

Research on Influencing Factors of Gambiered Guangdong Silk Culture Innovation Based on ISM Method*

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Abstract—This paper excavates and combs the cultural genes of Gambiered Guangdong silk, and analyses the hierarchical relationship among the influencing factors of the cultural innovation, and puts forward reasonable suggestions for the cultural innovation of Gambiered Guangdong silk. Through searching reference and the Internet, the internal and external influencing factors of Gambiered Guangdong silk culture innovation are extracted and summarized, which contributes to the spectrum of innovation influencing factors. The logical relationship between the influencing factors is obtained by interviewing experts. After that, building up the analysis model by Interpretation Structure Modelling method. The ISM (Interpretation Structure Modelling) method is used to derive the relationship and the hierarchical structure among the various influencing factors. It is concluded that the regional environment is the most fundamental reason that affects the innovation of Gambiered Guangdong silk culture. It is the main purpose of cultural innovation to expand the consumption group, change the inheritance of the inheritors and develop the talents. The ISM method can effectively sort out the relationship between the cultural innovation factors and the hierarchical relationship, which promotes the cultural innovation and cultural value of Gambiered Guangdong silk. It also provides new research method on the innovation and development of traditional culture for relevant governments, enterprises and individuals.

Keywords—ISM method; Gambiered Guangdong silk; influencing factors; cultural innovation

I. INTRODUCTION

Intangible cultural heritage is not only the essence of the nation created by the people but also the blood of the national culture of the country. In addition, it is part of the long-term social practice. In March 2017, the General Office of the State Council issued a notice on forwarding the Chinese traditional craft revitalization plan of the Ministry of Culture and other departments [1], pointing out that industrial production cannot replace the creativity and uniqueness of traditional crafts. In February 2017, the General Office of the Central Committee of the Communist

Party of China and the General Office of the State Council issued the "Opinions on Implementing the Inheritance and Development of Chinese Excellent Traditional Culture", which emphasized the unique wisdom and philosophy of China's excellent traditional culture, and pointed out the importance of building a strong socialist culture. It also puts forward the important goal of completing the inheritance of Chinese traditional cultural heritage by 2025 and the great goal of forming a development system [2]. In recent years, although the traditional culture has returned with the help of the support of the government, the inheritance and development of China's traditional handicrafts still faces the survival challenge as a result of the development of the modern culture. The dyeing and finishing process of Gambiered Guangdong silk is one of the national intangible cultural heritages. Nowadays, the production scale, product innovation, inheritors and personnel training of Gambiered Guangdong silk are in trouble. Therefore, it is of great significance to explore and summarize the influencing factors of traditional cultural innovation development.

II. DEVELOPMENT STATUS OF GAMBIERED GUANGDONG SILK

Gambiered Guangdong silk is a unique traditional handicraft fabric originated from Shunde District, Foshan City, Guangdong Province. It was famous in the Ming and Qing Dynasties and was even exported to India, Europe, America and Nanyang at that time. In 2008, the hand dyeing and finishing skills of Gambiered Guangdong silk was listed in the national intangible cultural heritage list [3]. Mr. Liang Zhu, the inheritor, believes that the dyeing and finishing process of Gambiered Guangdong silk has to combine the advantages of time, place and other factors. The dyeing and finishing process of Gambiered Guangdong silk is complex owing to its extremely high requirements on climatic conditions and raw materials. Therefore, as the development of economy, the application of new materials and the change of people's modern aesthetic concepts, its particularity is gradually transformed into limitation. It is these limitations that affect the innovation and development of Gambiered Guangdong silk culture. The main features and status quo of

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the dyeing and finishing process of the fragrant cloud yarn are as follow: complicated process, long work cycle, Low yield and high cost. To this end, it is extremely urgent to explore and analyze the influencing factors of Gambiered Guangdong silk culture innovation. All in all, promoting the innovation and promotion of Gambiered Guangdong silk culture is an absolutely necessary part of the innovation and development of Chinese excellent traditional culture.

III. INFLUENCING FACTORS OF GAMBIERED GUANGDONG SILK CULTURE INNOVATION

After reading a large number of references as well as performing detailed interviews and analysis with the experts, the paper analyses the internal and external factors of

Gambiered Guangdong silk. On these grounds, the six most important factors affecting the cultural innovation of Gambiered Guangdong silk were summarized and proposed — the internal factors includes fabric characteristics, dyeing and finishing process and historical culture; and external influence factors includes regional environment, national policy and business management strategy. And further subdivide the six factors mentioned above. After the subdivision, the influencing factors are marked as $S_1, S_2, S_3, \dots, S_{14}$, as shown in "Fig. 1".

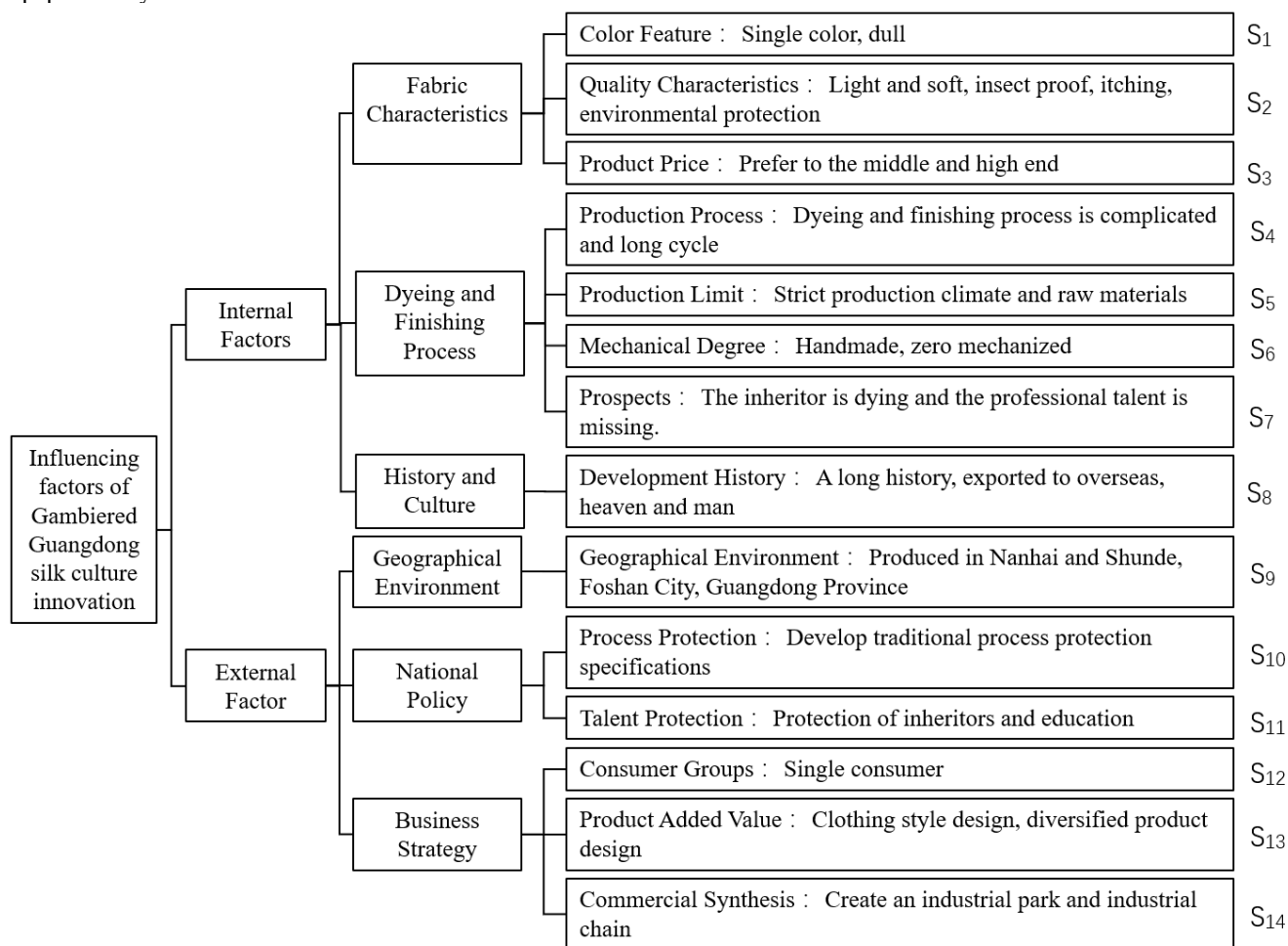


Fig. 1. Gambiered Guangdong silk culture innovation influence factor map.

A. Fabric Characteristics

Gambiered Guangdong silk is a unique traditional fabric in Guangdong, always with dark and dull color. Its color is relatively monotonous, compared with modern fashion clothing. It is mainly used in the field of medium and high-

end clothing and apparel. After exposure, the two-color fabric yarn with Foshan characteristics was obtained. It has excellent quality characteristics such as flame retardant, waterproof, antistatic, anti-insect, itching, soft and wrinkle-resistant, cool and environmentally friendly [4].



Fig. 2. Gambiered Guangdong silk application. (Source: <http://www.haibao.com/notes/article/1590538.htm>)

B. Dyeing and Finishing Process

The dyeing and finishing process of Gambiered Guangdong silk has hundreds of years' history up to now. Its production process is singular and complicated, the production cycle is long, the output is small, and the production cost is high. Since the production process of Gambiered Guangdong silk was strict with climate and raw

materials, it requires dozens of processes such as soaking, washing and long-time and high-temperature exposure to form high-quality fabrics. For this reason, mechanized production cannot be integrated with it so far. Handcrafting has a certain degree of requirement on both the development of inheritors and the cultivation of professional talents [5].



Fig. 3. Gambiered Guangdong silk dyeing and finishing process. (Source: www.pop-photo.com.cn/forum.php?mod=viewthread&ordertype=1&tid=297035).

C. History and Culture

It is said that fishermen in the Pearl River Delta region use soaked potato liquid to soak the fishing nets to make the fishing nets more durable. In the process of soaking the fishing net, the fishermen's clothes were also stained with dioscorea. Over time, the fishermen's clothes became as durable as fishing nets [6]. During the Qing Daoguang Period (1821-1850), Gambiered Guangdong silk began to

appear in the Nanhai area; during the Qing Dynasty (1862-1874), the production of Gambiered Guangdong silk was flourishing. In the 1940s and 1950s, it was in vogue in the Lingnan area. From the end of the 1930s to the early 1990s, Gambiered Guangdong silk had been exported to overseas. As time went by, with the continuous development and application of new textile fabrics, the pure natural handicraft industry such as Gambiered Guangdong silk has continued to be seriously affected to this day.



Fig. 4. Women in the late Qing and early Republic of China wearing Gambiered Guangdong silk. (Source: <http://news.163.com/13/0824/14/9725DTNB00014AED.html>).

D. Geographical Environment

The Nanhai and Shunde areas of Foshan City, Guangdong Province are the main production sites of

Gambiered Guangdong silk. The area is not only humid, but also has plenty of sunshine, providing a very adequate climate for the production of Gambiered Guangdong silk. Moreover, the land is fertile enough for grass and yam

cultivation, so as to provide drying and sufficient raw materials for the dyeing and finishing technology. At the same time, the river mud formed under the riverbed provides the main raw materials for the dyeing and finishing process.

E. National Policy

With the development of modern society, China has paid more and more attention to the inheritance and development of traditional culture. In recent years, it has repeatedly advocated in many major conferences and speeches, which put forward the relevant concepts and policies of the inheritance of Chinese traditional culture, providing a solid foundation for the protection of traditional Chinese crafts and the cultivation of heritage talents.

F. Business Strategy

At present, Gambiered Guangdong silk is mainly used in the medium-or-high-end clothing industry. Due to factors such as color characteristics and product prices, its consumer population is mainly concentrated in middle-aged and older groups, rather than younger consumers with more potential. In addition, the clothing style of Gambiered Guangdong silk lacks fashion sense and the style are single, which is not conducive to attracting more consumers. Relevant enterprises should integrate multiple aspects, tap demand points and innovation points to build the Gambiered Guangdong silk cultural heritage industrial park and related industrial chain.

the factors affecting the cultural innovation of Gambiered Guangdong silk are huge and complicated. The ISM method is an effective method for dealing with complex and messy system elements. It was developed by Professor Warfield in the United States in 1973 and is widely used in systems engineering, economic management, security systems and other fields [7]. However, ISM method is not much in the field of cultural innovation. Now the system analysis method is used to obtain the connection of various influencing factors in the system of Gambiered Guangdong silk culture innovation, and provide new ideas for relevant researchers.

A. Constructing Influence Factor Adjacency Matrix A

After comprehensive extraction and classification of the factors influencing the innovation of Gambiered Guangdong silk culture, 14 influencing factors are worked out: color characteristics S_1 , quality characteristics S_2 , product price S_3 , production process S_4 , production limit S_5 , mechanical degree S_6 , development prospects S_7 , development history S_8 , regional environment S_9 , process protection S_{10} , talent protection S_{11} , consumer group S_{12} , product added value S_{13} , and commercial complex S_{14} . The relationship between the 14 influencing factors is analyzed and judged by means of expert interviews to construct the adjacency matrix A. In the adjacency matrix, the relationship between the factors is generally represented by "0" and "1". If there is a direct relationship between the two factors, it is represented by "1", and vice versa [8]. From this, the adjacency matrix A of the influencing factors can be derived. As shown in "Table I".

IV. STRUCTURAL MODEL ANALYSIS OF THE FACTORS INFLUENCING THE INNOVATION OF GAMBIERED GUANGDONG SILK CULTURE BASED ON ISM TECHNOLOGY

After the factors influencing the innovation of Gambiered Guangdong silk culture mentioned above, it can be seen that

TABLE I. ADJACENCY MATRIX A OF INFLUENCING FACTORS OF GAMBIERED GUANGDONG SILK CULTURE INNOVATION

	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	S_{11}	S_{12}	S_{13}	S_{14}
S_1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
S_2	0	0	1	0	0	0	0	0	0	0	0	1	1	0
S_3	0	0	0	0	0	0	0	0	0	0	0	1	1	0
S_4	0	1	1	0	0	0	1	0	0	0	0	0	0	1
S_5	1	1	1	1	0	1	1	0	0	0	0	0	0	0
S_6	0	1	1	0	0	0	1	0	0	0	0	0	0	1
S_7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S_8	1	0	0	1	0	0	0	0	0	0	0	0	1	0
S_9	0	0	0	0	1	0	0	0	0	0	0	0	0	0
S_{10}	0	0	0	0	0	0	1	0	0	0	0	0	0	0
S_{11}	0	0	0	0	0	0	1	0	0	0	0	0	0	0
S_{12}	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S_{13}	0	0	0	0	0	0	0	0	0	0	0	1	0	0
S_{14}	0	0	0	0	0	0	0	0	0	1	1	0	0	0

B. Establishing a Reachable Matrix M of Influencing Factors

After determining the adjacency matrix A , use the Boolean algorithm $M=(A+I)^k$ to perform matrix multiplication on the adjacency matrix until $(A+I)^k=(A+I)^{k+1}$. The reachable matrix M of the influence factors of yarn culture innovation is drawn, as shown in "Formula. 1".

$$M = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 \end{pmatrix} \quad (\text{Formula. 1})$$

C. Hierarchical Decomposition

The function of hierarchical decomposition is to have a clearer understanding of the hierarchical relationship between the various influencing factors. Each level is represented as the reason of the upper layer, and the lowest level is the most important factor.

Before dividing into the decomposition reachable matrix, first collect the reachable set and the first set. Construct them and their intersection table. In order to have a clearer understanding of the relationship between the factors influencing the innovation of Gambiered Guangdong silk culture, the table is further summarized according to the method of hierarchical decomposition, and the influencing factors are extracted hierarchically under the condition of satisfying $R(S_i) \cap A(S_i)$. Thus, the following seven levels are obtained, as shown in "Table II". The results show that the regional environmental factors are the lowest level of the hierarchy, which is the root cause of the cultural innovation of Gambiered Guangdong silk.

According to the above analysis, combined with the adjacency matrix and hierarchical structure analysis of the influencing factors, the structural model diagram of the influencing factors of Gambiered Guangdong silk can be obtained, as shown in "Fig. 5".

TABLE II. HIERARCHICAL STRUCTURE OF FACTORS INFLUENCING CULTURAL INNOVATION

Level	Factors
1	7,12
2	1,10,11,13
3	3,14
4	2
5	4,6
6	5,8
7	9

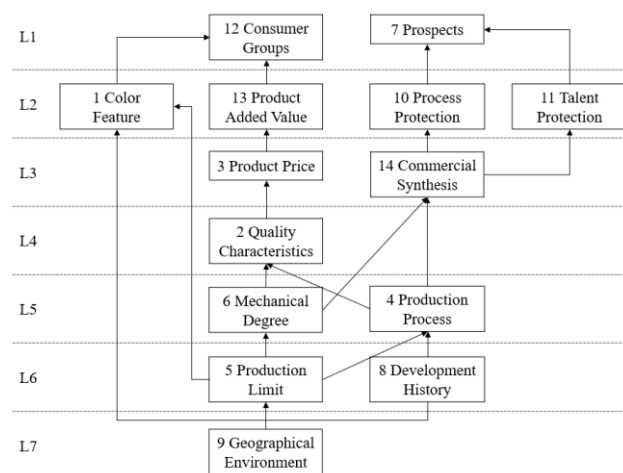


Fig. 5. Structural model diagram of influencing factors.

D. Model Analysis and Recommendations

Through the use of ISM method, the influencing factors of Gambiered Guangdong silk culture innovation were analyzed in detail, and the relationship between the various influencing factors of Gambiered Guangdong silk culture innovation and the hierarchical structure relationship between various influencing factors were obtained. The analysis draws the root cause of the cultural innovation of Gambiered Guangdong silk and the ultimate goal of Gambiered Guangdong silk culture innovation. Using the ISM method, the logical relationship between the internal factors, external factors and internal and external factors that influence the innovation of Gambiered Guangdong silk culture is clarified. After the above analysis, the following conclusions can be drawn, and on this basis, reasonable suggestions for the cultural innovation of Gambiered Guangdong silk are proposed:

- The links between the various influencing factors are relatively close and interlocking, directly or indirectly affecting the final goal. In the process of participating in the cultural innovation activities of Gambiered Guangdong silk, various culture-related factors should be fully considered. The paper extracted the cultural elements from six aspects, including tangible cultural elements, patterns, colors and shapes, etc., as well as intangible cultural elements, cultural connotations, etc., and find common ground between cultural elements. After comprehensive understanding of the accurate grasp of the direction of cultural innovation.
- The geographical environment is the most fundamental reason for cultural innovation. Consumers and development prospects are the ultimate goal of cultural innovation. Gambiered Guangdong silk culture innovation is inseparable from Foshan's climatic conditions and raw material production conditions. Foshan also provides rich regional cultural resources for the development of Gambiered Guangdong silk. Through the sorting and induction of resources, it's necessary to adopt

innovative methods of "Intangible cultural heritage+" strategies, such as "Intangible cultural heritage + fashion", "Intangible cultural heritage + Intangible cultural heritage", "Intangible cultural heritage + culture", etc. [9]. In Foshan, there are rich national-level intangible cultural heritage projects such as Foshan Autumn Color, Foshan Light Color and Foshan Paper-cutting. The relevant Foshan culture elements are exagated and the Foshan culture database is compiled. Through the research on the target consumer group, the user demand is obtained, and the characteristics of the silk yarn are matched and combined with the cultural elements in the database to create the Gambiered Guangdong silk product with the characteristics of Foshan culture, thereby expanding the product diversity and enhancing Inherit the confidence and motivation of talents. Only through the real integration and development between Gambiered Guangdong silk culture and Foshan regional culture can truly enter the heart of consumers and arouse people's sense of responsibility and mission for cultural inheritance.

- According to "Fig. 5", from the fourth level — quality characteristics, and the third level — commercial complexes gradually divided into two trends, which more clearly point to two final goals— consumer groups and development prospects. It can be concluded that the quality characteristics of the silk yarn are the price of the product, the added value of the product and the reason for the consumer. The good fabric characteristics of the silk yarn are light and soft, insect proof, itching and environmental protection, and the quality of the silk fabric products has a direct impact on the product price. The fabric properties and price of Gambiered Guangdong silk determine the shape and structure of Gambiered Guangdong silk product innovation. Therefore, the diversity of Gambiered Guangdong silk products directly affects the diversity of consumers. To expand the consumer population, it is necessary to fully understand the characteristics and functions of the yarn fabric, and to innovate according to its characteristics and the specific needs and preferences of the target users. In addition, commercial complexes are the cause of process protection, talent protection and development prospects. Creating the Gambiered Guangdong silk Ecological Protection Zone, Creating the Gambiered Guangdong silk Industrial Park and the industrial chain, and formulating traditional process protection specifications, can protect the development of the Gambiered Guangdong silk inheritor and the dyeing and finishing process to a certain extent, thus promoting the Gambiered Guangdong silk culture. Training of talent education in the field of colleges and universities.
- The geographical environment has a direct impact on production constraints. The climatic factors and raw material factors in production constraints are directly

affected by the regional environment, and they are closely related to each other and coexist. Gambiered Guangdong silk is a unique specialty of Foshan, and its unique reasons are inseparable from the direct influence of regional environmental conditions. The Foshan area belongs to the subtropical monsoon humid climate area, with mild climate, abundant rainfall and long sunshine time. It provides a superior growth environment for the growth of yam and green grass, and also provides sufficient sunlight and humidity for the production of Gambiered Guangdong silk. In general, Foshan is a growing greenhouse tailored for Gambiered Guangdong silk.

- Production constraints and development history have a direct impact on color characteristics. When innovate the Gambiered Guangdong silk culture, it is necessary to consider the raw materials that influence color, the production environment, and the historical factors of cultural development. The birth of the legendary silk yarn originated from the accidental discovery in the work of the fishermen in the Pearl River Delta. It was the product of the people's labor and many attempts. With the development of society, the system of dyeing and finishing of the cloud was formed. The process of dyeing and finishing the silk yarn also determines the color of the fabric, which is produced through the interaction of various factors such as yam, river mud and climate. Innovate the color of the silk yarn; it is necessary to understand the process of the dyeing and finishing process, as well as the main factors affecting the color. Trying to increase, decrease or replace the influencing factors is not a bad choice.
- Color characteristics and product added value have a direct impact on the consumer group. Different color positioning and product diversity have different effects on the consumer group. The color of the scented silk yarn is relatively deep and ancient compared to other costumes, and the color is relatively simple, so most of the attracting consumers are middle-aged and old-age consumers. Since the key factor of crossing the river mud during the dyeing and finishing process is the precipitation and organic combination of iron elements, it is possible to try to adjust the iron content in the river mud to create a new color [10]. Mainly used in the field of clothing, Gambiered Guangdong silk's clothing style is too single, lacking fashion sense. Moreover, its production process is complicated, the output is small, and the cost is high. Therefore, product innovations of Gambiered Guangdong silk are also restricted. In order to change this situation, a variety of attempts should be made to cope with color; combined with modern technology to improve the mechanization level of the production process, reduce production costs; try to combine the Gambiered Guangdong silk clothing with modern fashion elements, and redesign the clothing products, such as handbags, shoes, accessories, etc.

- Process protection and talent protection have a direct impact on development prospects. The formulation of traditional protection norms in national policies, as well as the protection and cultivation of inheritors, is a solid foundation for the inheritance and development of talent culture. The protection of Gambiered Guangdong silk culture has a long way to go. The inheritance and inheritance of the inheritors are limited, and it is necessary to combine the state with the enterprise. In order to cope with this situation, the government should introduce relevant policies to protect the traditional crafts and successors of Gambiered Guangdong silk. Special funds can be set up to protect the inheritors, and the Gambiered Guangdong silk intangible cultural heritage courses are offered in colleges and universities [11]. Relevant enterprises need to adjust their business strategies and use the power of science and technology to build the Gambiered Guangdong silk Cultural Industry Park. At the same time, under the development opportunity of "One Belt and One Road", combined with the development concept of "One Belt, One Road", the reputation of Gambiered Guangdong silk was improved, which promoted the optimization and improvement of traditional dyeing and finishing process of Gambiered Guangdong silk [12]. The government, enterprises and technology complement should arouse citizen's attention of Gambiered Guangdong silk.

V. CONCLUSION

With the development of society, the Chinese traditional culture has received more and more attention from the national government, enterprises and the people. At the same time, Chinese excellent traditional culture has been impacted and influenced by various emerging cultures. Therefore, the process of cultural innovation China General will actively or passively absorb various factors of the development of the times. This paper analyzes and judges the huge and complex Gambiered Guangdong silk cultural innovation influence system through the ISM model. From the new perspective of the system, it re-examines the logical relationship between the factors affecting cultural innovation. Therefore, it is clearer and more effective to find the cultural innovation factors of Gambiered Guangdong silk from various angles, and to carry out innovative design of Gambiered Guangdong silk more systematically and efficiently, and also provide new exploration ideas for the research of traditional culture innovation development of relevant governments, enterprises and individuals.

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