

Cultural Innovation Design — Taiwan Stain Color Scheme

Li Xin-Zhu

Abstract—As the climate change has made an enormous impact on the global environment in recent years, people begin to place a premium on the concept of environmental protection with many nongovernmental green groups working together surrounding the issue. Due to the interlocking effect of reducing productivity, the instability of oil price, and alternative energy, green ingredients, energy-saving materials and other green industries that the textile industry in Taiwan is confronted with, the approach to reviving the sunset industry may, through the lens of cultural creativity, has blue ocean business opportunities to offer. The study focuses on how to combine traditional stain and green stain so as to formulate visual and scientific standards and improve the age-old stereotype that dyed cloth belongs exclusively to traditional handicraft, which will open up the potential for the future application and originality of dyed cloth and may usher in new business opportunities for Taiwan dyed cloth. The study has two aims. On one hand, it will analyze the hi-tech green dyeing and natural dyeing in Taiwan textile industry and explore the two stains' properties of environmental protection, energy conservation, stain resistance, color fastness, and optical activity resistance. Through data-based visual research, a visual systematic structure will be set up based on the existing materials, and the stain color scheme will be developed for relevant industrial growth and designers to use. On the other hand, on the basis of the stain color scheme, compound media materials will be employed in wax printing craft to create cultural commodities that blends creativity and international competitiveness. The overall study result shall provide creators with a scientific research-based stain visual system, stain color scheme, thereby enhancing the quality and width of creation and open up the potential blue ocean business opportunities for cultural creation.

Index Terms—Green stain, craft recreation, cultural innovation design.

I. INTRODUCTION

According to the statistics of the Ministry of Economic Affairs of Taiwan in 2017, the output of domestic green industries in 2017 reached about 2,932 billion TWD and the number of relevant companies was 9,432. In addition, as one of the major sources of foreign exchange for the country at the early stage, the traditional textile industry in Taiwan played an extremely important role in the development of Taiwan's economy, creating Taiwan's economic miracle [1]. Such outstanding achievement was made because of the sufficient labor market and cheap labor cost that the domestic dyeing and finishing textile industry didn't possess in the past. However, Taiwan no longer have the advantage at present. Thus, its textile industry is transformed into one of the suppliers that develop and manufacture functional fabric in the world [2]. According to the second curve theory of management science, if the textile industry against the

backdrop of environmental protection desires to revive, the replacement of OEM and raw material production by cultural creativity and design may be a feasible alternative.

It is commonly thought that the manufacturing of conventional dyed fabric has long been DIY. The technology left by our ancestors in today's green development of the society may be complemented through the research by a relatively visible and standard visual reference material that combines natural stain and green stain for creative activities and relevant goods in the future. Currently, the Taiwan textile industry is underpinned by hi-tech green dyeing and natural dyeing. The former is a new type of stain that emphasizes health, environmental protection and technology and science, whereas the latter belongs to an ancient stain with focus on plant-based dyeing. The study will explore the two stains' properties of environmental protection, energy conservation, stain resistance, color fastness, and optical activity resistance, and carry out data-based analysis and research to formulate a stain color scheme. Then on the basis of the scheme, Taiwan stain is expected to combine with its design in order to create new cultural and creative commodities in Taiwan.

Study questions:

The questions of the study are as follows:

- 1) Discuss and conduct a survey of the operation of current distinctive dyed fabric industries.
- 2) Formulate a stain color scheme, the systematic visual materials of stain based on the properties of environmental protection, energy conservation, stain resistance, color fastness, and optical activity resistance of hi-tech green stain and natural stain in an attempt to provide reference for designers in the profession to select colors.
- 3) On the basis of stain color scheme, analyze users' satisfaction with the relevant goods that employ the design of dyed fabric so as to explore the new cultural and creative goods that are possible to be developed.

II. LITERATURE REVIEW

A. *The Current State of Textile and Garment Design*

Since the beginning of 1950s, the Taiwan textile industry has shifted from the reliance on importing raw materials at the early stage to obtaining them from the petrochemical industry in Taiwan. After decades of development, the industry has established a complete, vertical and integrated production system that includes artificial and natural fiber industry in the upper reaches, spinning, weaving and dyeing and finishing in the middle reaches, and ready-to-wear and accessories in the lower reaches, which has made Taiwan one of the suppliers of textile in the worldwide consumer market with the majority being functional textile [1]. According to the Directorate General of Budget, Accounting and Statistics,

Manuscript received July 1, 2020; revised November 12, 2020.

Li Xin-Zhu with the National Taipei University of Technology, Taiwan (e-mail: t108859011@ntut.org.tw).

doi: 10.18178/ijssh.2021.11.2.1033

Executive Yuan and the Statistics Department of Ministry of Economic Affairs, the number of Taiwan textile factories in 2018 reached about 4,317 with a total output of 3,859 billion TWD. The output of the textile industry was 3,712 billion TWD, accounting for 95.3% of that of the overall textile industry; the output of the garment industry reached 183 billion, covering 4.7% of that of the overall textile industry. Those statistics indicate that the textile industry has become one of the pillars of our economic growth [1].

At present, the clothing design industry is subsumed into the design brand fashion industry, the 11th item of industry in Taiwan cultural and creative industries (Taiwan Textile Federation, 2019). According to the statistics of the Financial Information Centre of the Ministry of Finance, the number of design brand fashion industries was 2,604 with a turnover of 543.03 billion TWD in 2018, which has been a growing trend since the beginning of 2009. The link between brands and merchants has helped create business opportunities for the clothing fashion industry and form the consumer culture specific to certain groups. Furthermore, people's pursuit of brands and their habit of following the fashion trend nowadays are attributable to the growth of current design brand fashion industries [3]. Fashion industries include ready-to-wear and clothing accessories manufacturing, cosmetics industry, furniture industry, the manufacture of leather and its products, timepiece industry and craft industry, of which ready-to-wear and clothing accessories manufacturing act as a pillar. As one of the most fast-changing industries, fashion design industry can be divided into two major categories, that is, clothing and accessories. The transformation of Taiwan textile industry has driven textile factories and merchants to develop their own brands, which can not only enhance industrial added value and one-stop production and sales supply chain, thus upgrading the overall textile industry, but push Taiwan textile industry and design brand fashion industry to improve the whole value chain [3]. In the textile industry that has been reduced to a sunset industry in Taiwan, new opportunities can be created by incorporating cultural creativity into innovation and design. Because the sales and manufacture of ready products can be higher than the supply of raw materials in added value, the increased value of cultural creativity may relatively improve the overall textile industry.

B. The History and Current Application of Stain

Human has already mastered the technology of dyeing since 3,000 BC. The craftsmen in ancient times could weave pieces of goods by using the natural fibre such as flax, cotton, wool and silk in a simple manner. The stuff used in fibre fabrics by human at the early stage is all natural material. Those natural and traditional materials are referred to altogether as natural dyes that can be divided into three categories, that is, mineral dye, animal dye and plant dye [4].

Currently, acidic dye, direct dye and reactive dye are most widely used in the ready-to-wear industry. Bright in color and complete in color spectrum, acidic dye can dissolve in water and it can be employed in many materials such as wool, silk, nylon, leather and paper, etc.. Because of the difference in chemical structure and dyeing condition, acidic dye can be divided into strong acidic dye, weak acidic dye and acidic media, etc.. Direct dye can dissolve in water immediately

without adding mordant. A small fraction of dye, however, needs pure salt to help fix color, which can enhance its fastness to washing. Some dye can directly used in cloth without adding dyeing auxiliary; such method is most frequently employed in all dyeing process. Though cheap in cost and complete in color spectrum, direct dye is low in color saturation and its washing fastness performed even worse than the material that use mordant. Therefore, media dyeing is still used in dyeing cloth directly to improve its fastness to light and washing [5].

Nowadays, dyes are not limited to acidic dye, direct dye and reactive dye. Disperse dye, vat dye, cationic dye, acrylic paint and fabric pigment, etc.. are also dyes. The study will point out the stains that are widely applied in the market before it carries out in-depth discussion in the future.

C. Current Situations about Industrial Application of Cloth Dyeing in Asia

With long and rich Chinese culture and the largest population of Chinese nation, especially famous for its longest and finest textile printing process craft, China is a multi-nation country and has made lots of unique cloth dyeing skills while communicating with other nations in Asia, thus spread them all around the world.

In recent years, the cultural industry is popular, driving the development of fashion textiles. Under this background, manufacturers make innovations in environmental protection, design, culture, life and fashion by improving technology and green technology, and apply this creativity of green technology to our life. Examples in Taiwan are dyeing goods from Tian Ran Gong Fang, designer Sophie-hong, Xinshipu Dyeing House and Indigo Dyeing House. They have something in common. First, natural plant dye are used to dye cloth; second, dye is done with large area gradient or blocks of colors; and third, there is no splice. Examples in Korea are clothing from Jin'enxi Persimmon Dyeing, natural persimmon dyeing cushion from Korean KAKIBABY and Korean Natural Dyeing Association. They have one thing in common, that is, natural plant persimmon dyeing technology is used for dyeing. In Jin'enxi Persimmon Dyeing Clothing, they combine wax printing while the goods from Kreaan Natural Dyeing Association are designed and made with multi-level tailor to become more popular for young people. In Japan, we take Xing Ran Yu Shou, Ran Zhi Li Er Ye Yuan and BLUE BLUE JAPAN as examples, and they all use local Katazome in most cases. Besides, goods from both Xing Ran Yu Shou and Ran Zhi Li Er Ye Yuan use Katazome to make colors and patterns while BLUE BLUE JAPAN makes popular clothes mainly using traditional blue dyeing and combining modern fashion trends. In China, examples are double-loop bag from Chinese NvGong Mill, Chu He Ting Xiang-Spring and Summer Clothing Fashion Designed By Chu Hong in 2016 and Batik made by Miao Nationality.

They all combine traditional technology and modern elements to make goods. Examples in Malaysia are Karyaneka and myBatik. They have common in the following aspects. First, they all use traditional wax printing to make clothing; second, they all use reactive dye; and third, they don't use splice.

Above are the dyed goods from Taiwan, Korea, Japan, China and Malaysia and they are country-specific. In Japan

and Korea, combine vegetation and come natural dyes are combined to make teaching and other cultural creative products. Although there are a lot of practical applications, dyes are not presented and recorded in normalized way, and therefore, there is still space to be normalized in practical teaching and commercial use. The dyed goods from above five countries rarely use mix-material and multi-pattern splice, and only BLUE BLUE JAPAN has combined denim with embroidery, spreading blue dyeing goods to young people. We can learn some characters and directions from BLUE BLUE JAPAN if we want to make traditional dyeing popular with young people.

III. RESEARCH METHODS AND DESIGN

At first, the study learns about stain and cloth dyeing industries, and then explores hi-tech green stain and natural stain to formulate systematic visual materials of stains that possess the properties of environmental protection, energy conservation, stain resistance, color fastness, and optical activity resistance. During the research process, all concerned details and content are recorded faithfully and minutely in color charts to produce the stain color scheme. Different from the color scheme in digital age and one that is presented by ordinary color atlas, the scheme is capable of approximating the practical application thanks to its exhaustive records of reproduction of vision and content. On the basis of the color scheme and taking the objectives of the study into account, the author blazes new trails with techniques to produce the potential cultural and creative commodities that blends environmental protection, design, culture, and the fashion of daily life. At last, a test of the satisfaction of designers and consumers is conducted to reflect on the overall results and application of the study.

It is based on literature review and for actual apparel industry, it uses interview, dye color scheme and dyed commodities. This methodology is divided into three parts: documentary theory collection and discussion, methodology making and case design, and research design analysis.

A. Documentary Theory Collection and Discussion

Based on literature review and market research, we know the development and process of dyeing from ancient times to now as well as the development of Asian dyeing market. Besides, we collect relevant materials to be analyzed as a basis of designing dyed commodities.

B. Research Process

In the first stage, the author intends to formulate the stain color scheme, and analyze the systematic visual materials on the properties of environmental protection, energy conservation, stain resistance, color fastness and optical activity resistance of the stains in cotton, flax, and silk fabrics shall be carried out. The questionnaires for 500 people aged from 18 to 25 years old shall be made. The respondents will take the following tests: the classification of stains, the single color test, the color mixture test, the categories of cloth, and the four-level test. Then set up the visual system of cloth dyeing, then use the values of MVs and SDs or ANOVA to calculate the result of the research on cloth dyeing vision and analyze the degree of satisfaction. Study the research result, that is, the visual system of stains to provide the foundation for stain color scheme and try to formulate the scheme.

In the second stage, the test of consumers' satisfaction will be carried out with two steps in the form of questionnaires. During the first step, six designers will make dyed cloth according to their own experience and the color scheme respectively, and use their dyed cloth to create six pairs of cultural creative commodities. The second step involves the test of consumers' satisfaction. The questionnaires for 200 people about the commodities made by designers will be conducted to examine consumers' satisfaction. And the values of MVs and SDs or ANOVA will be analyzed to validate the practicability of the stain color scheme.

C. Research Design Analysis

Based on dyed commodities, we will discuss how to adjust them to meet international market demands and promote Taiwanese culture, and spread Taiwanese cultural characteristics abroad and broaden its value.

Thus dye color scheme is formulated after above three processes to make this industry standardized. And, commodities can be changed based on consumers' view on color, thus balancing producers and consumers. Therefore, we should first understand the dyeing technology and then create cultural creative commodities to show Taiwan's uniqueness.

IV. DYEING VISION SYSTEM CONTENT DESIGN AND FORMULATING DYE COLOR SCHEME

A. Dyeing Vision System Content Design

The questionnaire for 100 people between 18 years old and 25 years old about the effect of cotton, linen and silk respectively dyed with natural dye, direct dye and reactive dye is conducted. Consumers are divided into different groups based on dye type, single color, mixed color and clothing type and then dyeing vision system is designed. And the values of MVs and SDs or ANOVA will be analyzed to check consumers' satisfaction with the dyeing vision research result. Based on this dyeing vision system, dye color scheme is formulated.

B. Formulating Dye Color Scheme

Products designed with dyeing vision system will be dyed and we formulate the dye color scheme in a normalized way. And the temperature, time and dosing will be recorded and based on it, designers can select colors.

V. DYED COMMODITIES DESIGN

Dyed apparel product is designed from three aspects: pattern, exterior and process. Designers present non-figurative intangible cultural assets in the form of figurative creativity. Therefore, such costume design can add cultural added value to practical products.

A. Description of Dyed Commodities Design Concept

1) Pattern

Apparel pattern is designed in the form of mode of composition in Chinese ink painting and its fabric flower is mainly composed of Taiwanese most representative plants, such as orchid, plum blossom, Chrysanthemum and *Phyllostachys bambusoides*, and its most original birds, such as black-browed barbet, mikado pheasant, black long-tailed

lantra and black bird, as is shown in the table below.


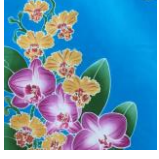

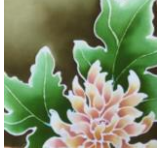
2) Exterior

Stereo trim is used to make apparel, mainly fashion dress. Designers choose cotton, as it touches nice and air permeable.

3) Process

There are two processes: traditional wax printing and embroidery of Shenming Apparel. The fabric flower is mainly handmade and wax printed, and then combined into a pattern with the help of embroidery of Shenming Apparel, thus making it present traditional process.

TABLE I. PATTERN INSPIRATION (FOR THIS RESEARCH)

Items	Pattern	Inspiration
Plum blossom		Plum blossom is our national flower. It is dark but neither colorful nor light, and honored as the soul of our nation. It is shown in multi-dimension way, highlighting its uniqueness.
Orchid		Orchid is always regarded as a symbol of nobleness and elegance in Chinese culture, making it a best-selling flower and first exported flower together with phalaenopsis and Tianxinlan. These two types are wax printed in traditional process.
Bamboo		Bamboo means integrity, modesty and elegance in Chinese culture. Bamboo leaves are painted in clothing supplemented by bamboo pole.
Chrysanthemum		Chrysanthemum blossoms in autumn, different from flowers in Spring, leaving an impression of escaping competition to people. Chrysanthemum is also used to describe people's good behavior and incorruptness and be loved by many literati.

VI. TEST OF CONSUMERS' SATISFACTION

The questionnaires for 200 people about the commodities made by designers will be conducted to examine consumers' satisfaction. And the values of MVs and SDs or ANOVA will be analyzed to validate the practicability of the dye color scheme. Designers can get consumers' satisfaction from feedback and based on consumers' habits and reasons for improvement, discuss it.

VII. DESIRED RESULTS

Using the stain color scheme to create the possible new cultural and creative garments or other relevant commodities should live up to the assumption of the study that the stain color scheme which combines conventional stain and modern stain to deliver a comprehensive visual system can provide relevant industries or creators with a standardized way of

creation and visual effects so as to open up the potential for future blue ocean business opportunities of cultural creation. The study is expected to achieve the following results:

- 1) Formulate a stain color scheme, the systematic visual materials of stain based on the properties of environmental protection, energy conservation, stain resistance, color fastness, and optical activity resistance of hi-tech green stain and natural stain in order to provide standardized application for relevant industries and address the problem of traditional DIY cloth dyeing. In the process of creation and production, designers can be provided with scientific and systematic materials which is relatively close to practical creation.
- 2) The development of the manufacture and application of cultural and creative stains by employing the stain color scheme shall create new possible cultural and creative commodities.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Li, Xin-Zhu conducted the research, analyzed the data and wrote the paper.

ACKNOWLEDGMENT

The authors would like to thank all colleagues and students who contributed to this study. We are grateful our Research Assistant, Michelle, who assisted with recording and transcription.

We thank the editor and series editor for constructive criticisms of an earlier version of this chapter.

REFERENCES

- [1] Taiwan textile federation. (2019). *Taiwan Textile Industry Overview*. [Online] Available: https://www.textiles.org.tw/TTF/main/content/ContentDesc.aspx?menu_id=95
- [2] Y. Zhang and X. J. Wang, *Hand Dyeing Technique*, China, Location: Donghua University, 2015.
- [3] L. C. Cheng, *Taiwan Cultural and Creative Industries Annual Report*, Taiwan, Location: Ministry of Culture, 2020.
- [4] X. M. Huang, "A study on the possibility of applying natural mordants to plant dyeing," Unpublished Master's thesis, Shu-Te University, 2013.
- [5] W. F. Hsu, "The study of competitiveness of Taiwan textile industry under economic globalization," Unpublished Master's thesis, Soochow University, 2015.

Copyright © 2021 by the authors. 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 ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).



Li Xin-Zhu was born in Taiwan on November 24, 1994. He is a Ph.D. student at College of Design, National Taipei University of Technology.

He received his master degree in management from Department of Fashion Design and Management, National Pingtung University of Science and Technology.

His research interests include cultural innovation design, teaching of creative thinking, Learning outcome, creative course of multi-material& art education and etc.