

Research Article

Study on the Design of Cantonese Cultural and Creative Products using Analytic Hierarchy Process

Xi Wang¹ and Yongyi Gu² 

¹Academy of Art and Design, Guangdong Agriculture Industry Business Polytechnic, Guangzhou 510507, China

²Big Data and Educational Statistics Application Laboratory, Guangdong University of Finance and Economics, Guangzhou 510320, China

Correspondence should be addressed to Yongyi Gu; gdguyongyi@163.com

Received 5 September 2020; Accepted 20 October 2020; Published 9 November 2020

Academic Editor: Chuanjun Chen

Copyright © 2020 Xi Wang and Yongyi Gu. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

In this paper, we have studied the design of Cantonese cultural and creative products. In the design process of the system, we use the Analytic Hierarchy Process to analyze the needs of users and apply the analysis results to the product design practice, so as to design Cantonese cultural and creative products more in line with the needs of tourists.

1. Introduction

Cantonese Culture, that is, the culture of Cantonese ethnic group of Han nationality, is an important part of Chinese Han civilization and is subordinate to Lingnan Culture [1]. Throughout the history, the population began to move southward in the Qin and Han Dynasties, which brought the impact of the advanced culture of the Central Plains to Lingnan area. Since the Han and Tang Dynasties, Guangdong, led by Guangzhou, has always been an important window for China's foreign trade. Cantonese have formed a typical "marine cultural character" [2]. Therefore, the main characteristics of Cantonese Culture are open-minded and active, daring to be the first in everything, natural and peaceful attitude, focusing on daily life, open and inclusive, pragmatic, and not exclusive.

Based on the understanding of the core of Cantonese Culture, our project team discussed and studied the design of Cantonese cultural and creative products. Usually, cultural and creative products are designed through emotional experience, but lack of rational guidance. In the product design process, it is better to use appropriate mathematical methods, such as Analytic Hierarchy Process (AHP). In 1977, Saaty [3] firstly proposed AHP with the aim of solving problems which can be modeled by a network or hierarchical

structure. AHP can be used to solve the problem of comparison of user demand factors. We use it to calculate the weight of factors to carry out the product design.

2. Cantonese Cultural and Creative Product Current Situation Analysis

2.1. Less Outstanding Products and Weak Brand Awareness. The project team investigated the current market of Cantonese cultural and creative products and found that there were few representative products and brands in the market. In the only products, the visual identity is poor and there is lack of systematic design; most enterprises have weak brand awareness and have not formed an influential brand; the lack of clear representative elements makes consumers confused and aesthetic fatigue in regional identification.

2.2. The Application of Graphics Is Hard and the Resonance Is Weak. At present, most of Cantonese cultural and creative products mainly use local representative graphics. For example, the cultural and creative products of Canton tower directly copy the shape of Canton tower, giving people a sense of mechanically copying. The lack of modern design means to analyze, deconstruct, and restructure the

characteristic patterns of Cantonese which cannot reflect the added value of cultural and creative products. At the aesthetic level, the expression of product surface decoration is obsolete, less consideration of the aesthetic needs of today's society, and it is difficult to arouse the resonance of consumers.

2.3. Single Product Type and Poor Experience. The great majority Cantonese cultural and creative products on the market are mainly handicraft ornaments, bookmarks, and trinkets. The handicraft thinking of these products is more than the industrial design thinking, and the general practicability is not strong. Nowadays, many Cantonese cultural and creative products still use the product carrier of the traditional handicraft era and do not develop new functions based on the needs of consumers' life. In addition, in the product reflection level, the cultural depth is not fully explored and the communication is not precise enough. Cultural and creative products need more in-depth consideration from the functional level, aesthetic level, and philosophical level to arouse the psychological resonance of consumers.

3. Cantonese Cultural and Creative Product Audience Demands

The consumption groups of Cantonese cultural and creative products are mainly local people and tourists in Guangzhou. According to the data, Guangzhou received 16.2383 million tourists during the National Day golden week in 2019, accounting for about one third of the total number of tourists in the province. Guangzhou is located in the Pearl River Delta, adjacent to Hong Kong and Macao, so the inbound tourists in Guangzhou are mainly composed of foreigners, Hong Kong, Macao, and Taiwan compatriots. Among them, Hong Kong and Macao tourists account for about 60% of the total flow, while Asian tourists account for 30% of the total flow, followed by European and American visitors. Due to the fact that Guangzhou has two sessions of Canton Fair every year, and the geographical advantage of being adjacent to Hong Kong and Macao, the inbound tourists in Guangzhou have their unique characteristics in tourism destination structure. With the heating up of tourism industry, it brings huge business opportunities. However, the low sales revenue of tourist souvenirs in Guangzhou is in contrast with the rapid development of tourism. Cantonese cultural and creative products can be used not only be as tourist souvenirs but also as the name card of the city. Nowadays, the business card of Guangzhou is vague and not good enough to be used.

Western psychological scholars have put forward some different theories of human motivation, which have certain reference value for audience analysis and marketing strategies. Among them, the most popular one is Maslow's "hierarchy of needs" theory [4]. According to the demand hierarchy theory and the market survey completed by the project team in the early stage, we can sort out the audience demand of Cantonese cultural and creative products, so as to

enhance the rationality and effectiveness of the later product design practice.

3.1. Appearance Requirements. The lowest level of Maslow's demand level is the basis of the transition to other levels. The external demand for products belongs to the most direct and instinctive response of human beings. It emphasizes the physiological characteristics of users' gaze, feeling, and voice. In the early stage, the project team took frequent visitors to Guangzhou as the main target group, sent out 117 questionnaires, and recovered 117 valid questionnaires. In the preliminary research, among "factors affecting the purchase of Guangzhou souvenirs," 36.84% of the respondents chose "appearance, commemorative significance, and usability," which is a very good illustration that tourists consider whether the products meet the basic demand as the most basic factor to influence the purchase.

3.2. Functional Requirements. Functional requirements are in the middle of Maslow's hierarchy of requirements. The function demand is related to the utility of the product, which emphasizes whether the product can solve the problems in life smoothly for users. Pragmatism is an important feature of western culture. Cultural and creative products with practical functions have the basis of commercial value, and they are also the first choice for tourists in Guangdong Province who combine Chinese and Western culture. In the preliminary investigate and survey, among the question "which features of cultural and creative products do you pay more attention to?" 38.46% of the respondents chose "practicability," accounting for the first place, which proves that consumers are attached great importance by the functional characteristics of Cantonese cultural and creative products.

3.3. Cultural Needs. Cultural needs correspond to Maslow's level of self-demand, and in the pyramid, it refers to a kind of ideological and spiritual transition after functional needs are met. The goal of product design is not only to enable users to use the product but also to meet their deep emotional needs in the multilevel interaction with products in the modern market environment with serious homogenization of functions. In the questionnaire, 74% of the respondents chose "custom" and 63% chose "traditional art" for "which cultural elements do you prefer to buy Guangzhou souvenirs?" Due to the unique composition of Guangzhou tourists, Hong Kong, Macao, and Taiwan compatriots, Asian and Western tourists account for a large proportion. Their aesthetic taste is more influenced by the West and has its uniqueness.

4. Cantonese Cultural and Creative Products Hierarchical Analysis of User Requirements

4.1. Analytic Hierarchy Process. One comprehensively utilized Multicriteria Decision-Making (MCDM) strategy is AHP [3, 5, 6]. Analytic hierarchy process decomposes the

decision-making elements into objectives, criteria, schemes, and other levels, on which qualitative and quantitative analysis are carried out. It is a simple, flexible, and practical multicriteria decision-making method for quantitative analysis of qualitative problems. AHP is utilized to measure, order, rank, evaluate decision choices, etc. AHP estimates criteria weights by pairwise comparisons. This method is helpful to determine the relative weight which should have each criterion when we need to make a decision. Therefore, it has been applied in various fields such as environmental management [7], risk assessment [8], and supply chain management [9].

AHP has three advantages: systematization, which regards the object as a whole system and makes decisions according to the thinking steps of decomposition, comparison, judgment, and synthesis; practicability, combining qualitative, and quantitative methods, can deal with problems that cannot be solved by traditional optimization methods; simplicity, it is easy to calculate and clear in results so that decision makers can quickly and directly understand and master.

Now, we give the main steps of the AHP.

Step 1: define the central questions, choices, and judgment criteria

Step 2: using the fundamental scale of Table 1 to create the pairwise comparison matrix

Step 3: determine the criterion weight vector. Normalize the comparison matrix by equation (1); then, calculate the average of each row of the normalized comparison matrix by equation (2) to obtain the weight vector:

$$\bar{a}_{ij} = \frac{a_{ij}}{\sum_{k=1}^n a_{ki}}, \quad i, j = 1, 2, \dots, n, \quad (1)$$

$$W_i = \sum_{j=1}^n \frac{\bar{a}_{ij}}{n}, \quad i = 1, 2, \dots, n. \quad (2)$$

Step 4: using equations (3) and (4) to compute the consistency index (CI) of the comparison matrix:

$$CI = \frac{\lambda_{\max} - n}{n - 1}, \quad (3)$$

$$\lambda_{\max} = \sum_{i=1}^n \frac{(AW)_i}{nW_i}. \quad (4)$$

Step 5: calculate the consistency ratio (CR) by equation (5), where the random consistency index (RI) value is determined by Table 2:

$$CR = \frac{CI}{RI} \quad (5)$$

Step 6: compare the obtained CR with the value considered acceptable for consistency.

4.2. Application of AHP to the Design of Cantonese Cultural and Creative Products. The analytic hierarchy process model is established. First of all, the questionnaire is

TABLE 1: Scale for pairwise comparison.

Numerical value	Description
1	Equally liked
2	
3	Moderately preferred
4	
5	Strongly preferred
6	
7	Very strongly preferred
8	
9	Extremely preferred

distributed to the tourists who often travel to and from Guangzhou. Then, it takes the user demand factors of Cantonese cultural and creative products as the goal level, takes the appearance factors, function factors, and culture factors corresponding to Maslow's demand level as the criterion layer, and extracts nine perceptual words from the user demand vocabulary of typical user interviews as the criterion layer, so as to guide the design of product appearance, function, and culture. Figure 1 shows the analytic hierarchy process model of user demand factors of Cantonese cultural and creative products.

The test group is composed of 117 effective users mentioned above. According to the index system, questionnaire survey is conducted by focus group combined with information method in user survey and decision is made. The importance of the goal layer, criteria layer, and evaluation index layer are scored, respectively. Then, the scoring results are discussed and summarized internally, and the pairwise judgment matrixes (see Tables 3–6) are obtained, and reasonable conclusions are drawn through consistency test. The judgment matrix is constructed and related calculation is carried out, and the relevant data are presented as follows.

The criteria layer judgment matrix is denoted by

$$A = \begin{pmatrix} 1 & 1/2 & 1/3 \\ 2 & 1 & 1/2 \\ 3 & 2 & 1 \end{pmatrix}, \quad (6)$$

then by equation (1), we can get the following normalize the comparison matrix:

$$A_1 = \begin{pmatrix} 0.1667 & 0.1428 & 0.1818 \\ 0.3333 & 0.2857 & 0.2727 \\ 0.5 & 0.5715 & 0.5455 \end{pmatrix}. \quad (7)$$

By equation (2), we get the criterion weight vector:

$$W = (0.1637, 0.2972, 0.5391)^T. \quad (8)$$

Therefore,

$$AW = \begin{pmatrix} 1 & 1/2 & 1/3 \\ 2 & 1 & 1/2 \\ 3 & 2 & 1 \end{pmatrix} \cdot \begin{pmatrix} 0.1637 \\ 0.2972 \\ 0.5391 \end{pmatrix} = \begin{pmatrix} 0.4921 \\ 0.8942 \\ 1.6248 \end{pmatrix}, \quad (9)$$

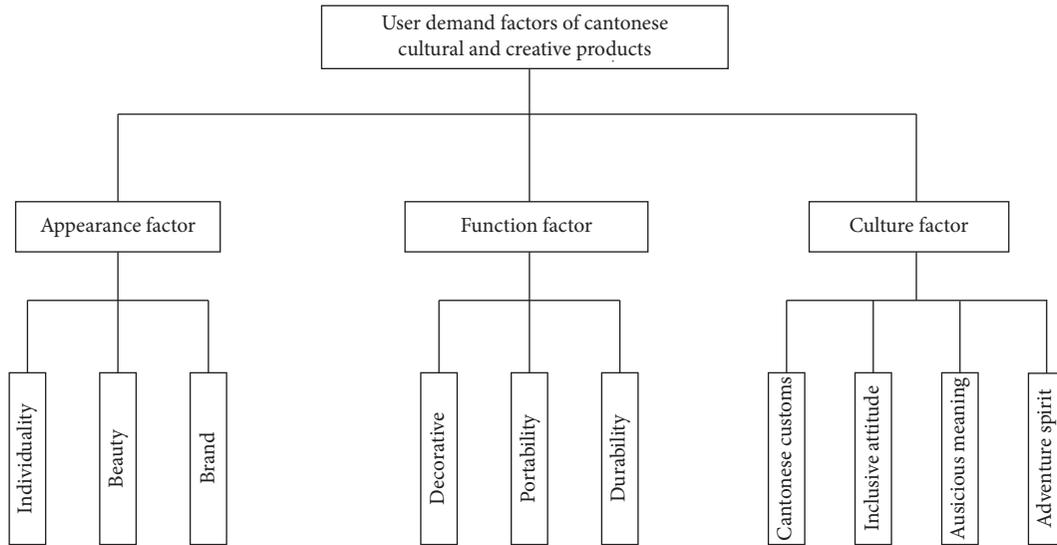


FIGURE 1: User demand factors of Cantonese cultural and creative product AHP model.

TABLE 2: Random consistency index (RI).

	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

TABLE 3: Criteria layer judgment matrix.

	Appearance	Function	Culture
Appearance	1	1/2	1/3
Function	2	1	1/2
Culture	3	2	1

TABLE 4: Appearance evaluation index judgment matrix.

	Individuality	Beauty	Brand
Individuality	1	1/4	1/3
Beauty	4	1	3
Brand	3	1/3	1

TABLE 5: Functional evaluation index judgment matrix.

	Decorative	Portability	Durability
Decorative	1	1/2	1/4
Portability	2	1	1/3
Durability	4	3	1

TABLE 6: Culture evaluation index judgment matrix.

	Cantonese customs	Inclusive attitude	Auspicious meaning	Adventure spirit
Cantonese customs	1	5	3	7
Inclusive attitude	1/5	1	1/3	2
Auspicious meaning	1/3	3	1	5
Adventure spirit	1/7	1/2	1/5	1

then by equation (4), we obtain

$$\lambda_{\max} = 3.0096. \quad (10)$$

Since the order of A is 3, by equation (3) we obtain

$$CI = 0.0048. \quad (11)$$

Because $n = 3$, we know that $RI = 0.58$ from Table 2, then by equation (5), we obtain

$$CR = 0.0083. \quad (12)$$

Similar with the above procedure, we obtain the results as follows and do not show computational process in detail for simplicity.

$$\begin{aligned} W &= (0.1199, 0.6079, 0.2722)^T, \\ \lambda_{\max} &= 3.0742, \\ CI &= 0.0371, \\ CR &= 0.0639. \end{aligned} \quad (13)$$

$$\begin{aligned} W &= (0.1372, 0.2394, 0.6234)^T, \\ \lambda_{\max} &= 3.0191, \\ CI &= 0.0095, \\ CR &= 0.0164. \end{aligned} \quad (14)$$

$$\begin{aligned} W &= (0.5628, 0.1079, 0.2671, 0.0622)^T, \\ \lambda_{\max} &= 4.0679, \\ CI &= 0.0226, \\ CR &= 0.0252. \end{aligned} \quad (15)$$

Through the analytic hierarchy process, the consistency ratio of each factor layer judgment matrix evaluation index is less than 0.1, which indicates that the test team has passed the consistency test on the user demand hierarchy factors. The order of the importance of the decision-making level is as follows: culture factors > function factors > appearance factors, which shows that culture factors are more important for the design of Cantonese cultural and creative products.

In the order of the importance of functional factors in the evaluation index layer, the order of importance of culture factors is Cantonese customs > auspicious meaning > inclusive attitude > adventure spirit, which shows that Cantonese customs are the most important in culture factors. The order of importance of function factors is durability > portability > decorative, indicating that durability is the most important factor. The order of importance of appearance factors is as follows: beauty > brand > individuality, which indicates that the beauty of products is more important in appearance factors.



FIGURE 2: Pen holder.

5. Design Practice of Cantonese Cultural and Creative Products

5.1. Appearance Design. Cantonese architecture mainly refers to the traditional architecture in Cantonese area, which refers to the building with traditional style built by using traditional building technology and building materials. Cantonese architecture is closely related to Cantonese culture and style and has strong regional characteristics. The cultural and creative design chooses the “Bahe guild hall” which is very historic and representative in Guangzhou Xiguan as the main design element. “Bahe guild hall” is the guild organization of Cantonese opera artists, formerly known as “Qionghua guild hall” [10]. This guild hall strengthened the unity of people in the opera industry, ensured the normal operation of the troupe, and resumed the troupe business after the lifting of the ban on Cantonese Opera in the Qing Dynasty. “Bahe” have branches all over the world, where there are Chinese, as long as there are Cantonese opera, and there are these guild halls. The long history and profound cultural heritage of Guangzhou’s “Bahe,” which are respected as their ancestors all over the world, are of great significance. They not only enable the intangible cultural heritage art of Cantonese opera to continue to be inherited but also represent the profound Cantonese opera culture and the indomitable spirit of Cantonese people.

5.2. Function Design. In the early research, we learned that tourists are more interested in some small products and stationery products, so we chose the four treasures of the study as the design objects, including a pen holder, a pen shelf, a paper weight, and an ink slab (see Figures 2–5). In the functional design, people pay more attention to the durability of the product, so in the design of the whole set of products, we strive to achieve a stable and reasonable structure.

5.3. Culture Design. The top half of the pen holder refers to the iconic roof of “Bahe guild hall,” while the lower part is added with window decoration elements; the shape of pen



FIGURE 3: Pen shelf.



FIGURE 4: Paper weight.



FIGURE 5: Ink slab.

shelf is transformed from the roof shape of “Bahe guild hall,” which is round and beautiful as a whole; the paper weight is decorated with the exterior wall patterns of the guild hall; the ink slab is designed by combining the cloud pattern on the ceiling of the guild hall with the architectural elements.

6. Conclusions

In the research of social science [11] and natural science [12–18], the selection of methods is very important. In this

paper, we choose to use an effective method, AHP, to study the design of Cantonese cultural and creative products. Based on the AHP model of user demand, we sort out the user needs of Cantonese cultural and creative products, conduct trade-off screening on the design demand factors of these products, so as to further quantify the needs of tourist groups, determine the most suitable combination of product design factors for users, and apply the conclusions to the design practice. With the vision of tourists, we can design products to meet the needs of tourists so that the cultural and creative products of Cantonese will be loved by more people, and the culture of Cantonese will spread faster and farther.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

This work was supported by the NSF of China (11901111) and Teaching quality and Teaching Reform of Higher Vocational Education in Guangdong Province (GDJG2019150).

References

- [1] X. Zhong, “Visual elements in cantonese culture: taking cantonese architecture as an example,” *Art Panorama*, vol. 10, p. 106, 2016.
- [2] Z. Wu, *Family Customs in Cantonese*, Guangming Daily Press, Shenzhen, China, 2017.
- [3] T. L. Saaty, “A scaling method for priorities in hierarchical structures,” *Journal of Mathematical Psychology*, vol. 15, no. 3, pp. 234–281, 1977.
- [4] M. Lin and Y. Yang, *Creative Product Development Model*, Economic Management Press, Beijing, China, 2014.
- [5] T. L. Saaty, *The Analytical Hierarchy Process*, McGraw-Hill, New York, NY, USA, 1980.
- [6] H. Michael and B. Haym, “Utilizing the analytical hierarchy process to determine the optimal lunar habitat configuration,” *Acta Astronautica*, vol. 173, pp. 145–154, 2020.
- [7] X. Ouyang, F. Guo, D. Shan, H. Yu, and J. Wang, “Development of the integrated fuzzy analytical hierarchy process with multidimensional scaling in selection of natural wastewater treatment alternatives,” *Ecological Engineering*, vol. 74, pp. 438–447, 2015.
- [8] E. Topuz and C. A. M. van Gestel, “An approach for environmental risk assessment of engineered nanomaterials using analytical hierarchy process (AHP) and fuzzy inference rules,” *Environment International*, vol. 93, pp. 334–347, 2016.
- [9] S. K. Mangla, K. Govindan, and S. Luthra, “Prioritizing the barriers to achieve sustainable consumption and production trends in supply chains using fuzzy analytical hierarchy process,” *Journal of Cleaner Production*, vol. 151, pp. 509–525, 2017.

- [10] W. Huang, "Cantonese opera guild organized the reconstruction and new change of bahe guild hall after the war," *Drama Literature*, vol. 10, pp. 144–150, 2016.
- [11] A. Rochman, G. R. Meuthia, R. A. Andi, and T. Lidya, "University reform and the development of social sciences in Indonesia," *International Journal of Educational Development*, vol. 78, Article ID 102269, 2020.
- [12] C. Chen, K. Li, Y. Chen, and Y. Huang, "Two-grid finite element methods combined with crank-nicolson scheme for nonlinear sobolev equations," *Advances in Computational Mathematics*, vol. 45, no. 2, pp. 611–630, 2019.
- [13] C. Chen, H. Liu, X. Zheng, and H. Wang, "A two-grid MMOC finite element method for nonlinear variable-order time-fractional mobile/immobile advection-diffusion equations," *Computers & Mathematics with Applications*, vol. 79, no. 9, pp. 2771–2783, 2020.
- [14] X. Zhang, L. Liu, Y. Wu, and Y. Cui, "Existence of infinitely solutions for a modified nonlinear schrodinger equation via dual approach," *Electron. J. Differential Equations*, vol. 2147, pp. 1–15, 2018.
- [15] X. Zhang, J. Jiang, Y. Wu, and Y. Cui, "The existence and nonexistence of entire large solutions for a quasilinear Schrödinger elliptic system by dual approach," *Applied Mathematics Letters*, vol. 100, Article ID 106018, 2020.
- [16] Y. Gu, W. Yuan, N. Aminakbari, and J. Lin, "Meromorphic solutions of some algebraic differential equations related Painlevé equation IV and its applications," *Mathematical Methods in the Applied Sciences*, vol. 41, no. 10, pp. 3832–3840, 2018.
- [17] Y. Gu and Y. Kong, "Two different systematic techniques to seek analytical solutions of the higher-order modified bous-sinesq equation," *IEEE Access*, vol. 7, pp. 96818–96826, 2019.
- [18] Y. Gu and F. Meng, "Searching for analytical solutions of the $(2 + 1)$ -dimensional KP equation by two different systematic methods," *Complexity*, vol. 2019, Article ID 9314693, 2019.