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# RIT

## **SafeSkin: A blockchain system of products' lifespan development to help the user find safer products**

by

Ru Li

A Thesis Submitted in Partial Fulfillment of the Requirements for the  
Degree of Master of Fine Arts in Visual Communication Design

School of Design  
College of Art and Design

Rochester Institute of Technology  
Rochester, NY  
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## Committee Approval

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## **Bio**

Ru Li was born and raised in Beijing, China. She is a UI/UX designer currently pursuing MFA degree in Visual Communication Design Program at Rochester Institute of Technology while she is focusing on Interaction Design track. She earned Bachelor of Engineering degree from Beijing Information Science and Technology University in Industrial Design Department in 2018. From 2018 to 2019, she studied in Taiwan as an exchange student. Her design working experiences in Beijing as an UI/UX intern help her acquire skills in managing several projects at the same time and solve related UI/UX problems. Ru is interested in exploring the connection between UI/UX design and virtual reality products. In the future, she plans to work as a UI/UX designer in a design company.

## **Abstract**

Due to the escalating demand for cosmetics skincare products and a growing number of beauty products putting people's health at risk by counterfeits or using chemical ingredients in order to give a better skincare result, people start to have more concerns about the quality of cosmetics and skincare products. Today, many companies strive to make the transparency of the ingredients by labeling on the packaging and knowledge their customers about the benefits of the ingredients they are using. However, the consumers unable to find out how does the product being produced by the original company, and being transferred to the department store or other retailer.

This study aims to use data and analysis from Environmental Working Group (EWG) and Get it Beauty Program, to provide comprehensive information on a skincare product from Production, Quality Inspection, Transportation to Marketing to assist consumers to determine whether the product is safe or not, also gathering consumers' skin related information and skincare concerns to evaluate the product in particular for their skin type and provide recommendations.

This paper investigates why it is essential to show a product from choosing raw material to the production process, shipment and when they are buying from the (online) store with after-sales support. To achieve this, a blockchain system of products' lifespan development that built-in many online websites to the spurious with the genuine and help users find safer products was discussed and evaluated based on the 52 users with different skin conditions background.

**Keywords: Blockchain, Clean Beauty, Side Effects, Cosmetics, Personal Care, Toxic Effects**

## **Introduction**

A variety of counterfeit products or chemicals used on the skin can have lasting and potentially fatal consequences for the health and safety of consumers. The current Food and Drug Administration (FDA) regulation are not required Cosmetic companies to get FDA's approval before the products are selling in the market (FDA, 2005). Because there is no regulation, the adverse effects of consumers and enterprises have rapidly increased.

There are two huge influences that leads to this growing trend. Based on the data in 2009 from Environmental Working Group (EWG: is an organization that is helping user have a healthier life), there are 88 chemicals used in more than 73,000 products in 595 companies which can lead to cancer, congenital disabilities, or DNA damage (Barrett, 2005), or other harm (Faber, 2020). According to the Organization for Economic Cooperation and Development (OECD), over \$700,000 in 2018 and \$300,000 in 2020 counterfeit beauty products were seized by the Los Angeles Police Department (LAPD), and the US, as for the biggest recipient of counterfeits, has nearly 12,000 adverse reports of cosmetics from the consumers and lost \$5.5 billion in sales profit (Miller, 2020).

With the increasing uncertainty and dangerous of the chemicals in products and adulterating or counterfeiting of many beauty products, these problem poses threats both on human health, the reputation, and revenue of brands. However, it is not enough to only indicate "Clean Beauty Matters" (Tzeses, 2020). More important is to give evidence to customers all ingredients they use are nontoxic. From in customers' perspective, the better way to have confidence about getting safer products is to check the production cycle development with Blockchain technology. The reason why Blockchain technology can stamp out counterfeits is that the records of distributed ledger technology cannot be altered (Whitehead, 2021; Media, 2019).

Therefore, this article will use the products' lifespan development from Production, Storage, Shipment, and Support; four stages connect to demonstrate whether the product is worth buying.

## **Context**

As a person with sensitive skin, my sister suffered from acne and allergic reactions for eight years. The possible side effects of the product on the skin vary from person to person, and maybe minor, such as redness, swelling, itching and peeling. It can also be severe, such as hormonal imbalance, neurotoxicity and cancer. Given the significance of the problem, knowing whether the product is safe before using all skin-on products is necessary. SafeSkin was designed as a credible platform between on-skin products and all customers.

The primary audience is the people who have skincare concerns. In particular those who do not become familiar with the benefits of the product, do not realize what product their skin is suitable for, and do not know how to distinguish between genuine and fake products.

Due to the limited number of survey subjects, the data collection is not accurate enough, and the results obtained are relatively vague. In addition, some references were published too early, so this method is suitable for current investigations.

## **Methods**

### **1. Research**

A questionnaire was generated with eight related questions. The age range for this questionnaire is all over 15 years old. There are two stages for the samples: the first one is by randomly asking online, the second is the video interview. The survey consists of 52 effective responses, people who can represent different types of participants were interviewed about personal experiences of on-skin products.

The questions in the survey are shown below:

Question 1: What's your gender?

- A: Male
- B: Female
- C: Rather not say

Question 2: How old are you?

- |            |                      |
|------------|----------------------|
| A: 15 – 18 | E: 41 – 50           |
| B: 19 – 25 | F: 51 – 60           |
| C: 25 – 30 | G: Over 60 years old |
| D: 31 – 40 |                      |

Question 3: What is your occupation?

- |                                      |                  |
|--------------------------------------|------------------|
| A: IT                                | E: Furniture     |
| B: Fast-moving consumer goods (FMCG) | F: Education     |
| C: Sales                             | G: Communication |
| D: Fashion                           | H: Manufacture   |

I: Automobile and Accessories

M: Banker

J: Catering

N: Doctor

K: Accounting

O: Other

L: Lawyer

Question 4: What's your skin type?

A: Oily

B: Dry

C: Combination oily skin

D: Combination dry skin

E: Normal

F: Sensitive

Question 5: What's your top concern when purchasing skin care products?

A: Brands

B: Budget

C: Product efficacy, such as acne/wrinkle removal/brightening

D: Suitable for skin type

Question 6: Have you ever bought fake skin care products?

A: Yes

B: No

Question 6\*: What kind of reaction have you had?

A: Irritation: Acne, etc.

B: Allergies: redness, peeling, itching, redness and swelling

C: Respiratory diseases

D: Other

Question 7: What is the source of your purchase recommendation?

A: Social software sharing

B: Friend recommendation

C: Celebrity endorsement

D: Sales recommendation

E: TV/Poster Ads

The results and analysis of the questionnaire are shown in Figure 1.1. Analysis: The results show that abnormal reactions to the use of cosmetics and skincare products are common and are not affected by skin type. Most people are looking for products suitable for their skin on the basis of focusing on the efficacy of products.

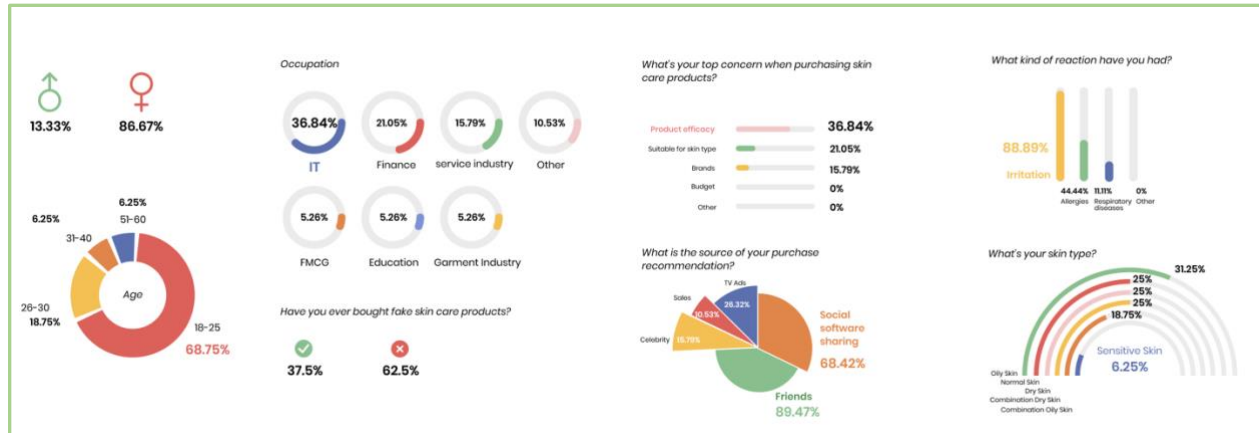


Figure 1.1: The results of the questionnaire

One-on-one interview:

Mia Liu, a sales assistant working in the cosmetics and skincare area at Duty-Free Store was interviewed with more profound questions base on the response of the questionnaire. The details are below:

Among the questions in the questionnaire, which question do you most impress?

Whether as a customer or as a salesperson, what I value most is practicality. I want to buy quality brands and consider my budget.

What do you think about the irritation of using products?

First of all, I will try to avoid buying irritating products, and occasionally I will encounter that there is no way to avoid it. Even if I work in this industry, I will have bought products with side effects. Since my skin is not sensitive, I value the effects rather than the ingredients.

How frequently do you encounter harmful products?

Not very often. About once or twice a year.

How did the allergic reaction you have ever had, and what kind of experience was it?

I used to use the dark spot serum as a daily serum and my skin was peeling. I did not realize it was caused by the serum till the product trainer from Kiehl's told me it might because of Dark Spot was too irritating as a brightening product. She recommended that to use only 1-2 times a week to reduce peeling while reaching my skincare goal.



If there is an abnormal reaction, what would you do?

If so, I will stop using it, especially the visible reaction

For example, for some products, many people who have used them say that they need to build tolerance and will have side effects. Will you stick to it?

I don't know what will happen before using it. After using it, after checking the feedback of other users, first deactivate it; after deactivating it for some time, it will still be used.

Will you find out what ingredients are causing the reaction?

Due to more minor allergic reactions, I do not pay attention to the ingredients. Alcohol cannot make my skin red, so I will continue to use it, even if it may hurt.

At work, what are the frequent experiences of customers buying products?

Out of stock. People love star products. Like SKII, La Mer's most popular product, it has a strong brand effect. They focus on specific and great ingredients that are well-known for the brand, with rich advertising introductions.

Through one-on-one interviews, I came to Mia's Core needs and Frustrations (Figure: 1.2)

Core needs:

- Wants to buy quality brands and consider the budget.
- Wants to avoid buying dangerous products
- Wants to know the extent of the side effects, such as alcohol, a joint irritation

Frustrations

- Star products of high-quality brands are often in short supply, and it is difficult to test whether the products are better to use personally
- Hard to distinguish certified products and counterfeits by the appearance
- Not sure if I need to stop when I encounter irritating products

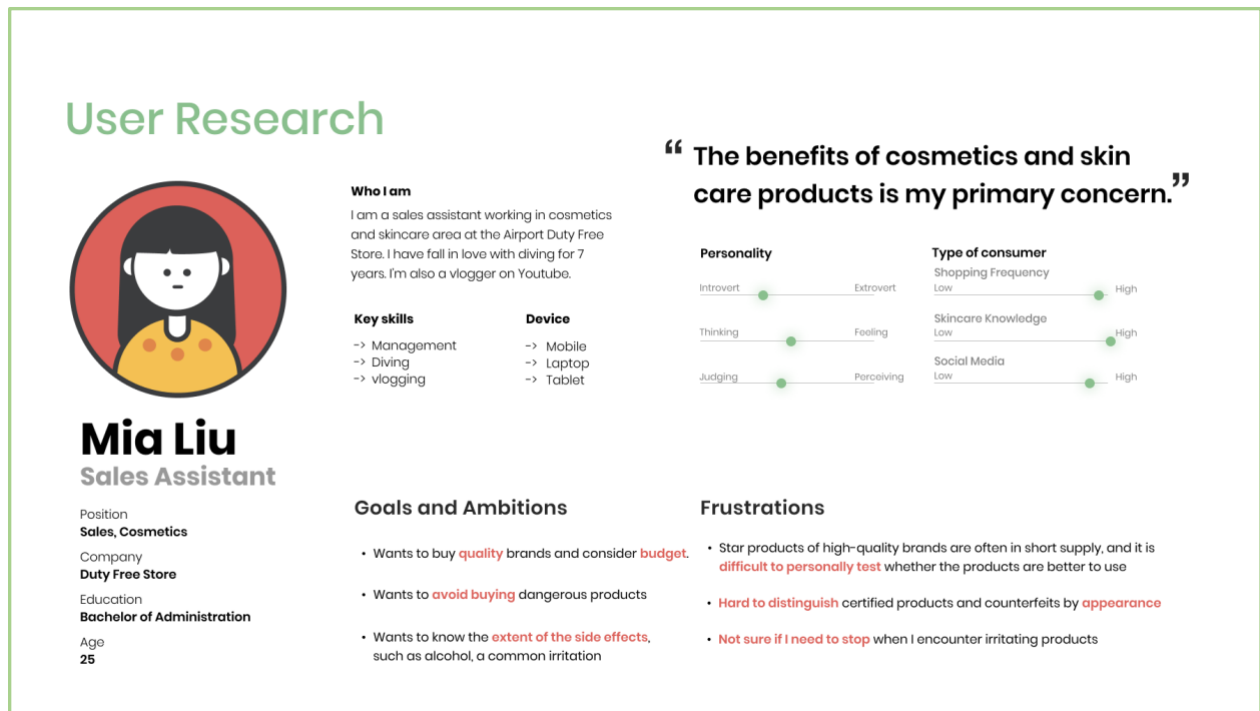


Figure 1.2: User Research

## 2. Design Goals

To address the Problem, the information of four stages (Production, Storage, Shipment, and Support) will be provided with Blockchain technology for users to check the whole process of products. Blockchain is a high level of security technology that can be used for the HR industry with managing large amounts of sensitive data about a company and its employees. SafeSkin purposes to utilize the benefits of Blockchain technology to build a stable system. It is also committed to analyzing user personal information and product efficacy to better use and purchase recommendations.

How these four stages are applied will be described below (Figure 5.6):

### i. Production

In this section, the user interface shows three parts: Highlights, Barcode and Ingredients. Two overall scores graded by Customers and SafeSkin, targeted use recommendations and SafeSkin Safety Level label are displayed in “Highlights”. Next to Highlights, users rely on a unique barcode to track this product in the following stages. Last but not least, “Ingredients” tells all ingredients of the products’ formula and the negative impacts on some people’s health. According to the article of Campaign for Safe Cosmetics, many ingredients in personal care have ties to

Sensitization and Allergies, Respiratory Diseases and Irritation, Endocrine Disruptors, Neurotoxic Chemicals, Carcinogens, and Environmental Toxicants (Campaign for Safe Cosmetics, 2004).

ii. Storage

Using products that fail the quality inspection may also take a toll on your health. SafeSkin aims to imitate the idea of Blockchain make sure that after the company collected all ingredients and finishes producing the skincare product, production will be linked to the next stage of 'a safely storage'. All products should be passed a high standard of quality control before they leave the storage warehouse at the beauty company towards the retailer or department store to guarantee products have been safely stored in the warehouse before heading to customers. Moreover, because every product owns a particular barcode, if any of the products did not make their quality test then customers should be able to see it through SafeSkin, which means the blockchain has broken, and customer should not be able to find it anywhere in the marketplace which prevents the counterfeit steel in somewhere.

iii. Shipment

We hope SafeSkin can help customers to find more suitable, better quality and safer skincare for themselves. The Shipment stage involves a lot of uncontrollable factors such as lost parts or damaged stock. Therefore, the unique barcode allocates to each product plays an important role when an unexpected situation comes up. When skincare being produced with unique barcode, it will be handed to a third party who runs road or air transportation then transfer to the warehouse operates by the retailer. The whole process is 'blockchained '. An example would be stock being transfer to Sephora are having a barcode from 0001 to 1000, which are 1000 items, if the Sephora retail staff only received 999 items from the truck driver, then there must be 1 item being lost or damaged during the shipment stage and the product's lifespan ends in shipment stage. Customers can access to all the tracking number through SafeSkin and search tracking number to see shipment detail not only for the batch they are buying from but also batches that sent to another retailer to ensure and verify the fidelity of the product.

iv. Support

Alternatives

The two main parts of Support are "Review" and "Safer Alternatives" (Harvard Medical School, 2020). In the Review section, SafeSkin plans to use tags to categorize consumers' feedback such as: suitable for "Dry skin (20)", "Effectively lighten the skin tone (5) and "Cheap and cheerful (10)" etc. Customers can use the number of tags and the actual review to decide whether they want to buy it or not. Furthermore, the 'Safer Alternatives' purpose of provide more and safer

opinions to customers. For instance, the product a customer currently browsing on their webpage is safe to use, then SafeSkin will recommend product with similar ingredients and result from provide more opinions to customer. On the other hand, if a customer is looking at a product contains toxic ingredients, SafeSkin will recommend a safer alternative product with similar skincare result for customer to choose from.

### 3. Workflow

- a. "Check products' lifespan development on SafeSkin when shopping on Sephora" (Device: Desktop)
- b. Sign up SafeSkin and start your journey to find safer products (Device: Mobile)

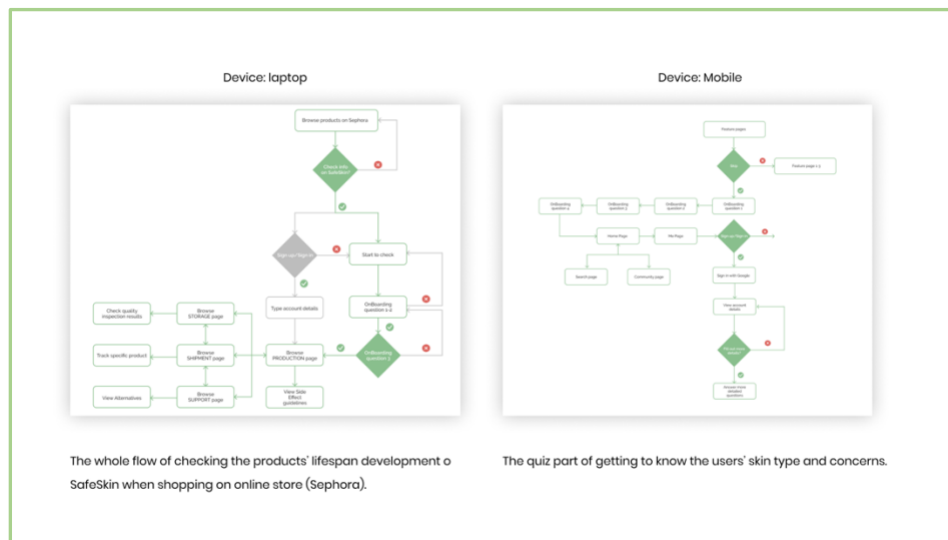


Figure 3.1: User flow 1

### 4. Wireframes

Wireframes with four main pages including homepage, search, community, and "me" connect the user flow above (Figure 4.1).

Homepage: Users can click on product pictures in different sections on the homepage to view the product information they want to know, and after clicking the information, they will go to the product details page to view it.

Search: If you need to search, click the icon in the tab bar or the search bar on the top of the homepage to enter the search page, which contains two options: category and brand.

Community: Both the "Certified Safe Products" page and the tab bar at the bottom can be entered into the community interface, and you can like, share and comment on the publisher and the published content.

Me: User personal information and Favorite can be edited on this page.

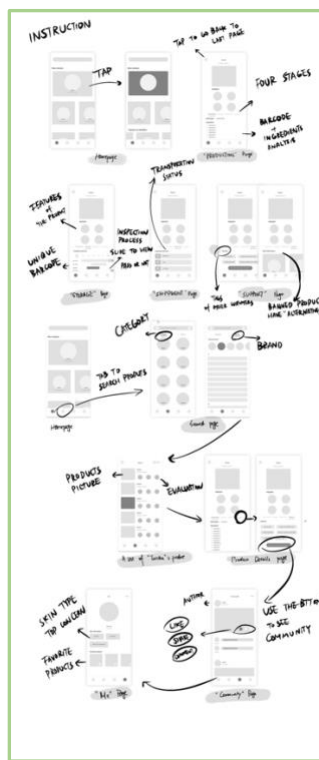


Figure 4.1: Wireframes

## 5. Visual Design

Main color: Green represents healthy and red represents credible (Figure: 5.1).

Secondary color: For both the Mobile and laptop user interface, I utilize color to show four stages of the product's lifespan development, for example, pink represents the production process, yellow represents storage, orange expresses shipment, and the blueish purple color expresses the Support section.

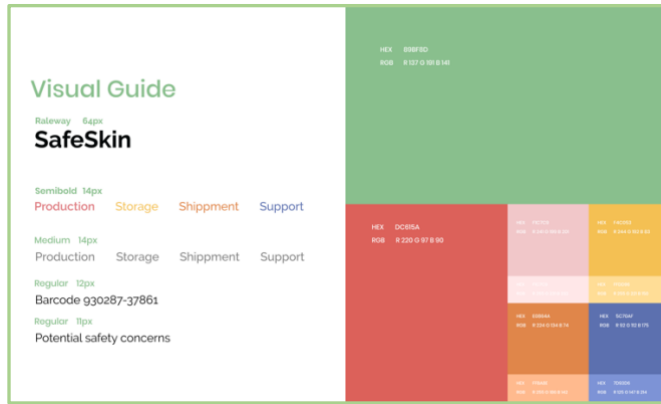


Figure 5.1: Visual Guide

SafeSkin shows the products’ lifespan development from Production, Storage, Shipment, and Support, four stages connect together to demonstrate whether the product is worth buying.

Before the customer buying products, it is necessary to ask user’s personal information of their skin. A quick quiz is created when the user first try SafeSkin. They can also create their own account and save profile for further use (Figure 5.2).

In order to achieve showing the “whole life” of the products, ingredients analysis, Inspection, Itinerary tracking, Customer Review, and Safer Alternatives will be introduced in the four sections mentioned above for users to better understand the product (Figure 5.3).

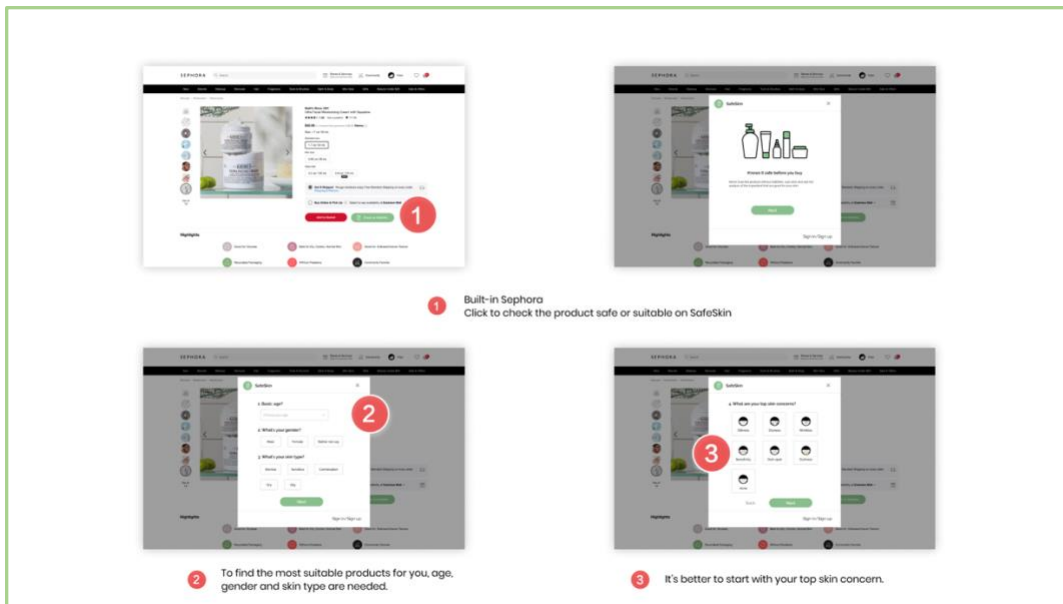


Figure 5.2: Main User Interface 1 (Laptop)

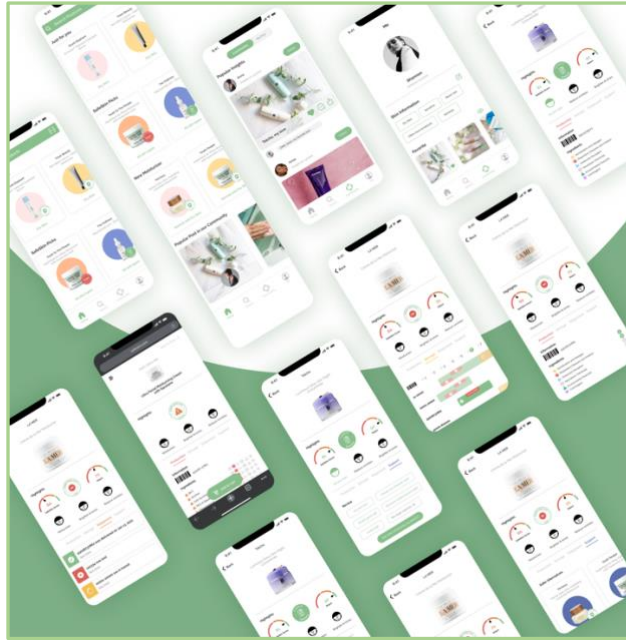


Figure 5.3: Main User Interface 2 (Mobile)

## 6. Testing and Iteration

By looking for users for testing, I got some constructive feedback. The user groups of the testing are multiple and referential in terms of reliability and rationality. Most of the participants have positive feelings about the idea of four main "Stages", which helps users understand and track the transaction and functions of the product to a large extent.

However, for the "ingredients" part of the product, the vast majority of users have given some suggestions. For professionals or non-professionals, no attention is paid to the names of all ingredients, and more attention is paid to the summary of the efficacy or side effects of the ingredients. Regardless of whether it is before or after using or purchasing cosmetics or skin care products, users hope to get suitable treatment for their skin. Therefore, after combining the feelings and suggestions of the subjects, I adjusted the "Production" part of the product details page (Figure: 6.3).

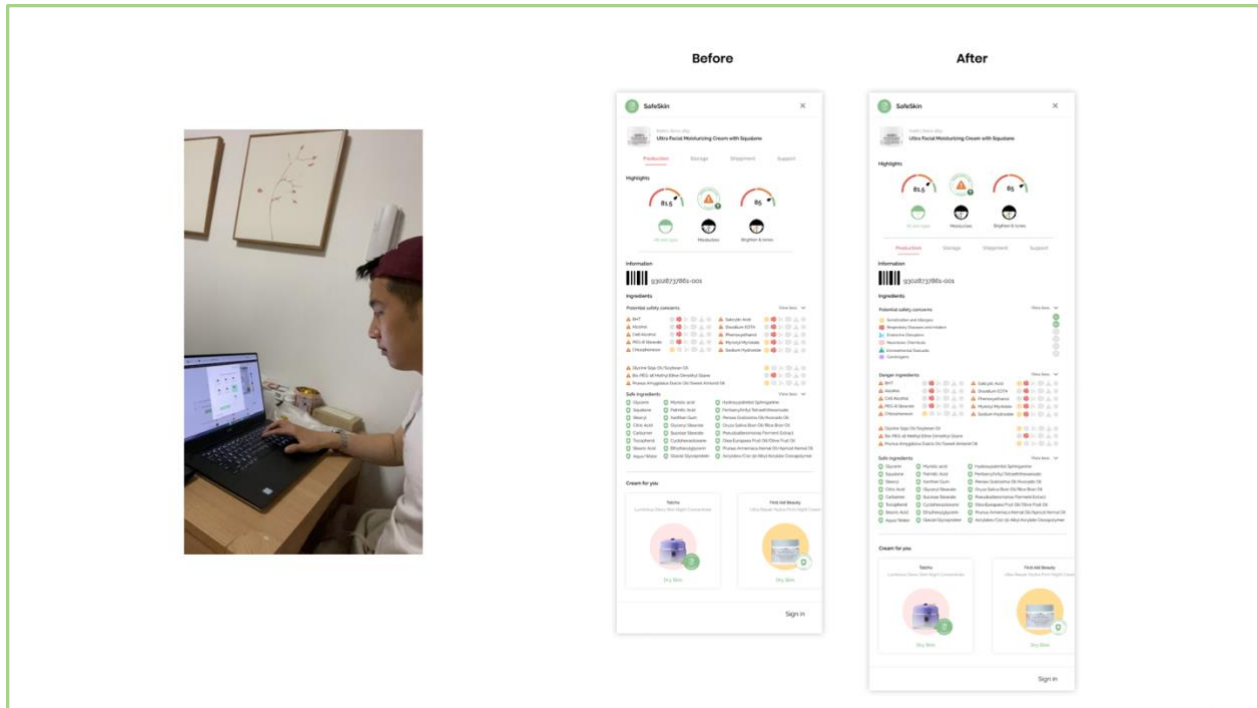


Figure 6.1: The changes of Production page

## Evaluation & Discussion

With consumers becoming ever more conscious of health effects from cosmetics, it is possible to see some change.

In order to solve the problems raised by this research, various methods have been used, such as surveys, questionnaires, interviews, Competitive analysis and Research references. The accuracy has been achieved by using all methods mention above. However, resources and access to professional advice are limited. First of all, the samples of this survey are not huge, so a more accurate result can be improved by increase the sample base. Questions and conclusions raised in the one-on-one interviews can be further studied.

As far as the existing cases is concerned, different beauty app consistently use the barcode to scan the product or search by name. It is necessary to aware that due to limited data, some brands or products cannot be searched.

Due to the above reasons, the features of SafeSkin still need to be enriched and updated. The issue of the product ingredient database was not covered in this study. According to the feedback of the questionnaire and testing, whether the database is complete and accurate has also become one of the areas that need to be studied.



## Conclusion

The side effects of cosmetics and skin care products seem to be a potential problem at present. Since most of the products have relatively inconspicuous side effects, the harmful reaction can only be triggered after a long period of use, and this kind of problem will damage the body organs for a long time. It is deep and can be fatal. Moreover, cosmetics and skin care products are daily routines that people must use every day. In order to ensure good health, it is time for consumers to pay attention to this issue.

The article explored the ingredients of Cosmetics and Skincare products while analyzed existing Apps related to skincare. Compared with other apps, SafeSkin is not only limited to analysis of the ingredients used in the product, but a complete set of production-storage-transport-support processes with blockchain technology to show the "lifetime" of each product in detail and transparently. Because of the records of distributed ledger technology of Blockchain cannot be altered, the system of SafeSkin is credible for consumers. In order to help users find suitable safe products and products that reduce exposure to harmful ingredients, highlighting the advantages and disadvantages of ingredients can effectively remind consumers.

This article has neglected some "skin industry" issues that fell into a more professional field. These issues lay the foundation for further research on how to help users find better products, the skin products and cosmetics related fields and try to output iterative products will be continue explore and research in the future.

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