THE STUDY OF PACKAGING DESIGN SYSTEM FOR COLOR-BLIND CONSUMERS

BY

DONG LIANG

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DONG LIANG

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Assoc. Prof. Pakorn Prohmvitak
Examination Committee Chairperson

Prof. Eakachat Joneurairatana, Ph.D.
Member

Assoc. Prof. Pisprapai Sarasalin
Member and Advisor

Approved by Graduate School

(Prof. Suejit Pechprasarn, Ph.D.)
Dean of Graduate School
August 30, 2024

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Dong Liang
Researcher

6406870 : Dong Liang

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Abstract

This research investigates the design of packaging systems tailored for color-blind consumers, a demographic often overlooked by many packaged goods brands. With color blindness affecting individuals' ability to perform simple tasks, such as selecting food, driving, and choosing clothing, the research underscores the importance of inclusive packaging design. The objectives were 1) to design packaging colors, fonts, and materials that accommodate the visual requirements of color-blind individuals; 2) to enhance the product selection experience for color-blind consumers, preventing mistakes in product identification and selection due to visual impairments. Utilizing a design methodology focused on color contrast, legibility, and material sustainability, the study developed packaging solutions that are both engaging and accessible. The results from user testing indicate improved ease of product identification and increased enjoyment in package interaction for color-blind consumers. The packaging, made entirely from paper, combines low manufacturing costs with environmental benefits, offering a sustainable and inclusive design solution. This study contributes to the broader discourse on inclusive design, advocating for the consideration of diverse visual needs in packaging design. Future research could explore the application of these design principles to digital interfaces, broadening the scope of accessibility for color-blind individuals in various consumer contexts.

(Total 48 pages)

Keywords：Color Blindness, Color Blind Packaging, Color Contrast, Packaging Methods, Packaging Design

Student's Signature ..... Thesis Advisor's Signature .....

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Chapter 1

Introduction

1.1 Background

Colour blindness or colour vision deficiency (CVD) is a reduced ability to see colour or differences in colour It can interfere with tasks such as picking ripe fruit, choosing clothes and reading traffic lights. Colour blindness can make some schoolwork difficult (Figure 1.1). However, the problems are usually small and people who are colour blind will develop adaptations and coping mechanisms automatically. People with complete colour blindness (colour blindness) are uncomfortable in bright environments and may experience a loss of vision. The most common causes of colour blindness are genetic defects or functional variations in one or more of the three classes of cone cells in the retina that mediate colour vision. The most common form is caused by a genetic disorder called congenital red-green colour blindness. Males are more likely to be colour blind than females because the gene that causes the most common form of colour blindness is located on the X chromosome. Non-colour-blind women also carry the gene for colour blindness, which they can pass on to their children. Colour blindness can also be caused by physical or chemical damage to the eye, optic nerve or part of the brain.

Figure 1.1 Objects for color blindness

Source:Researcher

Colour blindness makes suggestive colour tasks associated with food selection and preparation difficult. For example: Selecting bait based on ripeness may be difficult. The change from green to yellow in bananas is particularly difficult to recognise. In today's commodity packaging in order to package to appeal to consumers, this has resulted in many products with a rich variety of different packaging colours but with very close packaging colour schemes (Figure 1.2). This can give colour-blind consumers the opportunity to make purchases and use items that may be harmful and incorrect due to the colour, especially for children who are not yet literate and who will only be able to select the food they want to eat by using graphics and colours. For example, child fatality reviews reported 731 poisoning-related deaths to the National Fatality Review Case Reporting System (NFRS). More than two-fifths (42.1 per cent, 308 of 731) occurred in infants under the age of 1 year and the majority of deaths (65.1 per cent, 444 of 682) occurred in children's homes. One in six children (97 of 581) had an open CPS case at the time of death. Nearly one-third (32.2%, 203 of 631 children) were in the custody of an individual other than their biological parents. So how do we reduce harm and errors by using packaging.

Figure 1.2 Existing product packaging
Source:Researcher

Surveys estimate that about 8 per cent of males and 0.5 per cent of females (Figure 1.3) are born colour blind, and according to Colorblind, 99 per cent of people with colour blindness have red-green colour blindness. The number of people with monochromatic colour blindness (total colour blindness) is very small, about 1 in

33,000. Of these, 0.05 per cent are colour blind, 4.63 per cent are red-green blind and 1.07 per cent are blue-yellow blind. Red-green colour blindness makes up the majority of the colour blind population. People with colour blindness experience many difficulties in life that are unknown to sighted people. Problems can arise with even the simplest activities, including choosing and preparing food, gardening, exercising, driving a car, and choosing what to wear. Many packaged goods brands do not seem to take colour blindness into account because people who are colour blind often have difficulty distinguishing important information. Colour blind people often do not use colours when deciding what products to buy as many colours may look similar to them. Colour-blind people can also get into trouble because they are unable to properly understand information in the workplace or fail to notice, which can lead to pain and injury.

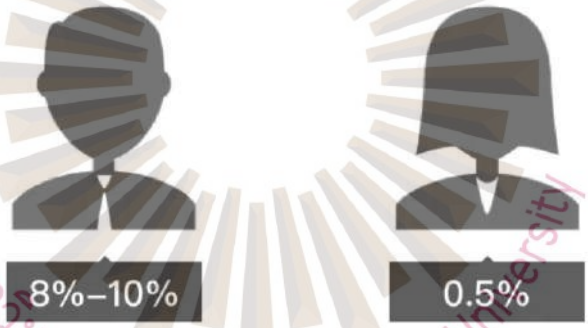

Figure 1.3 Image: Data
Source:Researcher

1.2 Research Objectives

The purpose of this paper is to summarize the existing product packaging for colorblind customers in the market, summarize the advantages and disadvantages of the existing packaging, delve deeper, summarize the advantages, and use the packaging for our own packaging. Add our own elements. Help colorblind people to better identify items through packaging.

1.2.1 Enhance market value

Through the product packaging will be the combination of artistic creativity and packaging can not only enhance the sense of value of the goods, but also help color-blind consumer groups on the use of the product sense of satisfaction. Enhance the packaging grade, enhance the sense of social value of the product. Therefore, the color art of packaging to design to help color-blind consumers of creative packaging design to obtain the real social value and sense of social responsibility.

1.2.2 Convey core concepts

Colorblind people are often overlooked in life, and this project aims to help colorblind people to easily identify colorblind people in shopping and food, and to reduce injuries caused by accidental eating. Through the packaging design will have the basic product dissemination, and the main purpose of information dissemination is to show the basic information content of the product, as well as in a wider range to reduce the accidental consumption of color blind consumers are harmed. Good packaging design is also for the product and consumer better communication.

1.2.3 The attraction of visual effects

Color blind people packaging design has very important requirements for packaging visual effect and packaging shape design. Commodity packaging has a communication value to consumers at first glance. Consumers in shopping malls, supermarkets, first of all from the product packaging to produce a first impression of the product, so in the visual effect of the packaging, color matching, font size selection, etc., to increase the visual communication effect, so that the product on the shelves at the first time to tell consumers the basic information of the product.

1.2.4 Packaging product image identity

First of all, the visual graphics of the packaging should be recognized by consumers as a prerequisite, so that every consumer through the image on the packaging should be recognized, rather than a coarse filtered fuzzy image. Let the consumer produce on the goods error, through the image on the packaging to consumers for a better understanding. Understand the basic information of the product, reduce the harm to consumers due to the wrong understanding of the product.

1.2.5 Protect the product

Potato chips product packaging design of for color blind consumers to ensure that the product is realized under the convenience of graphic identification. And also to protect the product contents, so that the product from external impact, to prevent the product due to light, moisture, collision and other reasons leading to damage or deterioration. Product packaging structure, packaging materials and packaging protection function has a direct relationship. In addition, the appearance of the packaging conspicuous, beautiful packaging design products from the shelves of the goods easily recognized, reduce the product information misinterpretation, identification errors.

1.3 Snacks product packaging design issues

Snacks as a popular food, its a habit of many consumers to eat snacks when watching TV, boredom, so in the snack packaging design, you need to know more about consumer preferences. Understanding consumer preferences, that is, to achieve through packaging design to meet the needs of the product audience.

Snack packaging design belongs to the food packaging design, in line with the national norms for food packaging based on, we should fully demonstrate the delicious snack products, so that consumers have a strong sense of appetite for snacks.

Snack packaging design should also be presented on the product itself, such as potato chips flavor, fried properties or non-fried properties, potato chips or yam potato chips, the transmission of this information, which allows consumers to quickly go to understand the main advantages of this product, to help consumers better carry out the selection of the product.

Chapter 2

Research and analysis of the types of color blindness

2.1 A study of the types of color blindness

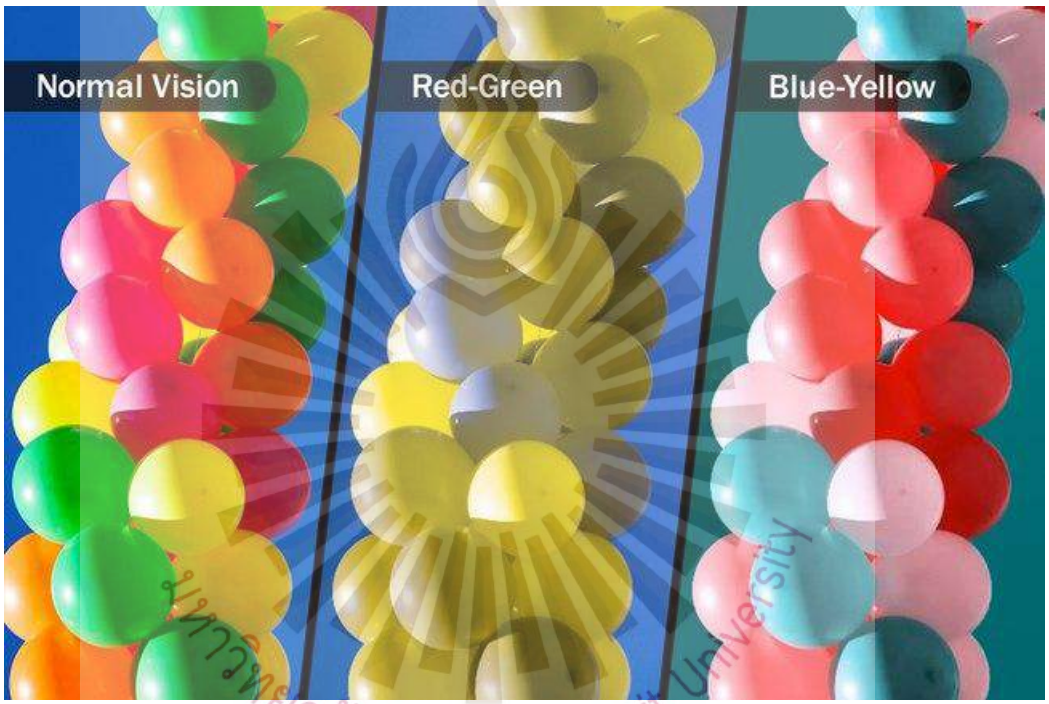

Figure 2.1 A study of the types of color blindness

Source:Researcher

"Color blindness" is an impairment of color vision due to genetic predisposition or disease, and is biomedically defined as an abnormally developed or damaged retinal cone cell, which absorbs a spectrum of light that is shifted or mutated in neuro transmission, and which is unable to efficiently discriminate some or all of the colors due to the inability of the photoreceptor cone cell to discriminate some or all of the colors (Figure. 2.1). Red-green color blindness is the most common type of congenital color blindness, and there are also rare types of blue-yellow color blindness and total color blindness, etc. With the progress of biomedical research, international research

On human eye color blindness has been conducted. With the progress of biomedical research, the functional difference of color vision of human eyes is understood as "diversity of color vision" from a scientific point of view. Human ordinary vision can recognize about 2,000 colors under medium illumination, and the visual senses are rich in color sensitivity and can obtain various visual information from the colorful world. And color blindness is not without color perception, although the colors in their eyes are not as rich as those of ordinary people, but research scholars from the University of Cambridge and Newcastle University in the United Kingdom have found that many color-blind people are able to observe the subtle differences between different yellows and browns that cannot be identified by ordinary color vision, as well as the characteristics of color-blind people with better night vision . Therefore, the different visual feelings brought by the diversity of color vision should be considered in packaging visual design. Since color expression and color perception need to be coordinated in both directions, the color seen by the human eye is the result of the light wave reflected from the object in the visual field and the retinal cells at the bottom of the eye perceiving the light wave and transferring it to the brain for processing. Therefore, with the existence of color diversity, in the process of packaging visual communication, the visual information mediated by color has a variety of faces to present the possibility of visual language communication results are not unique.

2.2 Difficulties encountered in life with red-green color blindness

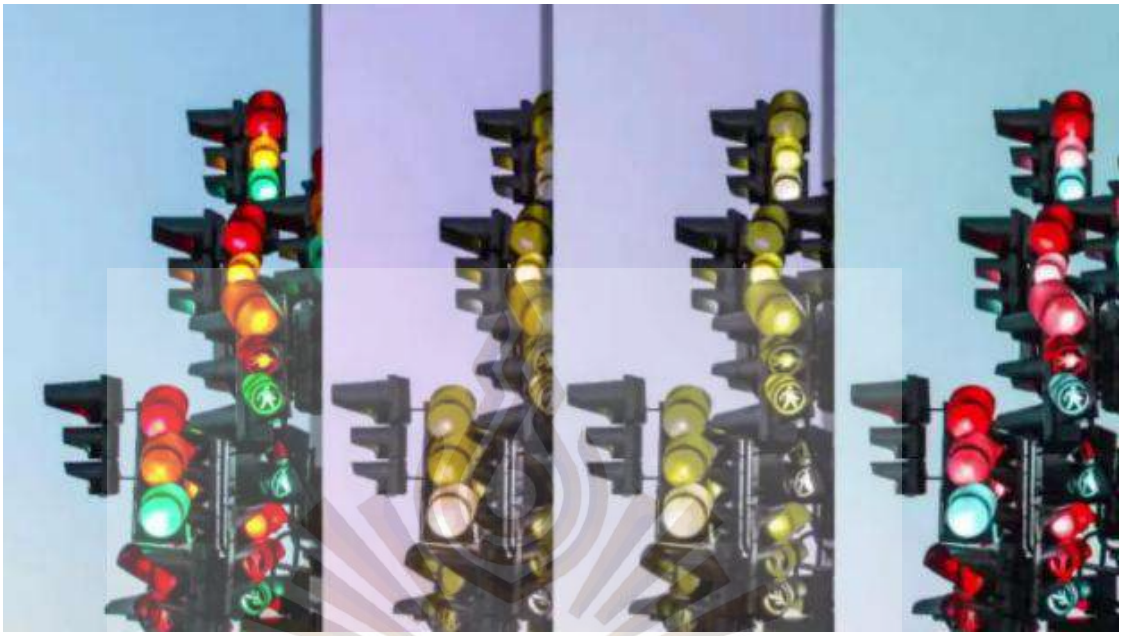

Figure 2.2 Difficulties encountered in life with red-green color blindness
Source:Researcher

In reality, color blindness is not uncommon. While acquired color blindness caused by disease is usually accompanied by a loss of vision, the most common congenital color blindness is usually the same as that of the general population, and some color blind people are even unaware of the fact that they have never had a normal experience of color vision. There is no effective treatment for congenital color blindness, which is characterized by green and red color blindness, and at least red color weakness. In daily life, although color blind people can judge the natural colors that always exist in nature according to their experience, the artificial colors of man-made things are free and changeable, such as the artificial colors of reading and reading newspapers, shopping, traffic, building appearance and so on, which become the biggest source of inconvenience in the life of the color blind people (as shown in Figure. 2.2). Commercial packaging is frequently contacted in people's daily life, but so far it still focuses on the color experience of the general audience, and seldom considers the existence of color differences, which is largely due to the lack of

relevant systematic theoretical guidance in the field of visual design so far. Although in recent years, designers can use the color detection function of computer software to check the color, but there is no corresponding color selection function to provide reference. Modern society has higher requirements for humanized design concepts, and the core competitiveness of commodity supply and demand is largely based on humanistic care and respect for human beings. Enhancing the visual experience of various types of users through universal color schemes for packaging is undoubtedly an important way to optimize the effective dissemination of packaging visual information.

Chapter 3

Packaging material research and case studies

Food packaging materials commonly used in paper, bamboo, wood, metal cans, enamel cans, ceramic cans, plastic packaging, rubber material, natural fibers, chemical fibers, glass and other products can be in direct contact with food.

3.1 Environmental problems caused by existing food packaging

Food packaging bags on environmental issues. Due to the rapid development of food packaging bags, environmental issues caused by product packaging is increasingly causing human concern. Due to the use of food packaging materials, a large number of plastic materials, due to packaging materials difficult to degrade the existence of a long time to pollute the natural environment or damage to human health, and thus packaging environmental protection to become recyclable marketing compelling to become an important element. The main problems of product packaging on the environment are the following three aspects.

Environmental problems with respect to food packaging container materials. For example, lead soldering cans for food packaging may cause lead contamination of food; the spray propellant used in spray containers will destroy the ozone layer of the atmosphere; the lids of containers for chemicals (hazardous materials, detergents, pesticides, etc.) are not secured, which can easily lead to accidental drinking by children; and the use of oversized containers or unnecessary multi-layered over-packaging in order to make the products more likely to attract the attention of the consumers will result in wastage of materials and increase in consumer spending. This results in wastage of materials and increase in consumer expenditure.

Figure 3.1 Environment
Source:Researcher

Waste from food packaging has increased and seriously polluted the environment (Figure 3.1). As a result of the large number of packaging materials used to increase waste. According to statistics, the Organization for Economic Cooperation and Development countries annually generated packaging waste accounted for almost all municipal solid waste 1 / 3. The increase in packaging waste, making its disposal a major problem. In particular, some packaging materials that are not easy to deal with make the environment seriously polluted. For example, chemical synthetic materials will pollute the atmosphere when they are incinerated as waste, and packaging made of polystyrene will not decompose even after years of being buried in the ground, making it the famous "white pollution" because of its difficulty in disposal.

Packaging materials consume a lot of resources. As the use of packaging materials consumes a large amount of resources, even including some scarce resources. According to statistics, the energy consumed in the production and use of packaging accounts for about 5 per cent of all energy consumption in developed countries. The use of an ever-increasing number of packaging materials consumes large amounts of metal, wood and other resources of the earth.

3.2 Analysis of Existing packaging

Figure 3.2 Analysis of Existing packaging

Source:Researcher

At present, all the packages of potato chips on the market basically have the above two kinds (Figure. 2.2), using paper and plastic packages, restarting the plastic packages are very easy to break and take up space, and the plastic packages can't be reused and have a long time of degradation, which cause great pollution to the environment after being discarded.

As shown in the figure above, the existing potato chips packaging for color blind consumers will be very difficult to separate the potato chips taste, and the illustration in the package does not reflect the taste of the product. Most of the packaging is based on potato as the basic design without integrating the flavor elements. This makes it easy for colorblind consumers to misidentify the product through the packaging alone. This leads to consumer harm due to misinformation.

3.3 Excellent cultural product packaging case

Figure 3.3 Excellent cultural product packaging case

Source:Researcher

Banana contains all the vitamins and minerals, so it is easy to take in various nutrients from it. Bananas are rich in dietary fiber, which has a good laxative effect, together with the pectin content, which fully lubricates the intestinal tract and accelerates the passage of feces, and the banana peel is yellow in color when it is ripe. Banana has become one of the favorite fruits of human beings banana milk has also become one of the favorite products of consumers.

The product is designed by the Japanese designer Naoto Fukasawa milk carton (banana flavor), in the packaging on the highlight to the color and shape of the banana to design so that consumers from the packaging can understand the basic content of the packaged product (Figure 3.3). Know what flavor the product is. The large banana shape allows people to immediately know that it is banana milk.

Figure 3.4 Excellent cultural product packaging case

Source:Researcher

Image design on packaging can use vector graphics (Figure 3.4), vector graphics is the use of straight lines and curves to depict graphics, the composition of the use of graphic elements are a number of points, lines, rectangles, polygons, circles and arcs, etc., with the characteristics of the editing will not appear distortion. The advantage of vector graphics, such as straight lines or polygons, is that they will not be distorted whether zoomed in, zoomed out or rotated; the disadvantage of vector graphics is that it is difficult to show realistic image effects with rich color levels.

Vector graphics with its clear outlines, bright colors, especially can be scaled arbitrarily and maintain the visual quality of the image and other characteristics by many designers. Vector graphics are generated through the combination of multiple objects.

As shown in the figure, the graphic image of chocolate on the package is based on the original chocolate object, the cocoa bean, which is vectorially depicted so that the consumer understands the taste and the basic content of the product. The use of different flavors of the real image for vector graphics, vector graphics to reduce the rigidity of the real picture, can give designers have the creative space to bring interesting packaging images.

Figure 3.5 Excellent cultural product packaging case
Source:Researcher

Candy is a snack food with sugar as the main ingredient. It is very popular in every country, and as people's needs evolve, manufacturers add different foods to the candy to blend with the candy such as nuts, fruits, alcohol, and so on. At the same time it can be harmful to some allergic consumers. Therefore, the designer has to consider the allergic consumers, especially for those who are color blind, it is difficult to distinguish the type of candies only from the image of the package.

This package is the outer package of candy (Figure 3.5), this package does not have a lot of paintings about the flavor of the candy but uses the text to express the product information, however, this kind of package has a limitation on the age of colorblind consumers, because in the younger consumers they can't recognize the text effectively and can't make the correct judgment, which leads to the harm of the consumers.

Figure 3.6 Excellent cultural product packaging case

Source:Researcher

NOMA colored pencils are colored pencil packaging designed for colorblind consumers. Each pencil package carries a symbol coding system to represent each color(Figure3.6).

Figure 3.7 Excellent cultural product packaging case

Source:Researcher

The overall graphic focuses on graphic simplicity, ease of recognition, fluidity, and a better experience for the user. The unique packaging structure allows the user to separate colored pencils into dark and light colors (Figure 2.5). The outer packaging can also be a pencil holder and is flat-packed, drawing inspiration from the flat-pack design and how the box connection works to create two prototypes and achieve multi-functionality.

The brand colors themselves are based on Ishihara's color blindness test panels. Symbols are used as a system to represent colors. Lighter shades will have line symbols while darker shades will have solid fill symbols.

A neutral font was used on the packaging so that it would not be embellished and the focus would be on the product itself. A light gray color was chosen for the wrapping paper as it provides a sandy texture that helps to leave a sensory impression on the user providing contact with the packaging.

Chapter 4

A preliminary attempt at the project

4.1 Design Idea

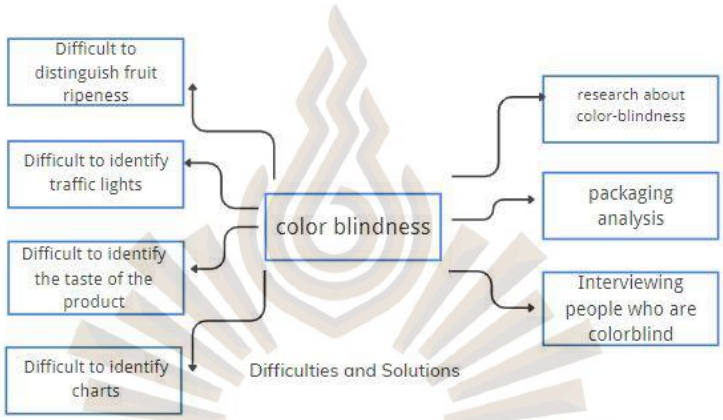

Figure 4.1 Design Idea

Source:Researcher

I will be working through the following three aspects, I will divide the design ideas into three parts, (Figure 4.1) and try new packaging ideas through different combinations.

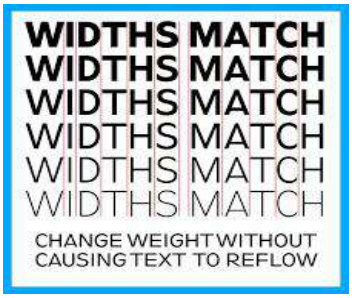

Figure 4.2 Text Information

Source:Researcher

4.1.1 Text Information Design

Consumers generally choose products through visual access to the description information on the packaging, however, the product packaging information is detailed and complex, which contradicts the visual characteristics of color blindness. Amblyopes have lower visual perceptual ability, text information should try to use simple and large fonts, do not use too fancy fonts to increase the difficulty of reading, and the position of the arrangement should be in line with the consumer's visual flow (Figure 4.2).

Figure 4.3 Packaging Color

Source:Researcher

4.1.2 Packaging Color Design

Color is ultimately the most sensitive factor for color-blind people in packaging design. From the perspective of humanized package design, package color design should be in line with the cognitive ability of all people, not only to consider that able-

bodied people have sufficient color saturation and attraction when viewing, but also to consider the requirements of the color effect in the eyes of color-blind people. Since the human eye reacts less when it perceives the hue change of colors, but reacts strongly when it perceives the brightness change of colors, the color design research for the color-blind people should fully consider the color application of visual perception, so that the color of each visual information has enough brightness change, and the greater the brightness contrast, the easier it is for the color-blind people to recognize the corresponding information (Figure 4.3).

4.1.3 Packaging design

Packaging design is not only to enter the plane of the design should also be the shape of the package design, in the design of the product packaging should pay attention to the touch is not easy to touch down, easy to grip when picking up and other issues to meet the characteristics of the stability of the same time, the packaging materials should also consider the safety of the choice to make the packaging more humane needs, but also to let them feel more social care and produce optimistic, positive, grateful and healthy mentality.

4.2 How to help colorblind consumers identify products by their packaging

4.2.1 Through packaging, color-blind people can better select products.

4.2.2 Use the complementary nature of color to increase the contrast of packaging colors and reduce the selection errors of color-blind people.

4.2.3 Reduce bad color combinations

4.2.4 Enhance the contrast between patterns and textures.

4.3 Attempt 1

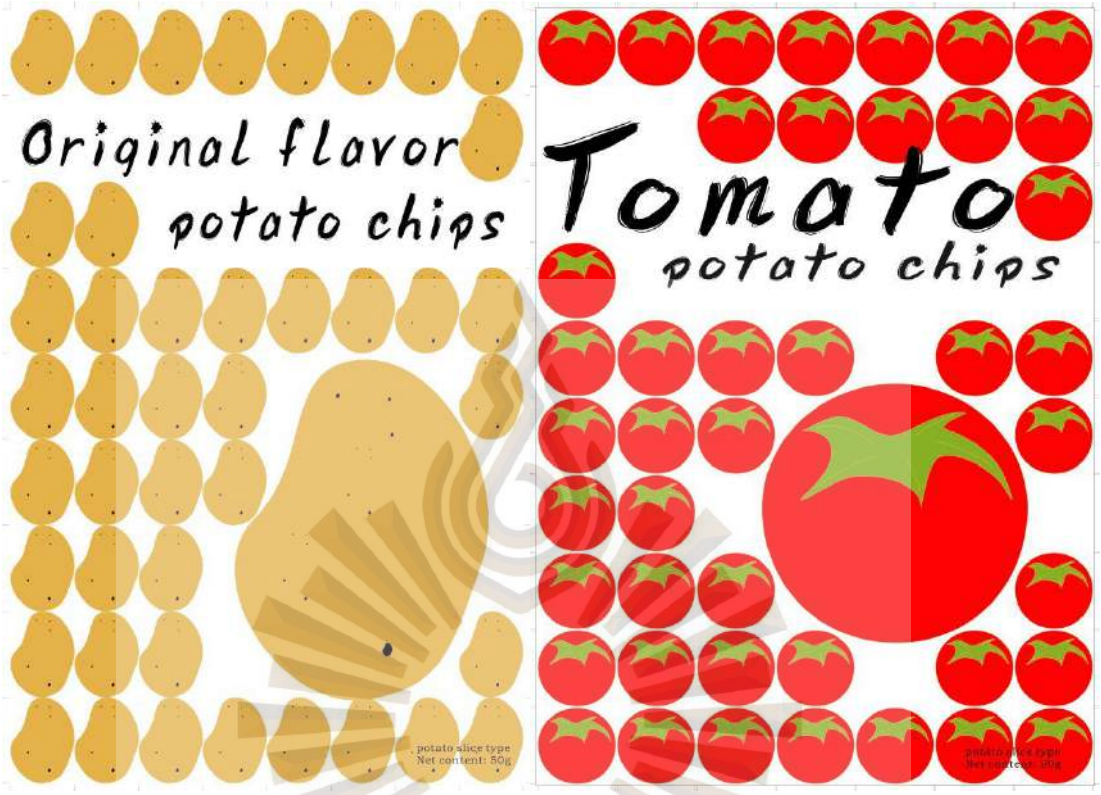

Figure 4.4 Attempt 1

For the first time (Figure 4.4) I chose the product itself as a graphic and drew it as a vector drawing through the graphic to make it easier for consumers to understand the taste of the product and to reduce the colorblind consumers to accidentally eat due to the color of the package triggering consumer harm. Utilize the repetitive composition of the graphic to make the screen layout full.

Attempt 1 failed because the screen layout is too dense and easy to make consumers aesthetically fatigued, the packaging lacks interaction with consumers is not interesting enough, the screen layout does not apply to all flavors only the tomato flavor can make the packaging effective to help colorblind consumers easy to distinguish.

4.4 Attempt 2

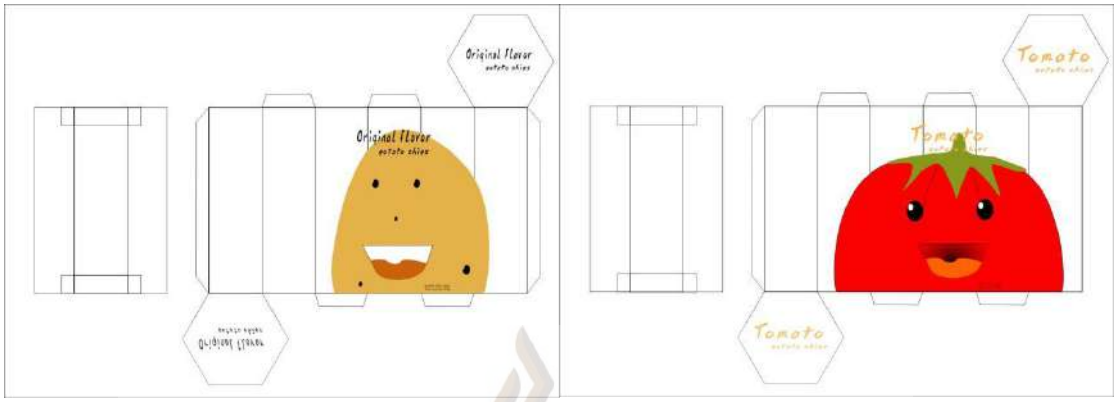

Figure 4.5 Attempt 2

After changing the first design (Figure 4.5) choose the product itself as the product as the design graphics, through the graphic image on the package can know the product taste, reduce color blind consumers due to the color of the package leads to misuse of food triggered by consumer injury. Reducing the number of graphics on the package compared to the first package reduces the misleading of colorblind consumers due to the many colors of the graphics and makes the layout clean and simple.

My choice to use eco-friendly paper and minimize the use of eco-friendly adhesives in packaging has several vivid and concrete benefits:

1) Reduced Resource Consumption: Choosing environmentally friendly paper uses more sustainable and renewable resources. This helps to reduce the demand for available such as wood, contributing to forest conservation and ecological balance.

2) Less energy consumption: Eco-friendly paper usually requires less energy to produce than regular paper production, thus reducing the environmental impact.

3) Reduced waste: The use of paper packaging reduces plastic packaging, and paper packaging favors biodegradable materials. This helps to reduce the amount of solid waste, lessen the burden on the environment and reduce pressure on natural cycles.

4) Recyclability: Reducing the use or not using plastic packaging improves the recyclability of paper. This promotes the recycling of paper packaging and reduces resource waste.

5) Health and safety: Reduced chemical adhesives minimize potential risks to product and user health. This is especially important for product-related packaging that is directly related to the health of the product and the consumer.

6) Green image: Packaging design based on environmental protection demonstrates a company's environmental responsibility and values, and establishes a positive brand image. In today's consumer market, where environmental awareness is growing, this image fosters consumer goodwill and trust.

7) Creative Inspiration: Reducing the use of adhesives can inspire creativity in packaging designers. By using only the necessary eco-friendly adhesives, designers can explore new folding and packaging techniques that give products a unique look and experience.

To summarize, choosing recyclable paper and reducing the use of adhesives in packaging can reduce resource and energy consumption and waste, enhance recyclability, protect consumer health, establish a green image, and create cartoon images to increase popularity with younger consumers. Reduce the harm to consumers caused by misuse of packaging.

Chapter 5

Final project

5.1 Packaging structure dimensions

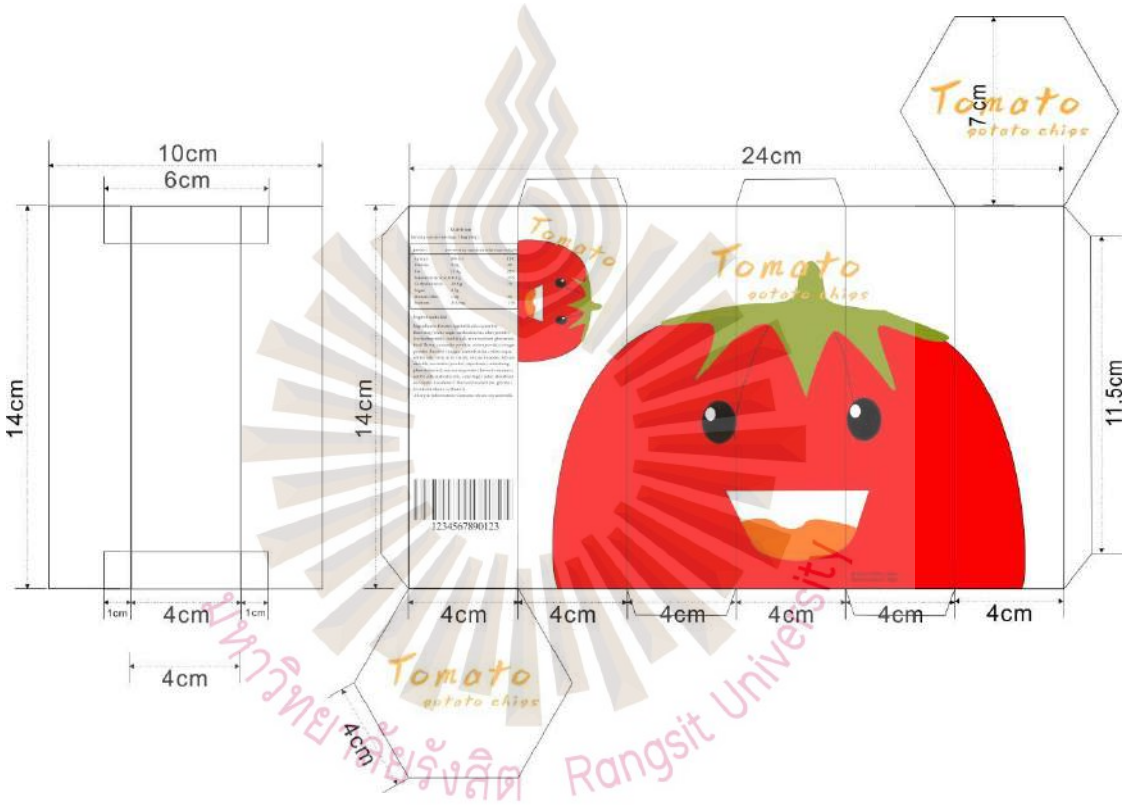

Figure 5.1 Packaging structure dimensions

The final package design uses cartoon images of different flavors as the theme, and the package only has cartoon images of the product flavors, in order to increase the interaction between the package and the consumer. The cartoon images on the package were designed to give better awareness to the low collar children (Figure 5.1). The size of the package is designed to be 14cm in height, so that it will not affect the space in the bag when placed in the bag of an adult consumer.

The package is designed as a six-pronged column package, because such a package is conducive to the consumer's hands to take, with a better sense of grip to increase the friction between the hand and the package, and in the inner package is designed to have a pull-out box to facilitate the consumer to take the product, convenient for consumers to take the product inside the package, and the pull-out box helps to place the product neatly

5.2 Packaging model

Figure 5.2 Packaging model

When the package is not opened, the picture shows an anthropomorphic image with an open mouth, which looks like an image about to open its mouth to eat (Figure 5.5). The simple design of the packaging prevents color-blind consumers from picking up or misidentifying the product due to their own visual factors when purchasing and taking it. The box can be opened in two ways. One is to pull out the inner packaging from the top of the package. The other is to open it from the mouth, creating an interaction with consumers when opening the package to increase interest. The entire packaging box is made of paper material, which is low in manufacturing cost, easy to transport, and can be quickly degraded and harmless to the environment when discarded.

The packaging design of this project is all made of paper materials, which can be quickly degraded after being discarded, fully demonstrating the characteristics of protecting the environment. The overall shape of the box is mainly a hexagonal prism, which gives the box strong support, increases safety during transportation, and prevents crushing and damage. The opening design of the packaging increases the interesting and beautiful memories that the packaging brings to customers. Increase consumers repurchase rate.

5.3 Conclusion and prospect

Conclusion: My packaging design is through the image of the product flavor image; through the image of a variety of fusion using the characteristics of the packaging image of the creative design, giving the product an interesting image to increase interaction with consumers. Through the design, combining art with environmental protection and innovative elements, it forms an interesting way of packaging and helps the colorblind group, reducing the burden they create when purchasing. This design gives colorblind consumers visual peace of mind, but also adds fun and resonance to the use of the product, thus increasing the repurchase rate of the product and protecting the safety of colorblind consumers.

Future Outlook: I hope that in the future, I can continue to be driven by innovation and explore new directions in packaging design. I will insist on prioritizing environmental sustainability, delve into more environmentally friendly materials and design methods, and inject rich green elements into packaging. Secondly, I will gain a deeper understanding of consumer needs and preferences, and introduce personalization and customization into my designs to cater to different demographics and enhance their interaction with the brand. In addition, I will further emphasize the characteristics of local cultural products by subtly incorporating the unique charm of the region and traditional elements into my packaging design. This approach not only attracts consumers' attention, but also spreads awareness and appreciation of special ethnic traditions.

In short, my packaging design is a channel for conveying emotions and embodying values. On the road ahead, I will persevere and innovate to create rich experiences and memories for brands and consumers. I believe that through unremitting efforts and unlimited creativity, my packaging design will stand out in the industry and become a strong support for the brand, as well as make a positive contribution to the preservation and development of local culture.

5.4 Packaging display

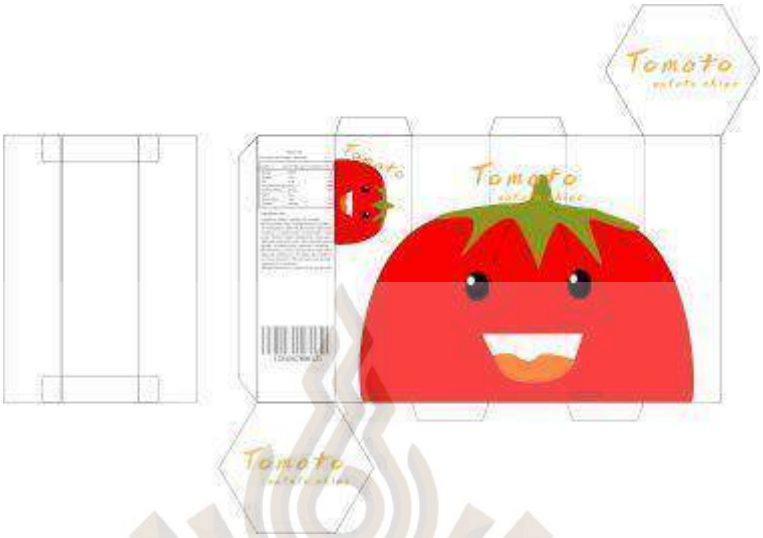

Figure 5.3 Packaging display (1)

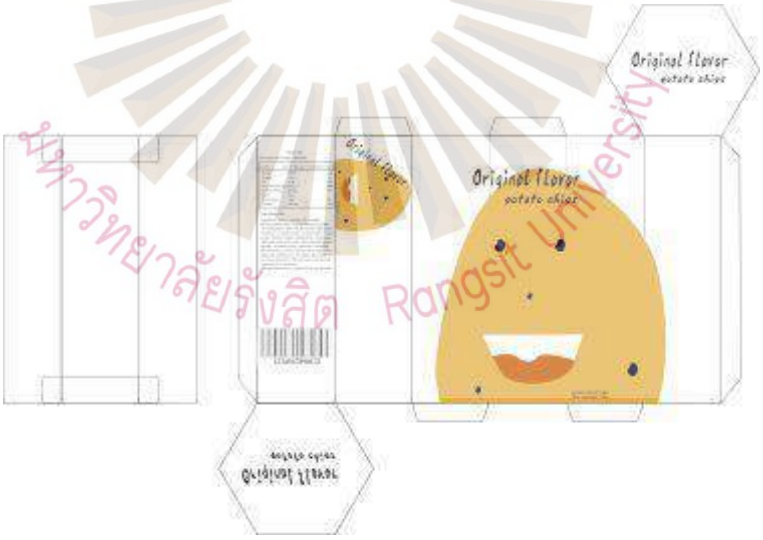

Figure 5.4 Packaging display (2)

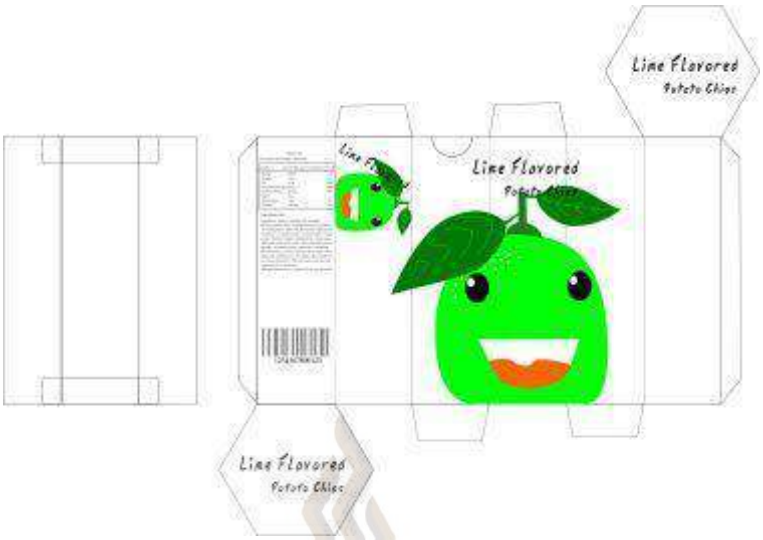

Figure 5.5 Packaging display (3)

Figure 5.6 Packaging display (4)

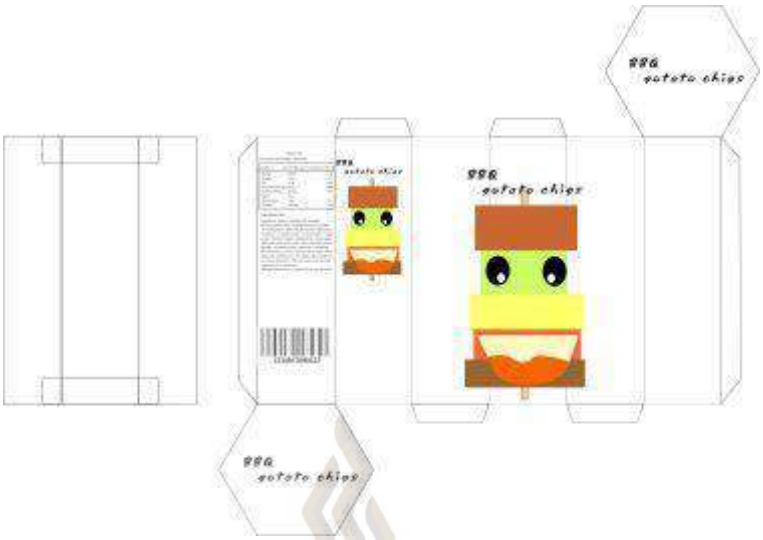

Figure 5.7 Packaging display (5)

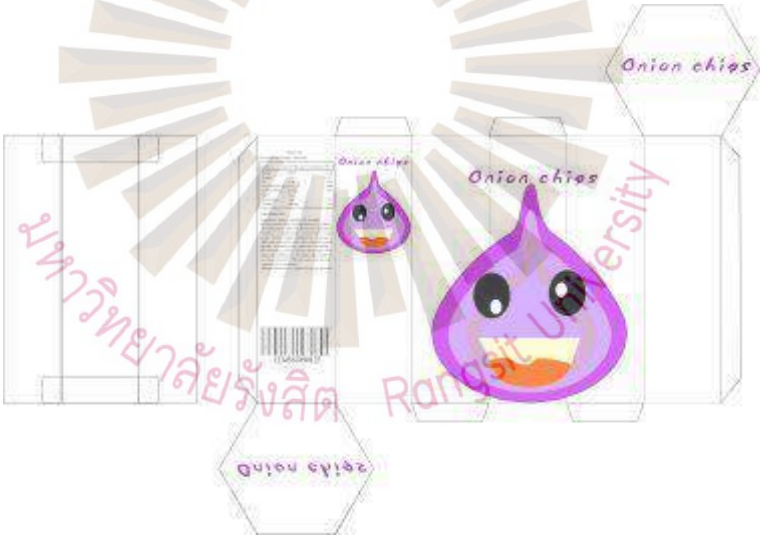

Figure 5.8 Packaging display (6)

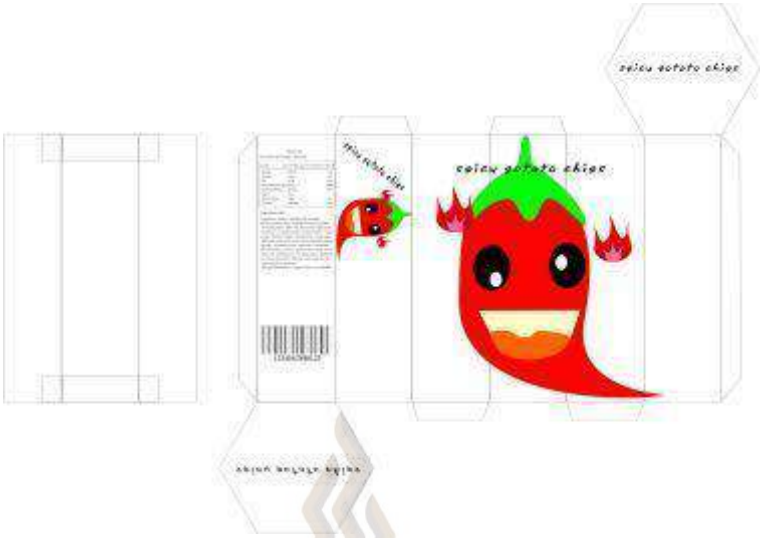

Figure 5.9 Packaging display (7)

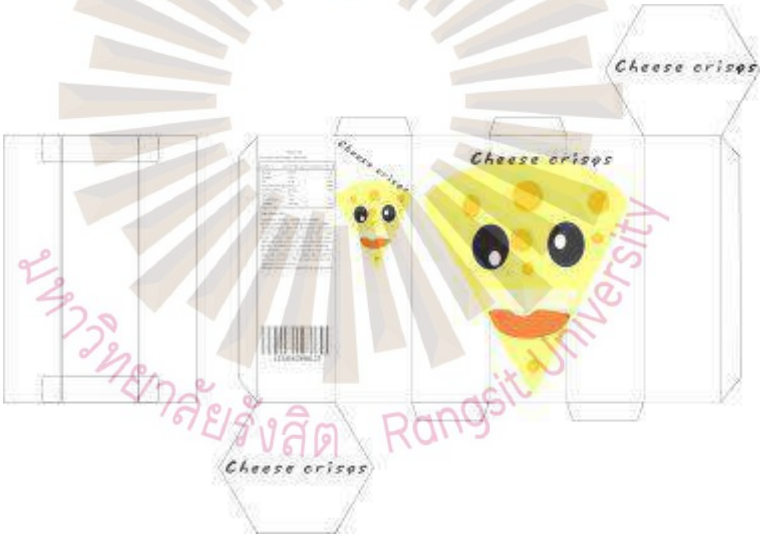

Figure 5.10 Packaging display (8)

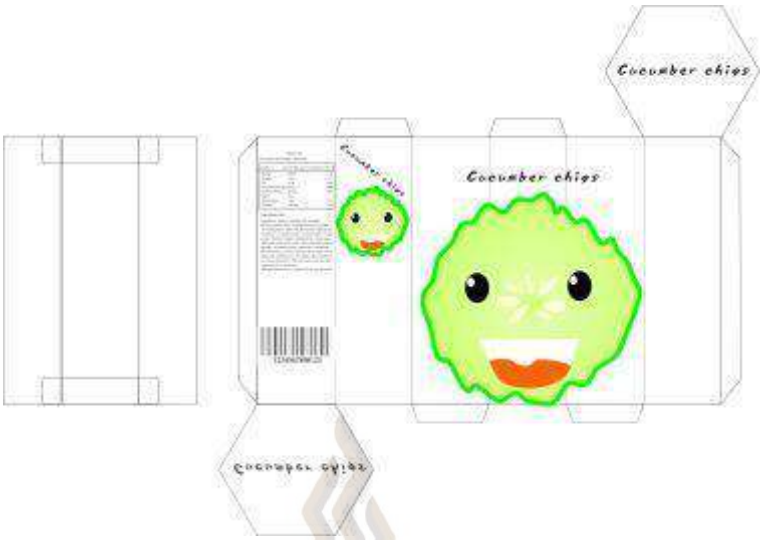

Figure 5.11 Packaging display (9)

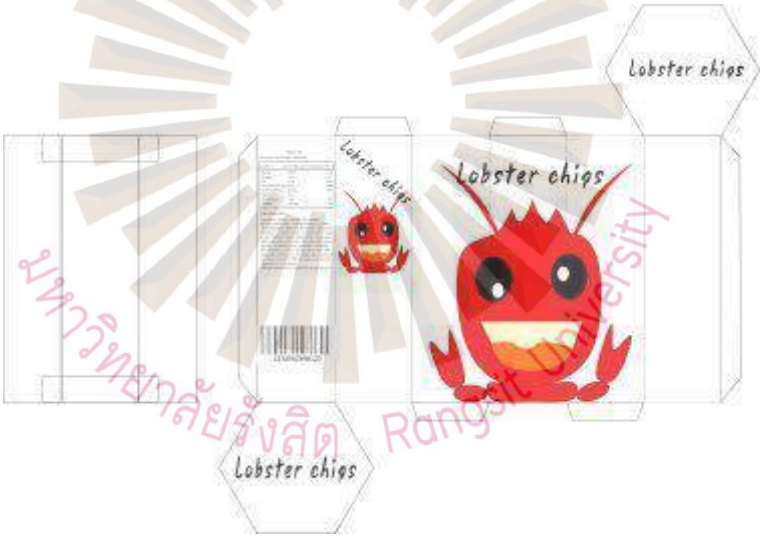

Figure 5.12 Packaging display (10)

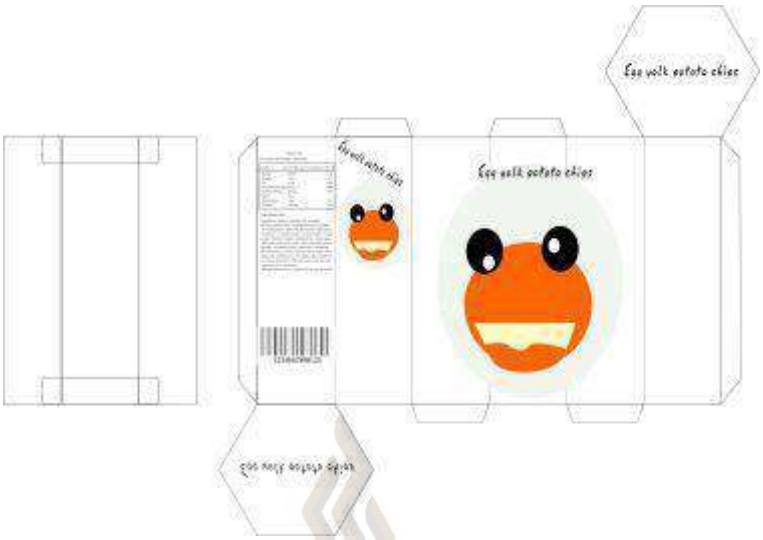

Figure 5.13 Packaging display (11)

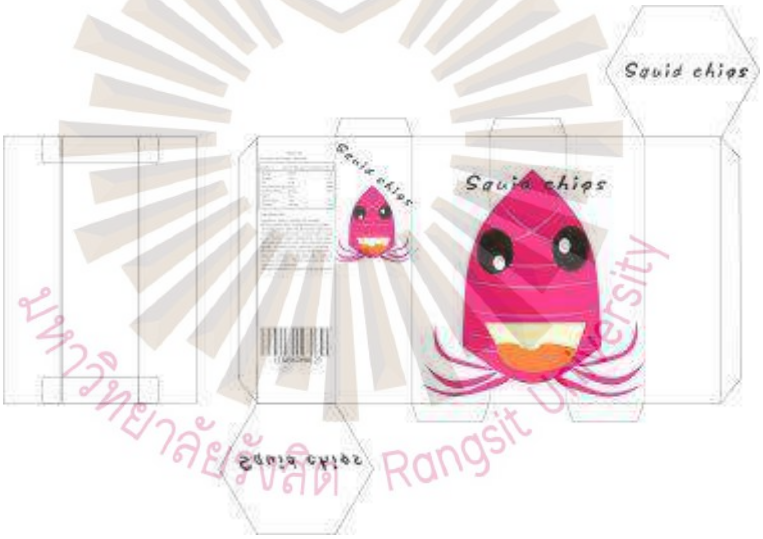

Figure 5.14 Packaging display (12)

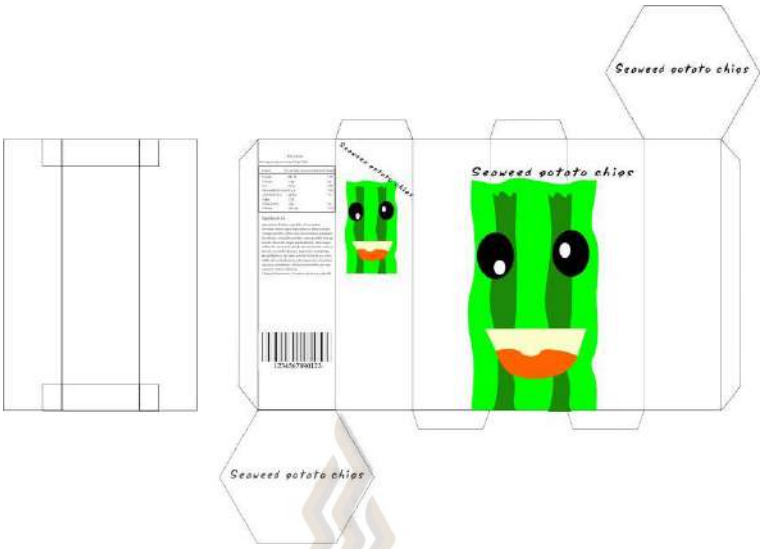

Figure 5.15 Packaging display (13)

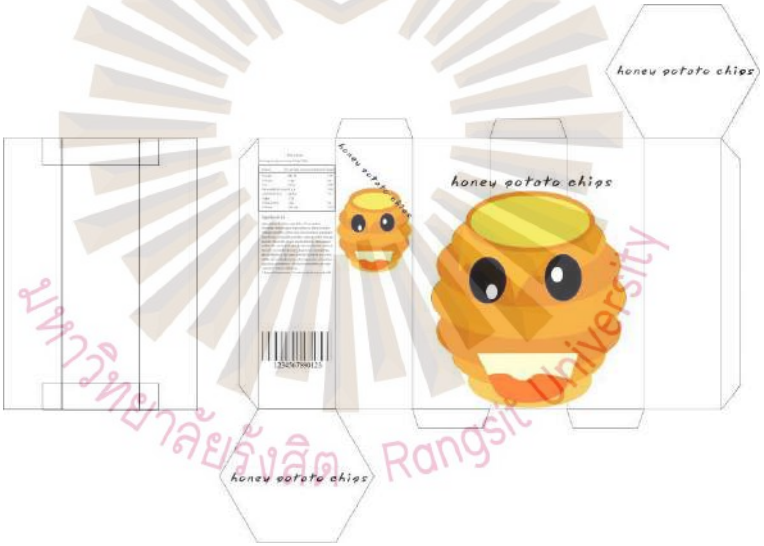

Figure 5.16 Packaging display (14)

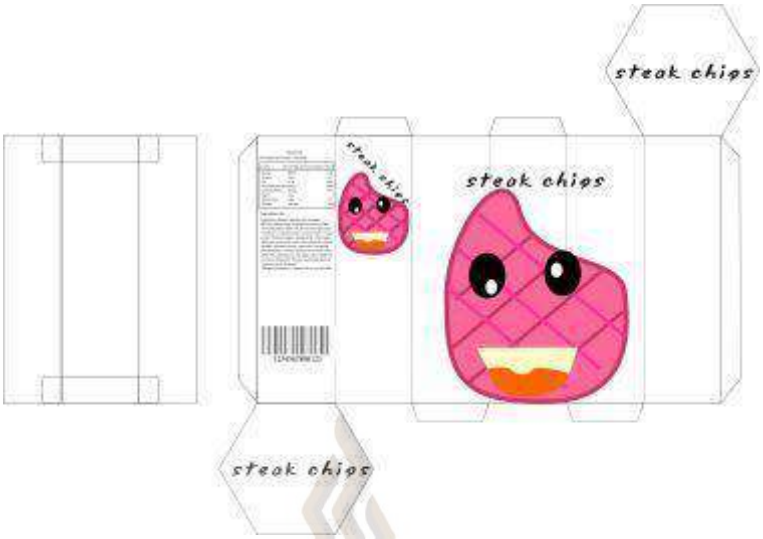

Figure 5.17 Packaging display (15)

Figure 5.18 Packaging display (16)

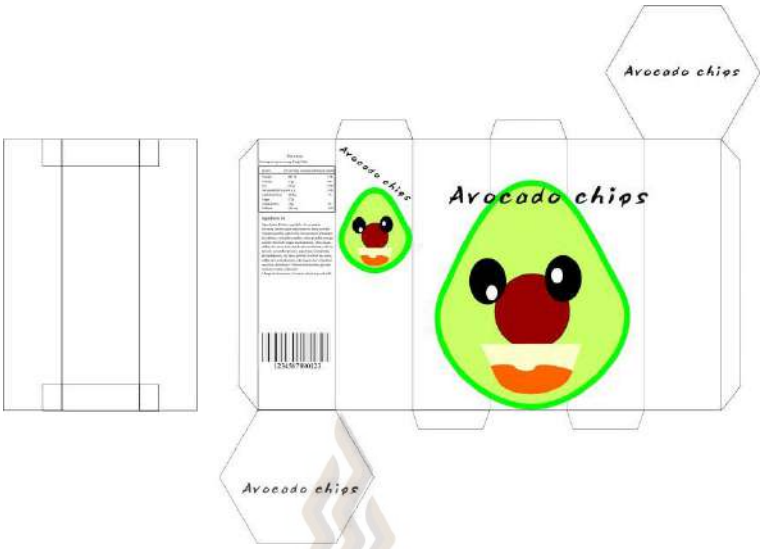

Figure 5.19 Packaging display (17)

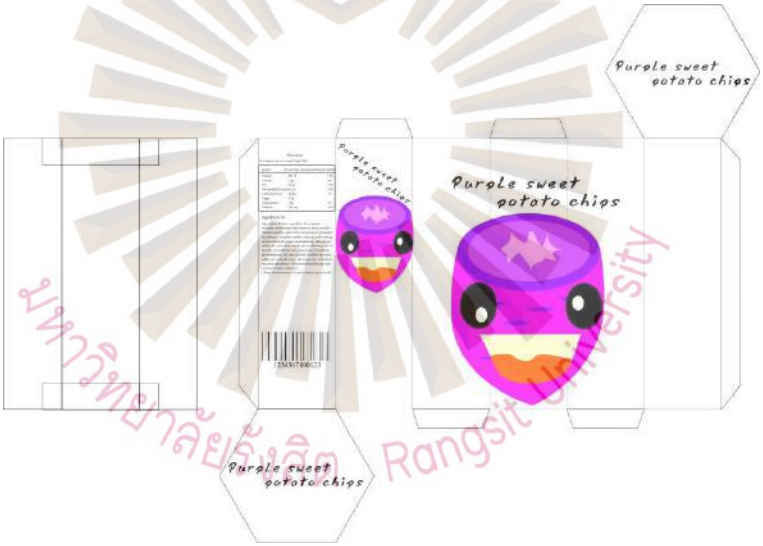

Figure 5.20 Packaging display (18)

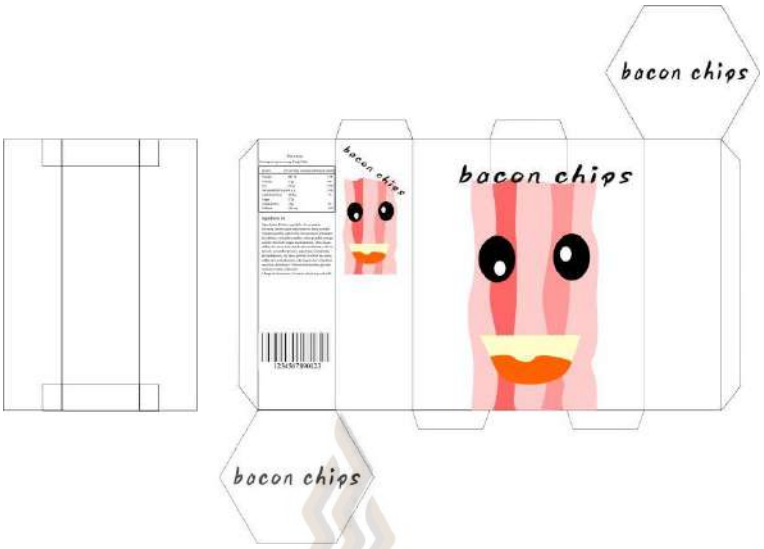

Figure 5.21 Packaging display (19)

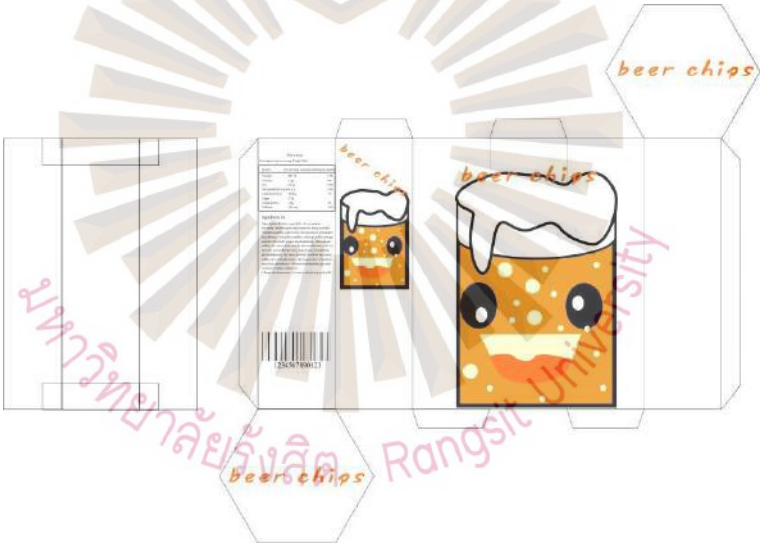

Figure 5.22 Packaging display (20)

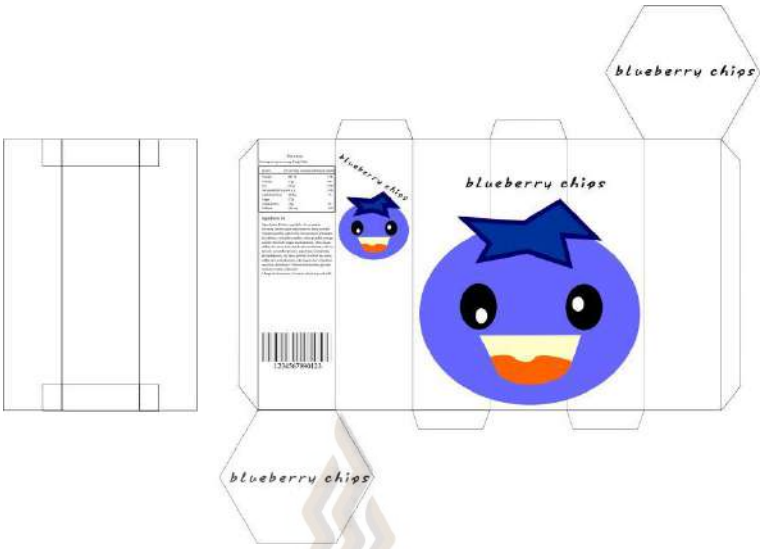

Figure 5.23 Packaging display (21)

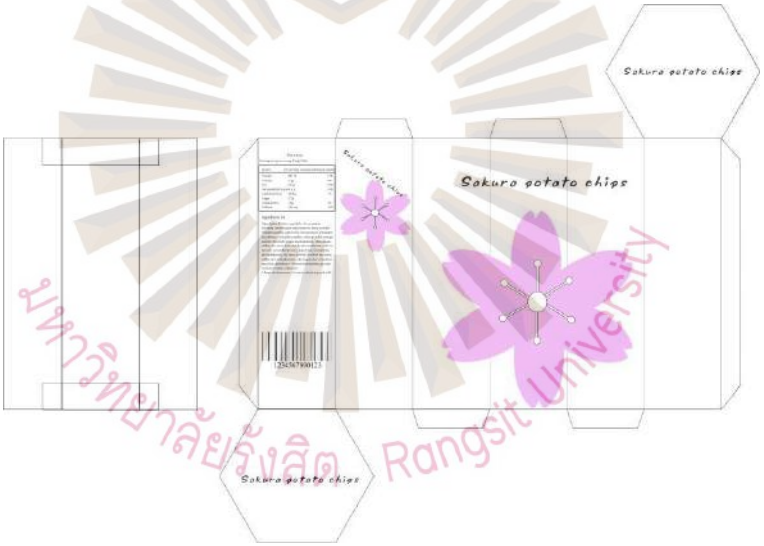

Figure 5.24 Packaging display (22)

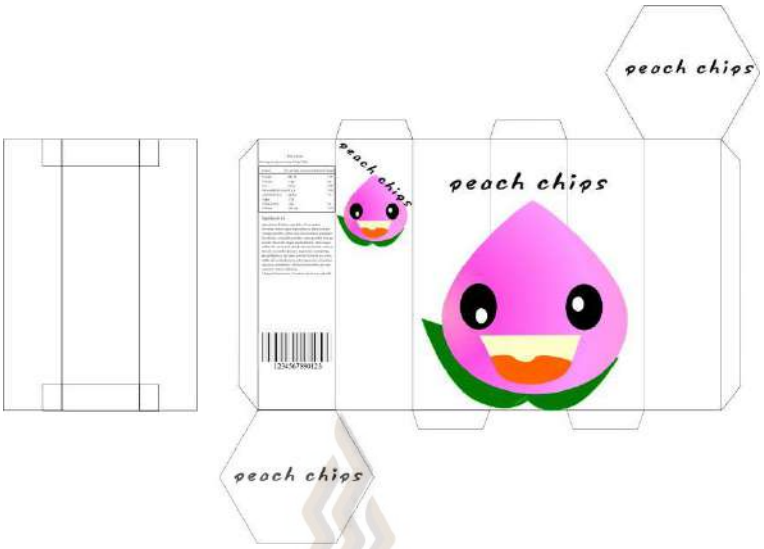

Figure 5.25 Packaging display (23)

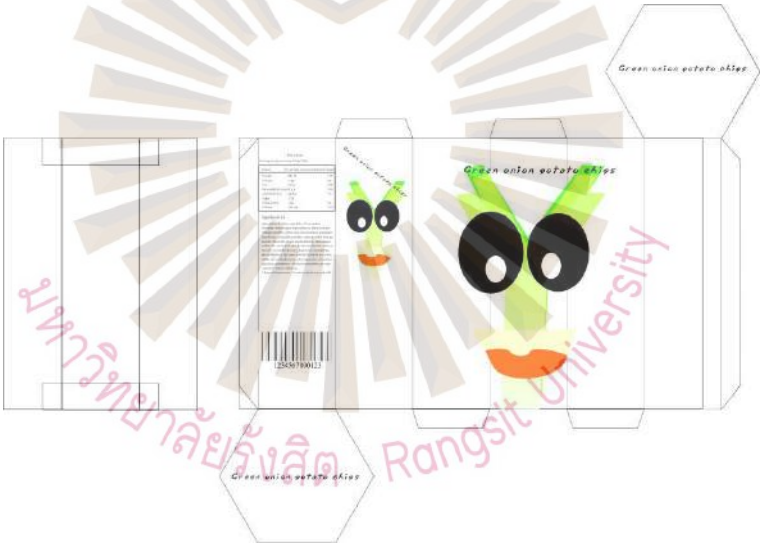

Figure 5.26 Packaging display (24)

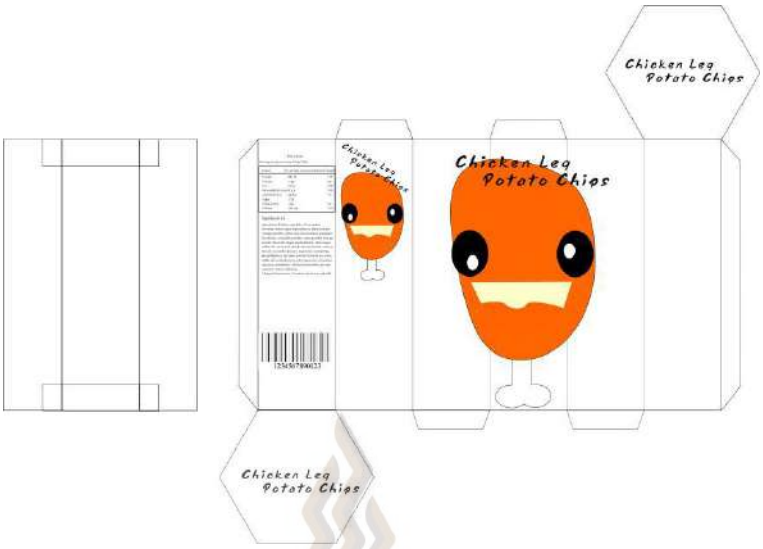

Figure 5.27 Packaging display (25)

References

Bernhard, J., & Kelso,N.V.(2007). Color Design for the Color Vision Impaired. *Cartographic Perspectives, 58,*61 – 67. https://doi.org/10.14714/CP58.270

Boting,Y. (2011), Research on bitmap and vector image conversion methods. *Science and Technology Communication, 15*,2.

Crameri,F., Shephard, G.E., & Heron,P.J. (2020) The Misuse of Colour in Science Communication. *Nature Communications, 11*, 5444. https://doi.org/10.1038/s41467-020-19160-7

Dong, H. (2022). *The blue dye absorbed elements of installation art studies* (Master's thesis, Lu Xun Academy of Fine Arts). Retrieved form https://kns.cnki.net/KCMS/detail/detail.aspxdbname=CMFD202301&filename=1022579632.nh

Hunter, J.D.(2007). Matplotlib: A 2D graphics environment. *Computing Science& Engineering*, *9*,90 – 95.

Jambor, H., Antonietti A., Alicea, B., Audisio, T. L., Auer, S., Bhardwaj, V., Weissgerber, T. L. (2021). Creating Clear and Informative Image-Based Figures for Scientific Publications. *PLOS Biology 19*, (3), e3001161. https://doi.ong/10.137/journal.pbio.3001161

Jiang, Z. (2011) *Color Perception and Color Blindness*.China: Beijing.

Li, H., Dodd-Butera, T., Beaman, M. L., Pritty, M. B., Heitritter, T. E., & Clark, R. F. (2021). Trends in childhood poison exposures and fatalities: a retrospective secondary data analysis of the 2009–2019 U.S. National Poison Data System Annual *Reports.Pediatric reports, 13*(4),613623. https://doi.org/10.3390/pediatric13040073

Masatako, O., & Kei, I. (2016) Diversity of Color Vision and Unobstructed Presentation of Color Vision. *Cell Engineering, 2002*(9), 1080-1104.

Qin, A. (2022) *Pediatric poisoning fatalities from 1972 through 2018.* Retrieved from https://www.cpsc.gov/s3fs-public/Pediatric-Poisoning-Fatalities-from-1972-2018.pdf?AssSXNgG73EHX2iZZTizrQufAMHbTwQ3

References (Continued)

Sun, F.(n.d.). Exploration of Color Design for Color Blind Groups. *Design Concept Exploration*, 23-25.

Tol, P.(2021).Paul Tol's Notes: Introduction to Color Schemes[Web log message]. Retrieved from https://personal.sron.nl/~pault/

Wong, B. (2011). Points of view: Color blindness.*Nat Methods,8*, 441. https://doi.org/10.1038/nmeth.1618

Xiang, Y., Zhao, W., Xiang, H., & Smith, G.A. (2012). ED visits for drug-related poisoning in the United States, 2007.*The American journal of emergency medicine,30*(2), 293 – 301.https://doi.ong/10.1016/j.ajem.2010.11.031

Appendices

Appendix A

Potato chips packaging

1. How do you distinguish flavors when buying potato chips?

   A. Text B. Image

   58.7%A&41.3%B

2. Do you pay attention to packaging when buying potato chips?

   A. Yes B. No

   63%A&33%B

3. How do you think potato chip packaging can help color-blind people?

   21% through text 32% through touch 37% through color 21% through packaging shape

Appendix B

Color blind packaging

Color blind people:

A. HelpfulB. Not helpful
78.7%A&21.3%B

Non-color blind people:

A. Color blind packaging affects you B. Color blind packaging has no effect on you
C. Usually pay attention to color blind packaging D. Absent
53.75%A&35.2%B&10.2%C&0.9%D

Biography

Name	Dong Liang
Date of birth	September 15, 1995
Place of birth	Xian, Shaanxi, China
Education background	XiAn Technology University College of Arts and Media, 2019 Rangsit University Master of Fine Arts in Design, 2024
Address	Xian, Shaanxi, China
Email Address	739164380@qq.com