	Decoration	306.9524	18	Zen	70.6399
4	Function	299.8079	19	Combination	65.586

5	Design	238.4525	20	Texture	63.0737
6	Vision	227.043	21	Pattern	62.4335
7	Popularity	221.3129	22	Simplicity	62.1924
8	Customization	207.9421	23	Mix and match	61.799
9	Space	174.0118	24	Southeast Asia	57.7691
10	Innovation	163.313	25	Interactive	55.5193
11	Plant	157.3771	26	Arm Chair	55.5193
12	Craft	142.0519	27	Install	55.3941
13	History	113.9055	28	Network	54.3002
14	Module	87.8721	29	Classic	53.7284
15	Install	86.6683	30	Uniform	53.0303

From the result of TF-IDF analysis shown in **Fig. 4**, we can see that the word "culture", which ranks sixth in both word frequency and connection centrality analysis, ranks first, indicating that "culture" is a key word in the TF-IDF analysis. This conclusion confirms from other angle that the cultural background carried by the neo-Chinese style furniture plays a key role in its development. Following it are "Modeling" (315.1139), "Decoration" (306.9524), and "Function"(299.8079), all of which are in the range of values close to 300, so they are grouped together. These three terms rank well above their rankings in previous analyses: "Function" and "Modeling", as mentioned before, are important design elements, and both have higher rankings, and "Decoration" is the best means to directly express the features of the style [32]. The subsequent "Design" (238.4525), "Vision"(227.043), Popularity (221.3129), "Customization "(207.9421), whose values between 250 and 200, are classified into the second group. The seventh-ranked word "popularity" had not appeared in the word frequency analysis, and ranked 16th in the connection centrality analysis. This contrasting phenomenon reflects the status-quo of neo- Chinese furniture in market today and the value of its in-depth research, as well as the current users' acceptance of it [33]. "Customization" ranks 8th in the TF-IDF analysis, 13th in frequency analysis, and 27th in the connection centrality analysis. From it, we can see that although the word refers to only one way to make the products, it now has become a word that needs high attention due to the influence of design and the fashion trend furniture products, indicating that customization is an important way to present neo- Chinese furniture. The following words which have values between 200 and 100, are space (174.0118), innovation (163.313), plant (157.3771), workmanship (142.0519), history (113.9055), in a relatively steady step-by-step downward trend. Compared with the results of the previous two analyses, the ranking of the word "space" has not changed, and the word "space" has slightly rose, but "plants", "crafts" and "crafts" which all ranked after the 20th place in the previous analysis., have improved significantly in this analysis. Adding a plant landscape that conforms to the Chinese aesthetic can optimize the exterior features of the Chinese style. The integration of representative plants into new Chinese-style furniture can highlight its difference from other styles and become an effective means to present its own characteristics. "Workmanship" and "history" are the representative characteristics of traditional Chinese furniture, indicating that new Chinese styles need to pay attention to and inherit and develop them [34]. The last words with values below 100 show a gradual downward trend, and so are grouped together. Many among them are words that have not appeared in the previous analysis, and most of them clearly point to the direction of products, technologies, composition and combination methods, etc. It shows that in the ranking of TF-IDF keywords, more attention is paid to the way to present and know neo-Chinese style furniture, and less attention to the historical background of the products and the deep cultural meaning before them.
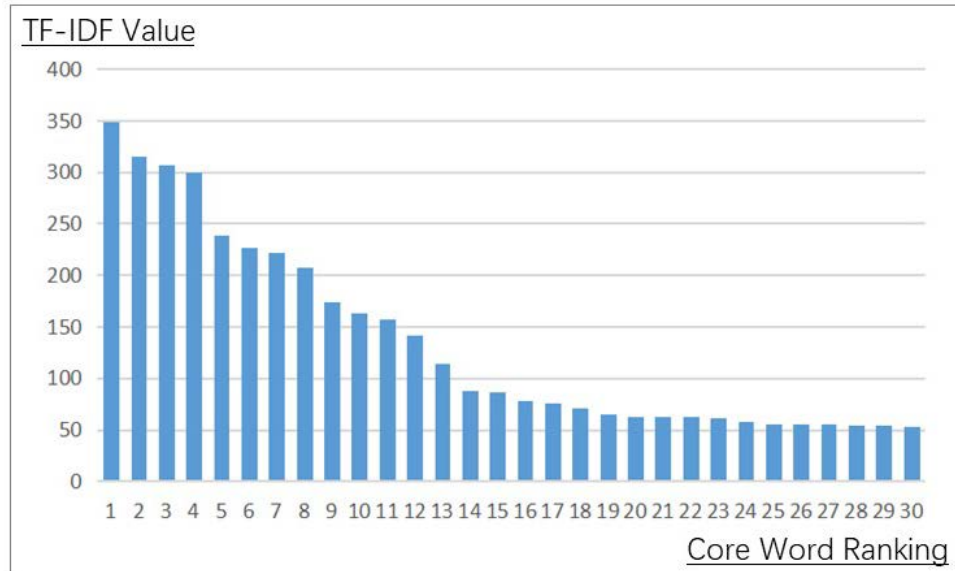
Fig. 4. TF-IDF Analysis Diagram

The result of the TF-IDF analysis is quite different from the previous word frequency analysis and connection centrality analysis. And words with obvious ranking changes and newly appeared words deserve extra attention and in-depth analysis.

5.4 Semantic connection

Through the analysis with the above three technical means, we have obtained a lot of semantically connected words that have close relationship with the entry "neo-Chinese style furniture". Comprehensively analyzing these words and clarifying the deep relationship between them provide a more comprehensive and in-depth interpretation on it.

Focus on the frequency of words that appear in the three analyses. Design, culture, shape, function, space, decoration, innovation, customization, material, vision, composition, history, plant, intelligence, workmanship, module, these 16 words appear in all analyses, so can treated as the core words in the analysis of "neo-Chinese furniture". They reflect salient identifiable features and trends of application and development of neo-Chinese furniture [35]. In the three analyses, the words that appeared only once are: Ming and Qing Dynasties, Plant, Behavior, Healing, Habit, Inheritance, Installation, Environment, Zen, Pattern, Mix and Match, Southeast Asia, Interactive, Arm Chair, Installation, Network, Classic, and Uniform. These words are only closely related to the "neo-Chinese furniture" in certain aspects, so they can be regarded as potential features to be explored. Such latent features are worthy of in-depth thinking during design, and purposely enhancement and highlighting of these features can highlight its differences from a large number of similar products and attract more attention [36].

The words can be classified into four groups through similarity analysis [37]. The first group of vocabulary is: culture, aesthetics, tradition, inheritance, nature, furniture, style, history, meaning, a total of 9 words. From this vocabulary, we can see that neo- Chinese style furniture is often closely related to Chinese traditional culture, indicating that it is an inheritance and development of traditional culture [38]. The second group of vocabulary is: modeling, pattern, nature, plant, Ming and Qing Dynasties, craft, simplicity, a total of 7 words. These words

reflect the representative characteristics of Chinese traditional artifacts. It is the continuation and retention of these characteristics that make the neo- Chinese style furniture clearly recognizable, showcasing its difference from other modern furniture products [39]. The third group of vocabulary is: design, modernity, space, innovation, fashion, vision, color, environment, a total of 8 words. They are often used to describe how the design are presented. The creativity in these aspects can free neo- Chinese style furniture from the limitations of traditional styles and bring refreshing experiences. The fourth group of vocabulary is: function, decoration, intelligence, customization, texture, combination, interaction, module, mix-and-match, a total of 9words. In terms of the development process of modern furniture, these words represent the future direction of furniture. This also further confirms that the neo- Chinese style furniture, in the context of the needs of modern users, has absorbed professional technical knowledge from various fields and helped through various technologies (**Fig. 5**), and in terms of product form, is a very inclusive modern product [40]. The user base of neo-Chinese style furniture is not only limited to the Chinese region, but covers the wide Eastern and Western countries [41].
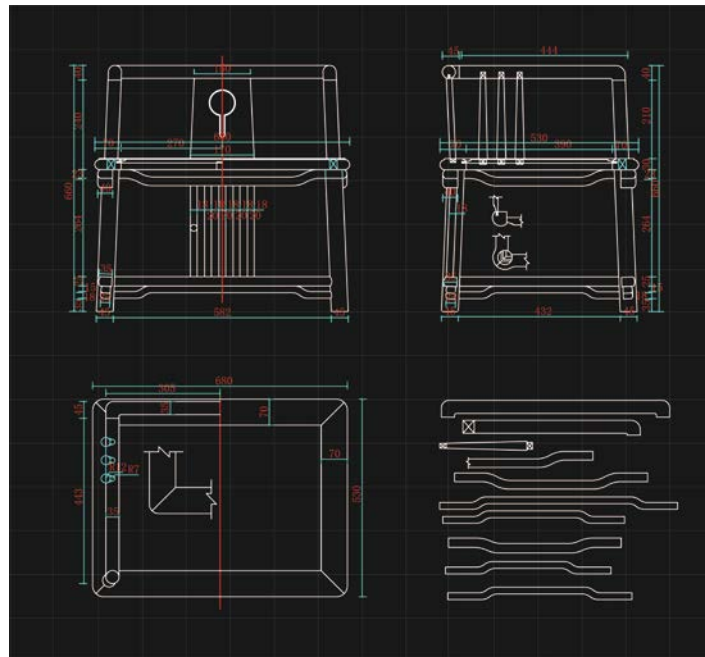

Fig. 5. Model design of a customized product using computer.

5.5 Qualification of results

 The semantic analysis of the results of the three directions of word frequency, connectedness centrality, and TF-IDF values reveals that the connections and logic between the core vocabulary are consistent with the findings of existing design-related theories. There are certain similarities and differences in the results obtained under different analysis perspectives [42]. After comparative analysis it can be determined that the similarity reflects the correlation between the three analysis results and that the three research approaches can simultaneously provide objective feedback on the information surrounding the words. At the same time, due to the different focus of the analysis, the ranking relationship and frequency of occurrence of the core words in the analysis results differ significantly, thus finding out how the relationship between the core words and the lexical items changes under different logics in order to obtain

new information.

In the experiment, it was found that the words that indicated the characteristics and trends of neo-Chinese furniture appeared most frequently in line with previous studies. An explanatory definition of product style has been proposed in a study by Sun Chi and others, and factors influencing the existence of style trends have been defined in a study by Xu Yanqing and others [43,44]. Likewise, we found that the core vocabulary information on cultural inheritance methods, style identification features, presentation expressions, and future development trends under different analysis modes were similar to the findings of Zhou Lian and Zou Weihua and other scholars [45,46]. Therefore it can be argued that the semantic analysis method is able to examine theoretical results in a scientific, rigorous and reliable manner.

It can be seen that the results of the semantic analysis based on data mining are consistent with the previous design theory definition of the word can confirm that this experimental method is a scientifically valid research technology tool. At the same time, the multi-perspective, high efficiency, and accurate quantification characteristics of data analysis technology exactly complement the shortcomings of traditional design analysis methods, adding observational research tools to help discover more new information [47].

6. Conclusion

This research shows that, with the technological help of text mining and semantic analysis method, it is possible to quickly sort out and obtain the lexical information around the entry of "neo- Chinese style furniture", and by analyzing the differences in their ranking, frequency, classification and comparison, we can obtain data that is instructive for product design. And the conclusion from analyzing the data is consistent with the view from the traditional research data. The research result proves that semantic analysis technique can be effectively applied in the field of design research. After sorting and sequencing the peripheral information with this technology, it can provide accurate and detailed information for design innovation.

The results of the research on neo-Chinese furniture through semantic analysis show that, neo-Chinese style furniture has become a popular style of furniture in modern China. It not only inherits traditional Chinese cultural elements, but also appears around users in the form of modern furniture. Through data analysis, designers can have a more systematic understanding of the reasons users are attracted to Chinese-style furniture and their expectations of Chinese-style furniture, and find what they have neglected and had not thought deeply in the past design, so as to carry out directional thinking and make furniture more fulfilling to users' expectations. At the same time, the timeliness of big data allows designers to follow more closely to changes in demand under the different times. However, as time goes, the appearance of synonyms, new meanings, homophones, and the replacement of some vocabulary have an impact on the data, causing deviations in content analysis and word meaning processing. Therefore, data collection and analysis need to be carried out on a regular basis to ensure the accuracy of big data analysis methods [48].

This article uses big data mining and semantic analysis method technique: word frequency analysis, center closeness analysis, TF-IDF analysis, and in-depth analysis of neo-Chinese style furniture. As an attempt to apply big data technologies in design, there are certain limitations, but as a method of collecting design information, it is of practical significance. It provides objective and true basic data for user analysis, style analysis, background analysis and product core value analysis in the field of product design, and it is desirable to promote it in other design fields.

Acknowledgements

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