

WellnessCare: OCR-based Web Application for Cosmetic Product Safety Assurance

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Abstract: *Cosmetic products are intended to enhance certain aspects that appeal to the aesthetic senses, particularly sight, such as the shape, color, or form of human beings. The global cosmetics market has shown consistent growth throughout time due to the consumers who are mindful of their appearance. However, consumers encounter certain issues when using them. As a result of the research study's findings, it is evident that majority of the cosmetic product consumers face difficulties in understanding the meanings of the ingredients also some ingredient names are not correctly included in the product. The popular side effects faced by cosmetic consumers are Skin Rashes, Pimples, Dryness, and Irritation. This study is aimed at developing a web application to ensure the safety of the cosmetics products used by consumers in their day-to-day life. This proposed system will allow the user to assure safety by uploading an image of the ingredient label or by manually typing the lists of ingredients. Here, the subset of the image processing domain, Optical Character Recognition technology is used to extract text from the uploaded image. It will output a report by displaying the descriptions of each ingredient, respective severity scores, and the overall score of the product by mentioning whether it is favorable or harmful to the health. Here the necessary datasets are gathered from a reliable and accurate source. This system will ultimately contribute the economic growth and will increase the sales of products and the safety of the consumers in the beauty industry.*

Keywords: *Optical Character Technology, Cosmetic Products, Safety Assurance.*

1. Introduction

The beauty industry is truly remarkable and its rapid expansion is almost recession-proof. The main reason is that it does not only sell products but also sell hope, aspiration, passion, and dreams with it. Today, the beauty industry has returned to its roots, with science-based products doing double and triple duty (Avenue Five Institute, 2021). If a product is designed to make someone more appealing, cleanse the body, or otherwise alter someone's look, it is considered a cosmetic. Cosmetics are items created to beautify, protect, and change the appearance of our bodies' external features. Cosmetics were not introduced today. For at least 10,000 years, and possibly much older, people have utilized various substances to change their look or attract attention to certain features (Chemistry of Cosmetics, 2022). Cosmetics are a necessary part of our daily lives, including antiperspirants, scents, make-up, shampoo, soap, sunscreen, and toothpaste. Cosmetics are heavily regulated to ensure their safety, primarily under the EU Cosmetics Regulation. Every cosmetic and personal care item available on the European market is risk-free to use (Cosmetics Europe, 2022).

Even though the beauty care industry has expanded to a wide range of products, there is a critical concern about the safety of these products. The European Commission has launched a public consultation on the upcoming targeted revision of the EU rules on cosmetic products. It requests input from all interested parties on how to further enhance current regulations about the security of various hazardous compounds and their exceptional and rigorous use in cosmetics. New standards for reporting product safety are introduced by a new cosmetics rule. Nanomaterial-containing products, such as UV filters and colorants, must have formal authorization (European Commission, 2022).

Consumers of these beauty products, both men and women, value transparency and are concerned about the safety of the goods they use in their regular lifestyle. The majority of consumers are unaware of the ingredients available in the products used in everyday life, and some of the ingredient names are even hard to pronounce. Customers should make an effort to get trustworthy brands from well-known retailers. Cheap imports or internet purchases of copies could not have gone through the required testing and evaluation procedures. The names of the ingredients listed on a product's ingredient list can greatly aid consumers in making wise decisions. In addition, it should be the responsibility of the consumer to ensure that the products are safe and labeled correctly. As a result, the main research problem addressed here is to identify a method to validate the safety and quality of cosmetic product categories.

The main objective of this study is to develop an interactive software system that can be used to verify the safety of all cosmetic categories.

2. Main Objectives

1. To examine the challenges the consumers, encounter when examining the ingredient lists on cosmetic products.
2. To investigate the negative consequences that cosmetic consumers have experienced while using cosmetic products.
3. Develop an interactive web application to assure the safety of cosmetic products using Cosmetic Ingredient label Analysis via Optical Character Recognition Technology

3. Related Works

This study has found out that "Cosmetic Ingredient Review" is an independent, scientific review board that critically evaluates ingredients used in cosmetics. The FDA has regulatory oversight and the CIR should be encouraged to

publish its findings. "It is the dose that makes the poison," Paracelsus said in the 16th century. The American Council on Science and Health has reviewed claims that cosmetic products are not regulated adequately. The ACSH's review included an examination of industry practices and stewardship related to safety testing and evaluation of ingredients. It also looked at regulation by the Federal government and the history of use and testing of some specific cosmetic ingredients (Ross,2006).

This study has discovered the ingredients that possess health effects that can be found in cosmetics and personal care products. Preservatives, fragrances, and heavy metal impurities were reviewed. Many chemicals remained arguable in terms of safety and their presence in the products (Zulaikha et al.,2015).

According to this research, the Cosmetic industry is considered one of the most rapidly growing sectors both in Poland and across the world. Plant-based raw materials have rich chemical compositions, which makes them appropriate for a variety of applications. They are suitable for consumers of different ages and with various skin types, and for the treatment of dermatological diseases. Fructans, including inulin, have also found cosmetic applications in hair shampoo production. Inulin is used as a stabilizer in cosmetic emulsions and detergents. It is suitable as a base for powders and sprinkles and as a nutritious ingredient in cosmetics (Łukaszewska et al.,2019).

This study has found that Allergic Contact Dermatitis (ACD) is an increasing problem in children. This study has found that 88% of products had at least one reference contact allergen. The most abundant compounds were parabens, fragrances, cetyl/stearyl alcohol, and methylisothiazolinone (Low et al.,2018).

The researcher discovered that cosmetics is a source of lifetime exposure to various substances including para-bens, being the most popular synthetic preservatives. Special attention has been paid to absorption. Parabens and their retention in the human body in the intact form, as well as their toxicological characteristics. Particular emphasis has been placed on the estrogenic potential of parabens (Matwiejczuk et al,2019).

This study has found that cosmetic products contain a wide range of chemicals to which we are exposed every day. Fragrances were present in 52.3% of the examined products, mostly limonene (76.9%) and linalool (64.6%) but also citronellol (34.1%) and geraniol (31.5%), coumarin (30%) and hexyl cinnamal (29.2%). The most frequently identified preservatives were phenoxyethanol (48.7%) and sodium benzoate (35.6%) (Panico et al.,2019).

The output shown demonstrates the utility of the model in determining systemic and dermal exposure to fragrances from individual products and aggregate exposure. Data on the concentrations of PEA in products used in this article were obtained from limited sources and not standard, industry-wide surveys typically employed by the fragrance industry (Safforn et al.,2016).

Table 1-Comparison of existing web applications

Name	Existing System Features
	<ul style="list-style-type: none"> E-Commerce Website Buys and sells all categories of Cosmetic Products
	<ul style="list-style-type: none"> E-Commerce Website Buys and sells all categories of Cosmetic Products Provide Salon and Nail Art Services
	<ul style="list-style-type: none"> Decodes all ingredients Ability to Compare Products Ability to view a photo of the ingredient lists labeled on the Product
	<ul style="list-style-type: none"> Allows to browse for Products by category and popular ingredients Browse Brands Compare Products Does the ingredient analyzer process through text analysis
	<ul style="list-style-type: none"> Ingredient Check using Text Analyzer and Image Analyzer Browse Products Allows to Create Routines Ability to Compare Products Ability to identify Skin Care Dupes
	<ul style="list-style-type: none"> Ability to Check ingredients using Text Analysis Compare Products Search for Brands
	<ul style="list-style-type: none"> E-Commerce Website Buys and sells all categories of Cosmetic Products
	<ul style="list-style-type: none"> E-Commerce Website Buys and sells all categories of Cosmetic Products Provide Skincare Tips
	<ul style="list-style-type: none"> Ability to Check ingredients using Text Analysis Skincare Quiz Routines and Reviews Best Ranking Product Recommendation

Project Novelty

This suggested web application would be more efficient and effective when users of cosmetic products seek Skin Care and Hair Care Solutions for the challenges they are experiencing. It offers an alternative solution using Chat Bot. Through this system-enabled chatbot, system users can raise skin care and hair care concerns and get solutions.

4. Methodology

An OCR-based web application dedicated to cosmetic products purchasing and consuming customers who are interested in knowing the safety of the cosmetic products. As the Research Methodology mixed method is selected as the research choice since the research relies on both quantitative and qualitative data. As per the Techniques and the procedures Interviews, documents, surveys, and content analysis are utilized as the data collection and analysis methods of this research.

According to the current implementations, pre-processing data/images with wordings can increase the accuracy but since there are different types of bottles and textures on the

bottle surfaces, these algorithms struggle to give an accurate result.

Therefore, developing the system by building a machine learning model from scratch will need a lot of data points which are images. Therefore, in this, the most typical strategy is to collect data on all ingredients under each cosmetic product category. Here the necessary dataset is gathered from the “Campaign for Safe Cosmetics” which is a reliable and accurate website (Campaign for Safe Cosmetics,2011) by considering the side effects and harmful effects related to that particular ingredient a severity score is assigned.

The technology used to transform an image of text into a machine-readable text format is known as optical character recognition (OCR). Therefore, OCR Technology is an ideal technology for precisely recognizing text from an image. As the designed system requirement is to compare a given ingredient string against the dataset stored in the database. So, to convert the image data into an application readable format OCR technology should be used.

OCR Technology is used for the ingredient label text detection process. In this OCR flow, the image is first preprocessed so that the data is normalized. First, the raw image with RGB channels is narrowed down to black and white. This will help the OCR algorithm to determine the output within a shorter time while preserving all data points. Then the contrast of the grayscale image is finetuned to pop out the characters. The output from the OCR can have results that have few characters. If a low-quality image is provided the detected characters can include a dot, comma, or a single letter. The Outputs of these results are given out by checking the character length.

This application has a separate configuration and allows all results or limits to have results with lengths with like 3 or more characters. After this, the comparison of these detected results with the existing list of ingredients (with severities) in the database is been done. If there is a valid ingredient, then it selects its severity amount and finally, the system will calculate the average severity for all the ingredient

5. Analysis

A questionnaire was distributed among both men and women who use cosmetics to see if they are concerned about

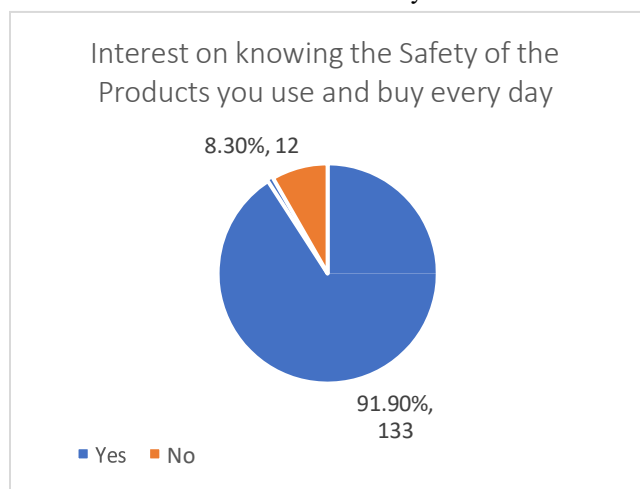


Figure 1-Interest in knowing the safety

the safety of the goods they use regularly. It was distributed among 200 people and received up to 145 responses. Out of all the respondents, 91.9% are interested in knowing the safety of the products they use and buy daily.

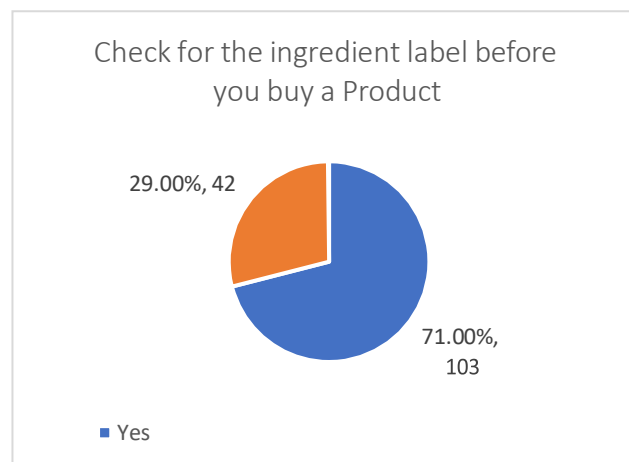


Figure2-Ingredient checking before buying a product
71% of cosmetic product consumers check for the ingredient label before they buy a product.

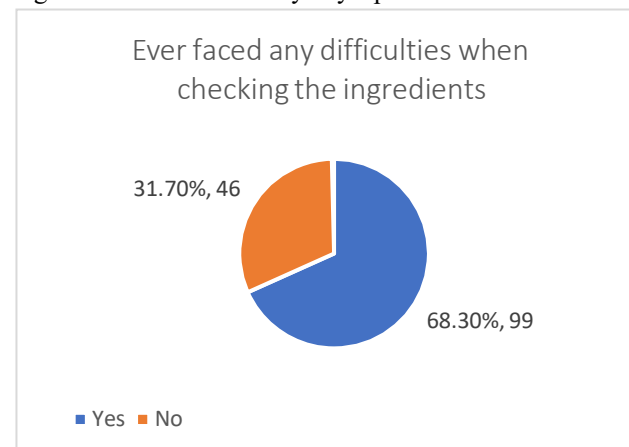


Figure 3-Difficulties faced when ingredient label checking
That assures that they are concerned about the safety of the products even though most consumers check for the ingredient label before they buy a product out of all the respondents 68.3% face difficulties in checking the ingredients

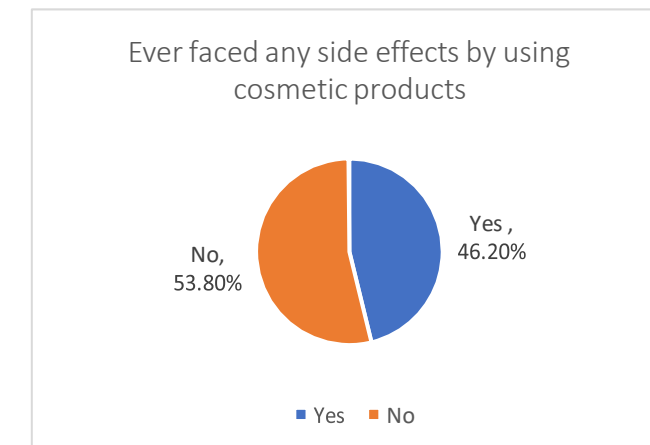


Figure 4-Regarding Side effects due to usage

It's visible that there is quite a high percentage of consumers who have faced side effects. so therefore this proposed system will be very useful to check the safety

6. Design & Implementation

The above shown conceptual design of the system which depicts all the functions,

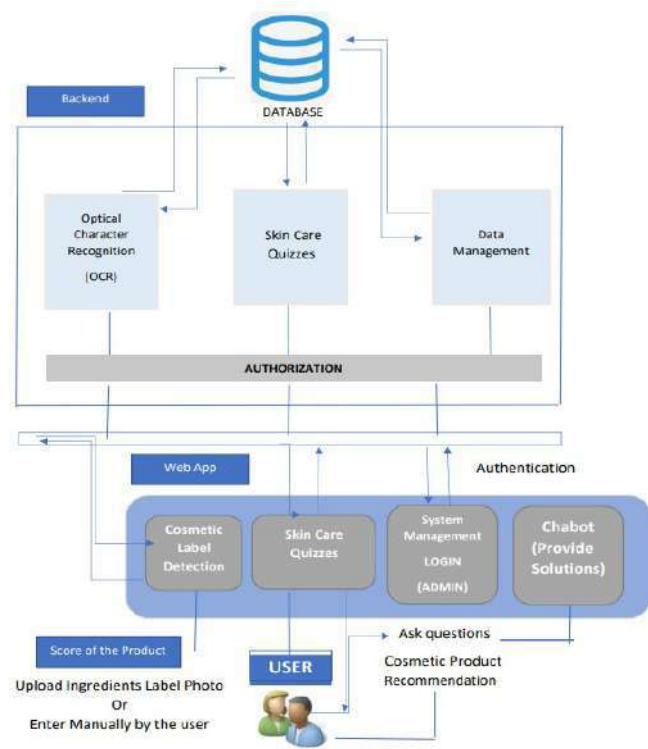


Figure 5-Conceptual Diagram

The potential beneficiaries of this system are cosmetic consumers (both men and women), beauticians, mothers (breastfeeding mothers and pregnant Mothers), baby parents or guardians, and dermatologists.

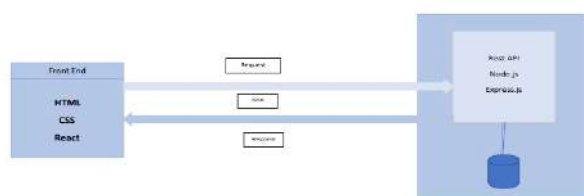


Figure 6- Overall System Architecture

HTML, CSS, and React.js were used in the front-end development of this system, and Node.js was used for the back-end development. Mongo dB is used for the database of the system and the open-source library Tesseract.js is used for text detection using OCR technology.

The functionalities of this system are,

A. Safety Assurance Process

This system provides the user the option of using either the Image Analysis Method, which requires the user to upload

a photo of the cosmetic ingredient label, or the Text Analysis Method, which requires the user to input or copy and paste the ingredient lists into the system. The OCR Technology is used for the ingredient label text detection process. The output from the OCR can have results that have few characters. If there is a valid ingredient, then it selects its severity amount and finally, the system will calculate the average severity for all the ingredients. The system detects whether the product is harmful or favorable by mentioning the severity score of each ingredient with a description total score

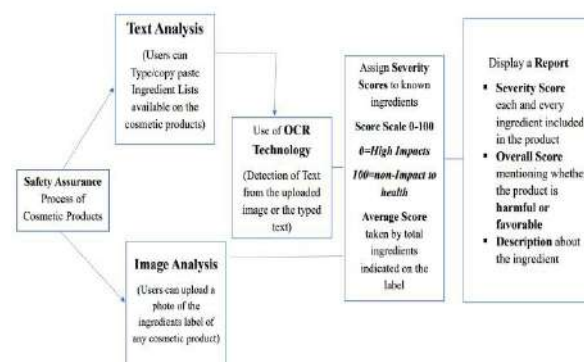


Figure 7-Main Process of the System

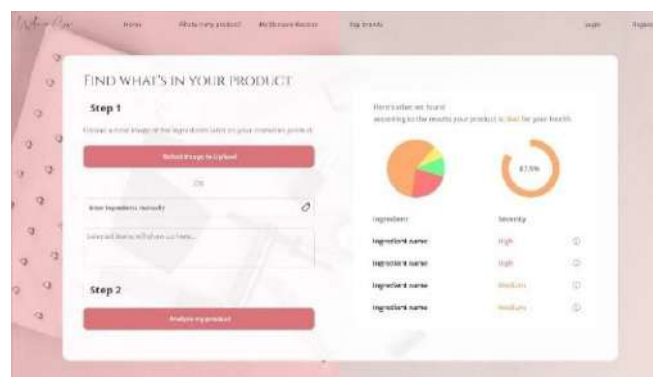


Figure 8- depicts a prototype of the Report

B. Brand Quality Recommendation

The system admin has the authority of adding high-quality cosmetic brands to the system with a brand logo and a description. The necessary data for this was gathered through the survey distributed among cosmetic consumers. The System allows the users to rate that product and provide necessary feedback on that product if they have used it before.

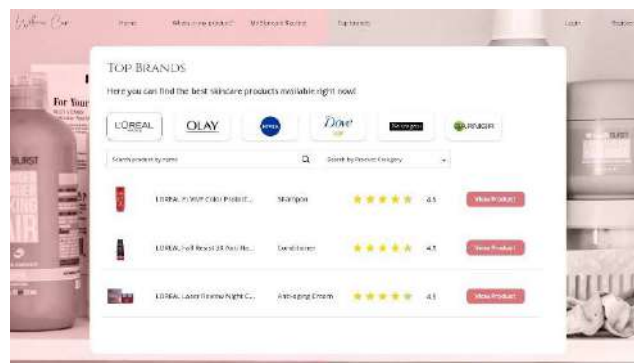


Figure 9-depicts a prototype of the top products

C. Skin Care Routine Creation

Cosmetic consumers who are willing to create their skincare routine can answer the quiz questions concerning answers given by the user a suitable skincare routine will be generated through the system and sent to the user's email

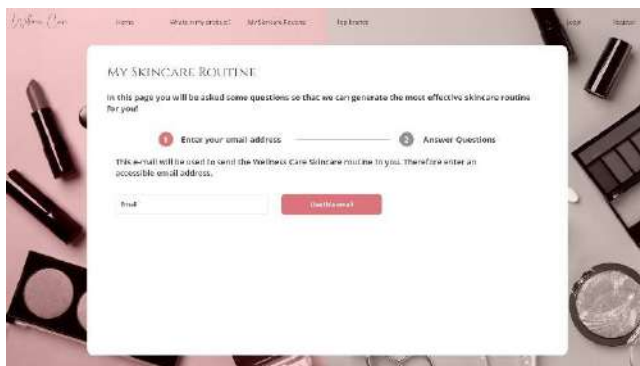


Figure 10 -depicts a prototype of the Skincare routine creation

D. Chat Bot for Skin Care and Hair Care Solutions

Users can ask questions about their skin Care and Hair Care problems and receive solutions through the Chat Bot.

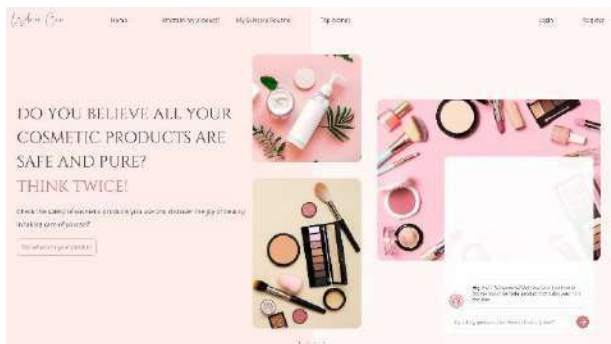


Figure 11-depicts a prototype of the Chat Bot

E. Sun Care Guidelines

The system will provide the users with a Sun Care Guideline which is very informative. It provides

- What is the time to apply?
- How often it should be applied?
- When should you reapply?
- How to apply Sunscreen
- What to look for when you buy sunscreen?

The below figure depicts the Data flow diagram of the Wellness care Web Application.

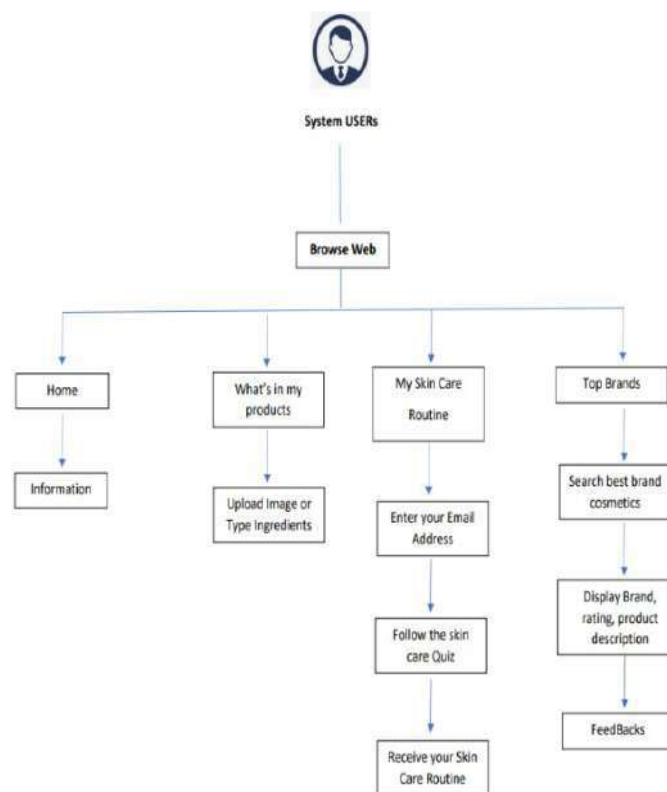


Figure 12-Data Flow Diagram

This proposed web application is designed and developed in a responsive manner which allows the user to access it whenever required by browser or on a mobile phone.

7. Results and Discussion

Table 2- Problems faced when checking the ingredients of a Certain Product

Problems faced when checking the ingredients of a Certain Product		
Problems	Respondents	Percentage
Difficulty in pronouncing the ingredient Names	40	28%
Cannot understand the meaning of the Names	80	55.9%
The font sizes of the ingredients are too small enough to read	50	35%
Not properly mentioned in the product	73	51%
Not at all displayed on the product	55	38.5%
No Problems	4	2.8%

As a result of the research study's findings, it is evident that majority of the cosmetic product consumers face difficulties in understanding the meanings of the ingredients. The other issue is that ingredient names are not correctly included in the product.

Table 3- Side Effects faced by Cosmetic Product Consumers

Side Effects faced by Cosmetic Product Consumers		
Problems	Respondents	Percentage
Skin Rashes	39	27.9%
Pimples	69	49.3%
Dark Complexation on the Skin	21	15%
Dryness and Irritation	34	24.3%
Skin Color Changes	20	14.3%
Redness	18	12.9%
Swelling	7	5%
Crusting	8	5.7%
Blistering	9	6.4%
Chapped Lips	9	6.4%
No Side Effects	49	35%

As shown in the above table popular side effects faced by consumers are Skin Rashes, Pimples, Dryness, and Irritation.

Therefore, it is clear that the suggested solution will promote the beauty industry's sales by offering a safe consumable goods, which will ultimately help to strengthen the economy.

This application is expected to expand in popularity as the world pursues the trend of using organic, non-toxic items. Due to this new application, people are prevented from using harmful products.

8. Conclusion & Future Work

This paper elaborates on a solution that can bridge the problems which the current cosmetic consumers are facing today. The system allows the users to check and verify the safety of the products they use in their daily life.

As for further improvements, this system can be presented to intended users, such as common consumers men and women, breastfeeding mothers, pregnant women, and baby guardians' dermatologists, and obtain feedback. Based on the feedback obtained, the system can be further developed to make it more effective for each pertaining user.

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Figure 10-Prototype design for the Chatbot

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