



Research on Innovation and Development of Chinese Traditional Textile Technology Duntou Blue Based on Design

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Abstract. Duntou Blue is produced in Heyuan, Guangdong Province, China. Hakka traditional hand weaving, dyeing and weaving techniques. It began in the mid-16th century and declined in the 1990s. Qualitative research methods such as field investigation, in-depth interview, questionnaire, case study and visual analysis were adopted. In-depth understanding of the Duntou Blue dyeing and weaving skills information. Starting from the historical development of Duntou Blue traditional handicraft, this paper combs the technological process and summarizes the technological characteristics. Visit the inheritor to learn about the current situation. Questionnaire method was used to obtain people's understanding and understanding of Duntou Blue, as well as reasonable development suggestions. The purpose is to study the economic value and cultural value of Duntou Blue. Explore the innovative design method of pier blue. This paper points out that design is an important means of cultural innovation and industrial development of Duntou Blue textile technology. Design innovative industrial chain strategy supported by consumption. Design Duntou Blue brand, make systematic formulation and layout of brand strategy, and promote the formation of the whole protection system. Design elements should be combined with the trend of The Times, in line with people's aesthetic. The design should not only respect the inherent law of Duntou Blue inheritance and development, but also be based on the reality of the development of Duntou Blue.

Keywords: Duntou Blue · Textile technology · Artistic characteristics · Innovation and development · Brand image design · Product design · Promotion design

1 Introduction

With the accelerated process of industry and urbanization. With the popularization of modern textile technology, traditional manual production has been abandoned. Young people are reluctant to engage in this traditional craft, which is on the verge of extinction. Research on Duntou Blue Hakka textile technology is very scarce in academic research and product market development. It is urgent to inherit and innovate Duntou Blue textile and dyeing technology. To this end, I will lead the student team to participate in the

“Innovation and Entrepreneurship Training Program for College Students” in 2020. The project aims at protecting and innovating the intangible cultural heritage of Duntou Blue. Duntou Blue is in urgent need of protection. The project investigated the status quo of Duntou Blue textile technology. Understand the technical characteristics and artistic characteristics of Duntou Blue textile technology. Study the economic value and cultural value behind Duntou Blue. Based on the practice of Duntou Blue brand visual image design, brand promotion and product development design are carried out. Expand product path, let Duntou Blue innovative products into life, extend the industrial chain of its products. Research product patterns that conform to the current aesthetic. In the Internet era, digital media technology is borrowed and diversified promotion methods are used to carry out online publicity. Information visualization design plays a role in the education and training of Duntou Blue skill inheritance. Deeply understand the cultural characteristics of Duntou Village in Heyuan and develop the regional culture of Duntou village. To protect intangible cultural heritage and promote rural development. Using design methods to complete the development of Duntou Blue traditional textile technology innovation strategy.

2 Status Quo of Duntou Blue Textile Technology

2.1 The History of Duntou Blue

Duntou Blue has a long history and has experienced more than 400 years of development. Combined with the local natural conditions, the formation of a unique textile and dyeing system. Duntou Blue is a kind of unique blue fabric produced by Hakka people by self-spinning, self-weaving, self-dyeing and self-spinning using cotton, linen and other raw materials cultivated at home. It is named Duntou Blue because of its origin. At one time, this textile technique was so popular that every family grew cotton textiles. Duntou Blue finished fabric has the advantages of strong and wear-resistant, crisp and smooth feel, simple and refreshing style, high color fastness, mostly plain color. It has a wide range of uses and is a must in Hakka’s daily life, including: head cloth, Hakka embroidered hat, embroidered shoes, clothes, trousers, mosquito net, quilt, quilt cover, cloak, shoes, socks, suspenders, handkerchief, towel, tablecloth, tea bag, tofu bag, etc. [1]. Cloth art is also used in painting and calligraphy mounting, book binding. High quality products are exported to Guangzhou, Dongguan, Huizhou and other places in the Pearl River Delta. In Fujian, Jiangxi, Hunan and other provinces have sales. See Fig. 1.



Fig. 1. Duntou Blue traditional products.

2.2 Duntou Blue Status Quo

Today, the status quo of Duntou Blue traditional textile technology is not optimistic, and gradually withdraw from People's Daily life. By 2021, there are less than 10 craftsmen, most of whom are old. This makes the inheritance of this skill more serious, facing the embarrassing situation of no successor [2]. The fundamental reason for the decline of Duntou Blue from prosperity is: the production mode has changed. First of all, machines take the place of manual work, which increases productivity. However, Duntou Blue textile, which relies on pure manual work, has many processes, from planting cotton to weaving cloth, which consumes long time cycle, high cost, but low economic benefit. Second, modern chemical dyes, which are easy to color and fix, replace traditional vegetable dyes. Finally, more and more practitioners choose to abandon this traditional skill and find new ways to make a living. See Fig. 2.



Fig. 2. Duntou Blue textile site.

Of course, the change of people's aesthetic consciousness is also the reason for the decline of Duntou Blue. Duntou Blue takes blue as the basic tone, the fabric is simple, the pattern is rich and all has the good meaning, was once the industrious and simple Hakka people's favorite product. However, with the development of The Times, people have different pursuit of beauty. Duntou Blue can't provide colorful, ornate and unique clothing. Gradually lost consumer groups.

At present, in order to change this situation, innovation mode is also being explored, but the effect is not good. The main reasons are backward production technology, product development lag behind, single product type. The products are mainly made of soil woven fabric and tourist souvenirs produced in small batches. The designs and patterns are more traditional. Without brand support, cultural value and artistic value are out of touch with modern society. Secondly, the inheritance and protection of intangible cultural heritage lacks systematic management. In 2015, Duntou Blue textile technology was rated as intangible cultural heritage of Guangdong Province [3]. But only individual organizations are making efforts to protect Duntou Blue. Duntou Blue want more long-term development, but also need to establish a reasonable innovation mechanism.

3 Characteristics of Duntou Blue Textile Technology

Visit intangible cultural heritage inheritor Mr. Chunlei Zeng in Duntou Village. Based on the existing fabric remains and restored fabric. It is understood that the weaving technology of Duntou Blue is very complicated, and it is woven by crossing warp and

weft. The textile process consists of five steps: spinning, tilling, weaving, dyeing and chuai (flattening) [4]. There are nearly thirty processes. In Duntou village, the master of this textile skill is mainly male, in the form of workshops. Because skills are taught only to men. Only local villagers are allowed to study.

3.1 Rigorous Process of Textile Technology

From a cotton thread woven into a piece of cloth, and then dyed into the Duntou Blue. To go through the first link - spinning. Refers to the process from growing cotton to spinning cotton yarn, making yarn and preliminary processing of textile materials. It involves the process of cooking pulp, sizing yarn, drying yarn and playing yarn tube. The second link - ploughing. It is the process of yarn finishing and yarn preparation before machine. It involves the process of tilling yarn, reeding, carding cloth, loading machine and wearing heald. The third link - weaving. It refers to the process of weaving the yarn through the heald, the machine, the cloth and the fabric. According to the different color of the fabric, weaving is done by dyeing before weaving or weaving before dyeing [5]. The fourth link - dye. It involves picking green leaves, soaking, natural fermentation, adding lime, condensation precipitation, blue and other processes to produce blue dye. The last link - flattening. It is the process of finishing the blue fabric later. It is mainly through the roller press to make the fabric smooth, while adjusting the skewed weft line. See Fig. 3.



Fig. 3. Rigorous process of textile technology

3.2 Textile Equipment

According to the large-scale weaving instruments preserved. It is found that each process is assisted by corresponding instruments. And form a complete weaving system. The weaving process has standardization requirements. In order to improve the weaving efficiency, the instrument design is ergonomic. For example, in the process of spinning, ergonomic warping frame, warp frame, bedroom spinning wheel is used [6]. At the same time, in order to avoid mistakes in the weaving process, it is necessary to concentrate on the operation of limbs and body.

3.3 Natural Weaving and Dyeing Raw Materials

Chinese folk cloth art mostly relies on local ecological environment and local materials. Adept at dyeing with vegetable and mineral dyes. Plant dyes are extracted from natural plants and have the characteristics of environmental protection and green. At the same

time also has certain antibacterial, mildew effect. Heyuan area is rich in plant resources, which provides diversified dyeing materials for Duntou Blue [7]. Common dyes come from locally grown or wild plants such as blue, suzuki, and madder. Due to the diversity of materials, Duntou Blue has a distinctive blue and fabric look.

After soaking, natural fermentation, adding a certain proportion of lime, finally condensed into indigo. Soak the cotton cloth in indigo dye and place it under the sun. The indigo dye on the cotton cloth is fully oxidized in contact with the air, and the original green dye liquid on the cotton cloth is rapidly transformed into blue. It is dried to form an indigo-blue color that is not easy to fade. The cotton cloth color after dyeing is simple, quality of a material is soft, safe and durable, natural environmental protection.

3.4 Plant Color System

Duntou Blue although named blue, but the color of blue department, red department, brown department. It is Duntou Blue, Duntou Brown, Duntou Red as the main color of plant dyed fabrics collectively. The dyeing material used for blue fabric is horse blue. After soaking, fermenting and adding a certain proportion of lime, fresh marlin is condensed into indigo, and then the yarn or fabric is dyed. Different dyeing times have dark blue, blue, light blue. Red fabric is made of madder heated extract juice and dyed, with deep red, bright red, pink and other colors. The dyed material that brown fastens fabrics to use has yam, mineral and so on dye and become [8]. Duntou Blue fabric overall color is mainly blue, red, brown department auxiliary embellishment color. Presents the beauty of natural and fresh color, with the color system of local characteristics. See Fig. 4.



Fig. 4. Folium isatidis, Duntou Blue, Duntou Brown, Duntou Red.

3.5 The Geometry of the Pattern

Influenced by traditional Chinese culture, Hakka people pay much attention to the aesthetic effect of costume patterns. Current analysis of existing fabrics. The pattern is closely related to weaving and dyeing. Duntou Blue fabric pattern in addition to plain dyed fabrics. With the development of dyeing after weaving technology. A series of geometric patterns were created using blue, white and red yarn. The fabric presents a simple and harmonious artistic feature [9]. Composition is based on the combination of straight lines, rectangles and squares to form geometric patterns. Geometric fabric has long flowing water cloth, well orchid cloth, sesame cloth. See Fig. 5.



Fig. 5. Long flowing water cloth, well orchid cloth, sesame cloth.

The fabric of long flowing water cloth takes weft line as direction in the weaving process. The grain is like a stream, so it is named long flowing flowered cloth. The pattern is mainly fine stripe, the warp is white cotton thread or blue cotton thread, and the weft is distributed by 4 blue and 4 white intervals. The width of the finished product is about 52 cm. Well orchid fabric is thick and thin lines intersect to form a cross shape. Found from the existing pier head blue fabric, well orchid cloth is divided into coarse grid and fine grid two kinds. Using the method of dyeing after weaving, uniform texture. Chinese people like to use odd numbers as the ratio. The number of striped longitude and latitude lines is repeated in singular numbers. It has its own unique rhythm and rhythm, reflecting the artistic beauty after the pattern proportion and balance. Sesame cloth is blue warp, white weft, two color single yarn interwoven plain fabric. Each batch of yarn finish, thickness are subtle differences, fabric texture shows different natural texture, or fine, or coarse.

4 Design Duntou Blue Innovative Development Ideas

4.1 Research on Design Direction

In order to obtain the innovative design direction of Duntou Blue. In the early stage, literature and materials were collected and sorted out to deeply understand the history of Duntou Blue. At the same time, by the way of field investigation to understand the characteristics of textile technology, weaving tools. Visit the skill inheritor. Field investigation of textile technology development status, and the product derivatives have done detailed and careful analysis and research. In the later stage, questionnaires were issued on social platforms to collect people's understanding of Duntou Blue and suggestions for its future development [10]. The process is divided into three parts: part one, question setting and preparation. On the basis of determining the research theme, the relevant information of Duntou Blue culture was collected and analyzed in a large range. Several important keywords are analyzed and extracted: "awareness, Hakka, intangible cultural heritage culture, innovation and development". Set the question from these keywords. The second part, questionnaire delivery and collection. Fill in the questionnaire as Hakka and non-Hakka. Better understand how different people think about it. The third part analyzes the data. Analyze and review the collected 400 questionnaires, make statistics on data sources and answer division, conduct multi-dimensional analysis and discussion, and provide effective information for later program formulation.

4.2 Duntou Blue Textile Technology Innovation Design Direction

Through research, we can see a clear core context. How to save this intangible heritage? It's not simply copying; it's not simply developing lots of derivative designs. The economic value and cultural value of Duntou Blue should be studied [10]. Formulate systematic innovation strategies in line with market rules and product positioning. The use of design techniques and innovative ideas to do a combination of Duntou Blue and modern trends. Extract the cultural connotation and design elements in line with this era. Integrate tradition with the sense of The Times to create a chain of innovative industries supported by consumption.

4.3 Duntou Blue Brand Image Design

Market demand for brand building. Duntou Village has rich historical and cultural resources. The local villagers and the few artisans cherish and love this skill. I also hope that Duntou Blue can be passed on. At the same time, Duntou Blue inheritance and innovation. Promote the cultural development of Duntou Village through brand design. The innovation of Duntou Blue brand culture is centered on young literature and art, quiet and elegant, traceability and innovation, and protection of intangible cultural heritage. Brand building should be considered in all directions. We should combine the cultural background of Duntou Village in Heyuan. Drive the development of rural areas and form villages with cultural characteristics [11].

In the brand image design, the blue tone of Duntou Blue is adopted. In line with the spiritual needs of urban people homesickness. Meanwhile, regional cultural elements are extracted. Use design language for innovative design. Form a new aesthetic visual image in line with The Times. Based on the above factors, a brand image design named "Shike" was designed. Promote brand, enrich brand culture connotation. Expand market development value. (see Figs. 6 and 7).



Fig. 6. Duntou Blue brand image design "Shike".

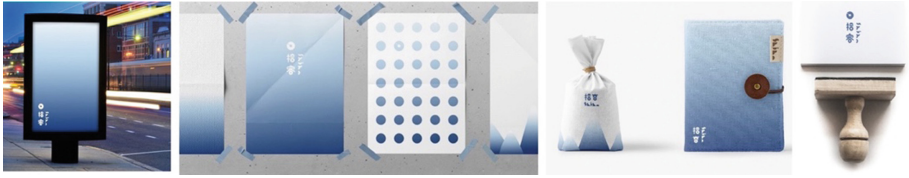


Fig. 7. Brand promotion application.

5 Industrial Design Development Paths

It is an important method to use design to intervene in cultural innovation and industrial development of Duntou Blue. Duntou Blue due to the green environmental protection, sustainable development and other characteristics back to the public vision. Based on the protection of intangible cultural heritage, restore Duntou Blue fabric technology [12]. After analyzing and summarizing the technological process and artistic performance characteristics. The design and development paths of Duntou Blue products are discussed from three aspects of technological innovation, product application and diversified promotion methods.

5.1 Innovation in Process Design

The core of Duntou Blue textile technology should be retained for its inheritance. The core technology of Duntou Blue is embodied in two aspects: improved weaving machine and set dyeing technology. From the perspective of technological innovation, the dyeing technology of Duntou Blue textile technology should be taken as the key development object. Because through special weaving and dyeing raw materials, the fabric dyed by plant color system has regional uniqueness. Developing cultural and creative product design based on dyeing is one of the ways to develop Duntou Blue product [13]. The weaving machine, influenced by modern machinery, has no advantage in the production process. See Fig. 8.

5.2 Cross - Boundary Design to Broaden the Scope of Product Application

Design and manufacture of derivative products to generate consumption chain. Combined with daily aesthetic and life consumption, attract people to consume, improve the influence and economic benefits of Duntou blue. In Duntou village to mobilize artisans engaged in this craft, attract more young people to learn this craft. Design intervention to broaden the scope of product application to solve the contradiction between Duntou Blue textile technology inheritance and economic development needs. In the design process to show the characteristics of the hand, the development of high-end hand series products. Combined with the characteristics of fabric art in home textiles, furniture soft decoration products, electronic products, tourism souvenirs and other fields, develop products [14]. Based on the market consumer groups, seeking more humanized design form, into modern life. See Fig. 9.



Fig. 8. Blue dye home textile design products by Yang Xiaoli, Gao Jie.



Fig. 9. Duntou Blue innovative product design by Du Wenfei.

For example, the use of Duntou Blue dyeing, combined with the local specialty plum tea, to develop cross-border packaging design. The design inspiration comes from the combination of plum garden tea culture and Duntou Blue culture. Consumers can not only touch the tea culture, but also feel Duntou Blue culture. Packaging design concept “green environmental protection as the premise, appearance combined with the regional characteristics of Duntou village.” The structure of the package adopts the shaker box, and the architectural shape of the window is lined with dyed gradation [15]. The box body is mainly white, fresh and elegant. The inner box is mainly blue gradient, showing

the dyeing and weaving process. Using dyeing changes as a starting point, blue is rooted in the product to form a unique color memory. In terms of design elements, the box extracts the typical buildings of Duntou village as the main graphics. Three pictures are combined to form a series of boxes for viewing. A blue gradient plum blossom pattern is enclosed in the inner box. On the top of the box, there is a famous quote about Duntou Blue. The number of products corresponds to the process of Duntou Blue dyeing and weaving technology. See Fig. 10.



Fig. 10. Duntou Blue crossover product design—Plum tea packaging design.

5.3 Design Diversity Promotion Methods

There are two ways to promote Duntou Blue textile technology: offline and online. Under the line of the Duntou Blue textile technology life. For the development of derivative products, we try our best to combine Duntou Blue with daily necessities, stationery, clothing, etc., to integrate into life and extend the industrial chain of its products. For example, the “Mini Version Duntou Blue Process Device” was developed to experience and promote textile skills. Let people understand the textile technology culture, enhance people’s awareness of intangible cultural heritage protection. Combined with parent-child interactive education development of the “Chinese green leaves planting pot” toy [16]. Toys in the concept of advocating green natural pollution-free life. Inspire children’s perception of vitality, exercise children’s observation ability, hone their patience, and increase parent-child interaction between parents and children. Let more parents and children know Duntou Blue. Experience the time and patience aesthetics of Duntou Blue. To promote and develop the intangible heritage Duntou Blue culture.

Information visualization of Duntou Blue, combined with digital media, online propaganda, make the network become an important carrier of communication. Using information visualization design, the process of pier blue as the key diagram. Introduce the characteristics, inheritance, historical background, geographical location and representative buildings of Duntou Blue in turn. Let people further understand the Duntou Blue handicraft, rather than stay on the surface of the impression of blue dye [17]. See Fig. 11.

Holding “China · Duntou Blue Town Blue Festival” cultural display activities. Use cultural exhibitions to let people know about Duntou Village. Let Duntou Blue culture achieve sustainability. Let consumers feel the charm of Duntou blue culture, so that this handicraft more widely spread out. Thus, maintaining the spiritual memory and cultural heritage.

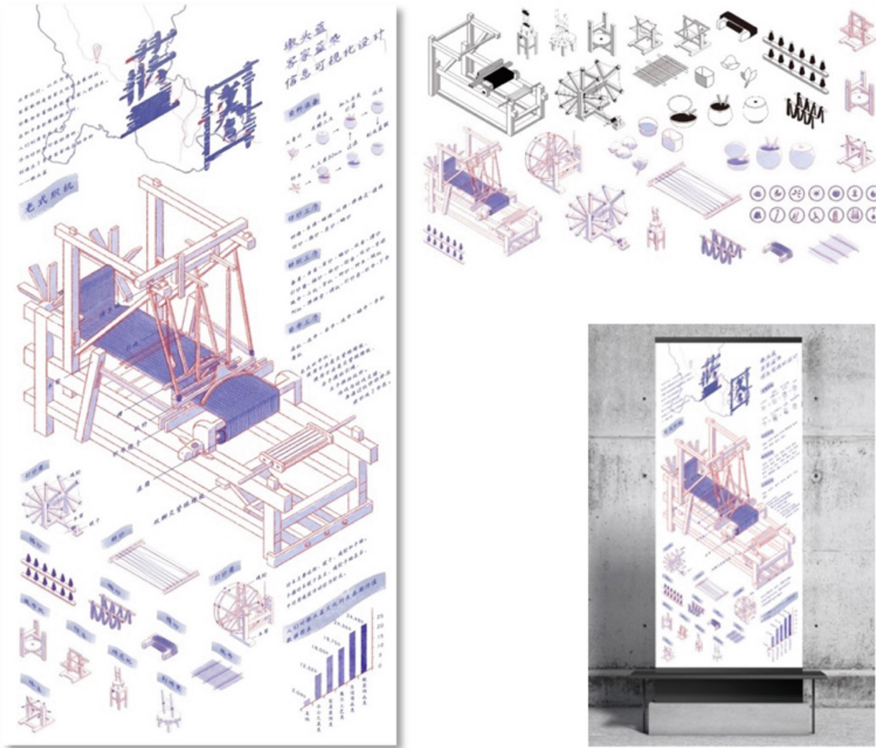


Fig. 11. Information visualization of Duntou Blue.

6 Conclusion

Duntou Blue textile technology has experienced more than 400 years of development, is the product of human civilization. Both practical and aesthetic. There is a textile system of excellence in craftsmanship. Local materials are used to form natural weaving and dyeing materials and unique plant color system. Aesthetically reflects the Chinese farming culture under the simple aesthetic thought, and human wisdom. At the same time, it is also an important product of local residents' economic development.

At present, people pursue the values of returning to the origin and craftsman spirit. Recognize the importance of protecting intangible cultural heritage. By analyzing and summarizing the technological process and artistic expression of textile technology. Study the economic value and cultural value of Duntou Blue. Design is involved in the cultural innovation and industrial development of Duntou Blue textile technology. From the process innovation, product application, brand image building, design diversity promotion. To develop a systematic innovation strategy in line with market rules. Using design techniques and innovative thinking, the traditional textile technology and the modern trend to do a combination. Extract the cultural connotation and design elements in line with this era. Integrate tradition with The Times to create a chain of innovative industries supported by consumption.

References

1. Guangdong Cultural Center. Skills-Duntou Blue textile skills. <https://www.gdsqyg.com/agdfygz/mingluinfo/mlproid=2018040410267538>. Accessed 10 July 2020
2. Xiuli, H.: Structural characteristics and process analysis of Hakka “Duntou Blue” traditional clothing in Heyuan area. *J. China. J. Fashion.* **16**(4), 5 (2019)
3. Feng, Z.: “Duntou Blue” Hakka clothing cultural inheritance and innovation. *J. Western Leather.* **20**(4), 63–66 (2016)
4. Hai, H., Yang, H., Lan, C.: Investigation and practice of traditional crafts in cross-cultural context. *J. Art Des.* **57**(11), 137–139 (2015)
5. YanRen, S.: *Annals of Heyuan County*. Zhongzhou Ancient Books Publishing House, Zhongzhou (2017)
6. Zhigan, C.: *Intangible Cultural Heritage of Heyuan*. China Literature and History Press, Beijing (2010)
7. Guiyuan, L.: *On The Pattern Art of Lei Guiyuan*. Shanghai Culture Press, Shanghai (2016)
8. Daoyi, Z.: *On Auspicious Culture*. Chongqing University Press, Chongqing (2011)
9. Yueqi, W.: Research on the design of Lingnan plant dyeing products. *J. Pack. Eng.* **37**(16), 39–43 (2016)
10. Wei, W.: Overview of the historical development of Chinese traditional dyeing of plants and trees. *J. Sichuan Silk.* **22**(3), 52–54 (2007)
11. Johnson, M.: *Brand Design Book*. Shanghai People’s Fine Arts Publishing House, Shanghai (2020)
12. Bingnan, W.: *Packaging Design*. Cultural Development Publishing, Beijing (2016)
13. Xiaoqin, L., Liwen, W.: The inheritance dilemma of “Duntou Blue” in Heping county, Guangdong province. *J. Jiamusi Voc. College.* **27**(12), 49–50 (2017)
14. Sun, H.: Industry Interpretation of “Seeing People, Seeing Things, Seeing Life”. Beijing China Textile Intangible Cultural Heritage Development Report, Beijing (2019)
15. Jinrong, X.: Innovative research of Duntou Blue in modern home design and soft decoration. *J. Forest Prod. Ind.* **57**(11), 60–64 (2020)
16. Yu, A.: *Innovation, Integration and Practice of Cultural and Creative Industry*. Beijing United Publishing Company, Beijing (2020)
17. Guanzhong, L.: The designer coordinator must take into account the interests of all parties. *J. Des.* **32**(2), 67–68 (2019)