Title	Kaleido-Skin : design of user interface for people with appearance anxiety due to skin condition
Sub Title	
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Publisher	慶應義塾大学大学院メディアデザイン研究科
Publication year	2021
Jtitle	
JaLC DOI	
Abstract	
Notes	修士学位論文. 2021年度メディアデザイン学 第890号
Genre	Thesis or Dissertation
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO40001001-00002021-0890

Master's Thesis
Academic Year 2021

Kaleido-Skin:

Design of User Interface for People with
Appearance Anxiety Due to Skin Condition

Keio University
Graduate School of Media Design

Zexin Ma

A Master's Thesis
submitted to Keio University Graduate School of Media Design
in partial fulfillment of the requirements for the degree of
Master of Media Design

Zexin Ma

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Abstract of Master's Thesis of Academic Year 2021

Kaleido-Skin:
Design of User Interface for People with Appearance Anxiety Due to Skin Condition

Category: Design

Summary

Skin anxiety, or appearance anxiety, is a common problem for women in today's society. This paper will introduce the current situation of women's misunderstanding on skin condition and misleading to mental health problems. Discussing about the current issue of certain problem and researching on the current available design on market. This paper will be analyzing base on the current situation of this particular problem and searching for the way to ease this anxiety problem.

The paper will be introducing Kaleido-Skin, it is an user interface app that is made to redefine and educate the meaning of beauty especially for those who is struggling with self-value due to skin condition. The app will use it's feature and try to educate and give an extra definition to what beauty standard is. Discussing how the design of Kaleido-Skin will be able to resolve the problem by using different methods of presenting beauty. The progress and the concept of the Kaleido-Skin, and from prototype that was listed in the design chapter, the evaluation that was conducted in the evaluation chapter. As the model for the design, the Kaleido-Skin is a platform where people can be able to get to understand and learn, from their flaws using the tool of Kaleidoscopic picture/image based on their actual problem. And using the picture/image to redefine the uniqueness as beauty standard in order to achieve the goal of empowerment.

In addition, the paper will also be discussing the result of the design by conducting interviews with people who has experience and struggling with certain

problem. And also will be discussing about the future possibilities of the design. Create new beauty standards for each person and help empower women's confidence.

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Keywords:

personal value, skin condition, education, user interface, beauty standard

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Acknowledgements

the people that was able to give me the opportunities to test my prototype. Thank you for giving me honest feedback and provide me with your results.

Thank you!

Zexin Ma

Chapter 1
Introduction

1.1. Background

The world has been changing through the past centuries, some results has find out that number of people with mental illness has increased significantly in the recent years especially in Japan. Nowadays, Mental illnesses are common across the world, and specifically in Japan, it has been becoming a social problem not only among Japanese society but also among foreigner in Japan. According to the World Health Organization was established, depression has been affecting over 350 million people; bipolar or effective disorder affects over 60 million people.

Some results has find out that number of people with mental illness has increased significantly in the recent years especially for those who was born after year 1998 (who people that's born after social media become one of the most important part of our lives.) Nowadays, Mental illnesses are common across the world. According to the World Health Organization [1] was established, depression has been affecting over 350 million people; bipolar or effective disorder affects over 60 million people.

Due to the influence of social and cultural factors, women's bodies have always been in the context of being evaluated and viewed, and their bodies and appearances often become an important part of women's self-worth. This phenomenon is called sexual objectification by scholars, that is, a woman's body, body part, or sexual function is separated from her, and reduced to a pure tool or regarded as a representative of the woman's own appearance and anxiety among the masses. The frequency of occurrence is becoming more and more obvious, especially among women aged 10 to 30. In such a big environment, many people

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1   World Health Organization: `https://www.who.int`

will choose to use makeup or plastic surgery to achieve their satisfaction. But at the same time, in such a process of pursuing beauty, many people slowly enter an aesthetic misunderstanding.

Patients with body dysmorphic disorder often have some seemingly ordinary behaviors, and these daily behaviors can give us a better understanding of the fact that many people in modern society are affected, an graph of behaviors for body dysmorphic disorder is listed below in Figure 1.1:
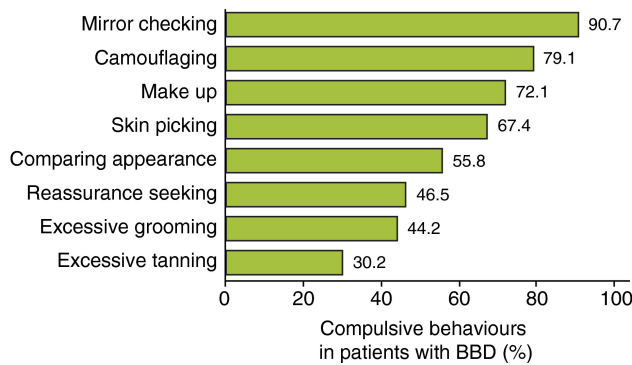
(Source: Body dysmorphic disorder in

patients with acne: a multicentre study [4])

Figure 1.1 Top Behavior for BBD Patients

This is problematic as untreated mental health issues can lead to ruined lives, and in some cases untreated cases of depression related to skin disease have been related to suicide.

Some people claim that " In the beginning I could not go out, would not look in the mirror, became withdrawn and probably very depressed. Since joining the group I have realised that it's okay to be different and that the sky won't fall in just because I lost my hair. Some claim that they are somehow needed to be slimmer, have a better looking nose, better looking eyelid etc. And this has created a trend of competing among each other and eventually becoming one of the problematic that is leading to mental illness among the competition.

1.2. Problem Statement

As a female living in Asia, I've been having these problems as some other people they've been having the problem. Me myself since I was a teenager I have been very uncomfortable about my looks. And it has made a very big influence throughout not only my teenage years but also until now. However, since I have moved to Japan, getting to know some of the people from the skincare company and they have been giving me a lot of advice that makes me feel confident again. And the fact is it it very largely influencing a person's life and their emotion and mental states.

In today's society, appearance seems to have become an epidemic. People are becoming more and more addicted to their appearance, and many people are increasingly dissatisfied with their appearance, which has had various influences on modern people. Appearance defects are obvious to others, and are different from the normal appearance standards defined by traditional human words. There are two main causes: congenital appearance defects and acquired appearance defects. Congenital appearance defects include obvious abnormalities at birth (such as cleft lip). Causes of acquired appearance defects include: trauma (traffic accidents, burns, etc.). The impact of appearance problems on people runs through all stages of life, involving many psychological aspects: negative emotions (anxiety and depression, etc.), negative self-concepts and low self-esteem, difficulties in interpersonal communication, etc.

Also, as a foreigner living in Japan, I have felt the unbalance about the skin-condition treatment differ from what I've experienced in United States and China. Due to structure of society and difference in culture, Some people, especially foreigners in Japan who is struggling with problems with their skin claims that it is very difficult to find conveyable treatment to help them to be comfortable about their skin. And due to different of culture, they've felt especially unsafe about their condition.

At the same time, many people with appearance anxiety and lack of confidence in the quality of their own skin say that when they test or really rub their own skin condition, they slowly become more insecure about their condition because the enlarged pictures taken by the camera will magnify certain flaws of their skin. At the same time, if you go to the doctor hastily, you will be intimidated by some

3

complicated and cumbersome medical names.

1.3. Concept of Kaleido-Skin

This research paper is based on the related works and the results of research that I've conducted in the past two years in KMD program, the paper will provides suggestions to the problem of mentally or emotionally disorder due to the cause of one's skin condition. In the past two years, I've been hoping that the creation of Kaleido-Skin, an interactive skin scanner app can make people not only find their confidence back but also gain the education about their own self as far as their skin and own beauty standards.

I will be discussing about Skin anxiety, or appearance anxiety, is a common problem for women in today's society. What is the situation of this particular problem in Japan within the foreigner society and what measures or methods have been taken to exacerbate/address this anxiety problem. Also will be including the definition of "beauty" is too single, I developed the Kaleido-Skin, the purpose is to make education, and composition of beauty gives a broad definition using the graphic and definition of kaleidoscope as the inspiration. Meaning that everyone is unique and beautiful in their own way. In addition, it can connect with Skin Professionals to provide them with one on one service.

To achieve this goal, this research project will be take a deep look into related works that has been done already, as far as designing a problem solving prototype that is related to the subject, and then an evaluation of the prototype will be also included in the paper. Furthermore, in the end, will be concluding and seeking for future possibilities for the project.

1.4. Contribution

Reports of high increased suicide cases due to unsafe feeling about their own skin condition. People with such problem is also associated with clinically significant emotional distress, changes in body image, difficulties in close relationships, and impaired daily activities.

And while this problem has happens and influencing a large amount of people

around the world. Cases of suicidal due to mental illness has been reported in Japan especially due to emotion and pressure in society. Cases has also been increasing among the foreigner society in Japan, they've felt the unbalance of what skin-condition has brought unneeded anxiety into their daily life. Kaleido-Skin is designed to help emerge the uncomfortable that has been brought by certain issues, and the features of Kaleido-Skin shall create new standard for them to become more confidence with who they are. And creating that environment, they need to know who they are. Understanding your own self is one of the most important thing to success confidence.

1.5. Thesis Organization

The contents of each chapter as follows:

Chapter 2: Literature Review Chapter, which studies the factors of appearance anxiety and anxious feeling regarding skin condition, as well as how much does skin condition be in Body Dysmorphic disorder, how effective can it be link to serious mental illness problems. This chapter also conclude some related works that has been done in the past on skincare including service such as "HIFUMIRU", discuss the pros and cons of those projects, and how the studies of Kaleido-Skin can bring those idea forward.

Chapter 3: The Design Chapter, which describes the concept of the Kaleido-Skin, the meaning after the design, and the process of the prototype building. The prototype of the user-interface Skin-Scanner mobile app that offers the platform for educational information using Kaleidoscope images instead of text or actual pictures of flaws to avoid anxious emotion that comes along, Kaleido-Skin is designed for those who has curiosity about the condition of their skin especially for those with different skin type and race, or people with languages barrier in Japan.

Chapter 4: The Evaluation Chapter, this chapter will lists and concludes the process of evaluation from the prototype (Kaleido-Skin) on 3 different participant with different skin and cultural background as sample tester, Comparing their emotion changes before and after using Kaleido-Skin, observation record, and the result of survey that was conducted before and after using the prototype. The evaluation method used for the analyse is conducted by observing and interview-

ing. An analyzing report will also be in the end of the evaluation chapter.

Chapter 5: The conclusion chapter, this chapter summarize the overview for the whole project according to the analyzing from the evaluation chapter. The summarize concludes the whole design process and the future planning and expectation. In the end of chapter also describe the possibilities for the future works additionally to this research project.

Chapter 2
Related Works

2.1. Concept of Beauty and Role of Skin

2.1.1 Beauty and attractiveness

It is an instinct of human beings to be attractive. Human beauty has an immense aesthetic value. In fine art and literature, certain characteristics of human beauty have been adored. Beauty has not been limited to attract mates, but it is a status issue among same-sex peers. [5] Regardless of her race, ethnicity, cultural background, or other different factors, every woman wants to be beautiful. The beauty consciousness among women is more than the men. Therefore, they are likely to suffer more from social anxiety, prejudices and inequality based on their appearance. [6] Physical beauty consists of several aspects, such as height, weight, facial appearance, body shape etc. Skin or complexion is among such physical aspects.

2.1.2 Skin: An Imperative Factor of Beauty

Skin is one of the most important determinants of human beauty. In 1967, zoologist Desmond Morris stated, "Flawless skin is the most universally desired human feature." Several factors are responsible for skin's appearance. These factors are intrinsic and extrinsic. In intrinsic factors are genetically determined, and they influence overall health, stress level. These factors cause skin issues such as acne, rosacea, or eczema. Extrinsic factors include ultraviolet exposure, changing lifestyle, pollution, diet, sleeping pattern, addiction and day-to-day skincare habits. El-Domyati and Kligman discuss the results of intrinsic and extrinsic factors on the skin. These results are presented in the following table.

intrinsic factors on skin	extrinsic factors on skin
Thinning, Atrophy, fine lines, and dryness	Stratum corneum thickening, mottled pigmentation, dullness, dryness, wrinkles, laxity, sagging skin, prolonged wound healing, dryness, dullness, wrinkles and laxity.

Table 2.1 Results of Intrinsic and Extrinsic Factors on the skin [7] [8]

2.1.3 Strategies for Healthier and Refreshing Skin

Gardner calls skin the largest organ on the human body. It consists of several components such as minerals, chemicals, lipids, protein, and water. Proper skincare is extremely crucial for keeping the skin healthy and fresh. Some simple measures can be taken to maintain the health of the skin. They include thoroughly cleansing the skin by removing make-up before going to bed, using a gentle soap, and taking a balanced diet and nutrition.

The mantra for maintaining the beauty of the skin to understand that "beauty comes from inside". It means that there is a strong connection between nutrition and diet, and skin condition. One of the most effective strategies for maintaining the skin's health is a well-regulated lifestyle such as physical exercise, body care and proper diet such as anti-oxidative food. Fruits and vegetables are the healthiest and safest methods or nutritional strategies to sustain the skin's youthfulness. [9]

2.1.4 Skin Color and Social status and Satisfaction level

Skin color needs to be considered because it is one of the factors of dissatisfaction with the skin. It was observed in previous studies that those who want a different tone of the skin favored being lighter more than darker. It is also observed in Maxwell et al.'s study that black men like lighter skin. Skin color satisfaction is also closely associated with overall appearance and face. [8] Falconer and Neville developed a Skin Color Satisfaction Scale in which they observed that skin color is also associated with body image dissatisfaction. There is an inferiority com-

plex among the blacks regarding their skin tone. Hunter analyzes the impacts of skin color on life outcomes. The author studied African American and Mexican-American women. While analyzing the outcomes of skin color on social status, Hunter uses the historical framework of European colonialism and slavery in which the fair complexion is perceived to be the superior status. [10] Skin color stratification interacts to limit the opportunities of Mexican American and African American women.

Gleiberman et al. researched finding the relations between skin color and socioeconomic status among blacks. The authors explained the relation between skin color and BP by considering skin color as the marker of socioeconomic events such as racial discrimination and its consequences such as self-esteem, genes of African origin, and the chances of high blood pressure. [11]

2.1.5 Skincare Conceptions

Water Keeps Skin Hydrated

A clear and radiant complexion is everyone's dream. However, while caring about skin and its health, people have several misconceptions. One such misconception is the water keeps the skin hydrated. However, there no such empirical evidence of whether drinking water has a good or bad impact on the skin. No scientific study has been published to prove it. [12] Nevertheless, it has been partially proved in the study of William and Krueger, in which the authors concluded that more than 2L of water per day could have a significant impact on skin physiology. However, the exact pathogenic factors have not yet been discovered. [13]

Right Cream Keeps Skin Younger

According to a document published by Harvard Medical School is that there are several myths. The first myth mention in the article is that the right skin cream keeps skin younger. However, along with the skincare cream, there are other treatments to keep the skin look younger. Therefore, it is not right to conclude that any specific cream is good for the skin. According to Gancevicience and his fellow researchers, skin aging is a complex process and influenced by the combination of endogenous (intrinsic) or exogenous (extrinsic) factors. Daily skincare

helps to keep the elasticity and smoothness of the skin. [14] One more approach to preventing wrinkle formation is reducing inflammation by topical or systemic antioxidants, which should be combined with sunscreens and retinoids. [15]

2.2. Skin Condition and Diseases

2.2.1 Skin Diseases and their Impacts on life

Picardi and Pasquini conducted a study on the biopsychosocial approach towards various skin diseases. According to the authors, skin and mind are interlinked. They also referred to the epidemiological studies confirming the high prevalence of psychiatric disorders among dermatologists' patients. The skin-related problems bring psychological distress, poor psycho social functioning and other such diseases. [16]. The authors suggested the biopsychosocial approach to manage the patients' skin disease. It is possible through the collaboration between dermatologists and mental health professionals. Following is the biopsychosocial model Verhoeven developed.
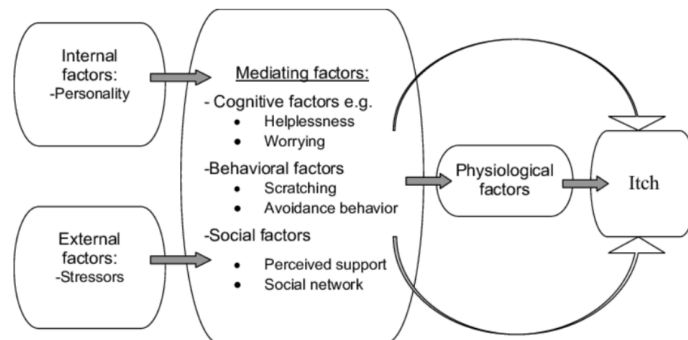
(Source: [16])

Figure 2.1 Biopsychosocial Model

Skin disease has been a psychological burden among people. In their study, Dalgard carried out a study among dermatological outpatients in thirteen European countries. Another study observed that skin condition is the fourth commonest cause of nonfatal disease burdens. The rank is produced in the following table:

Cause	Global YLDs	Rank
Low back pain	80,666,896	1
Major depressive disorder	63,239,334	2
Iron-deficiency anemia	42,505,250	3
Skin conditions	**33,717,725**	**4**
Neck pain	32,650,797	5

(Source: [3])

Figure 2.2 Skin conditions years lost due to disability (YLD)

This burden is in the form of infection, disability related to eczema among adults. Ulceration, other skin conditions, NMSC, infections, and pruritus. Scabies is one of the commonest skin conditions worldwide. Poor skin conditions are the key factors of loss of healthy life among the patients. It is crucial to incorporate skin disease treatment and prevention in national and global policies according to Hay. [3] Skin conditions impact the daily activities and emotional status of the patients. The following chart presents how skin conditions affect individuals' daily life.

Skin Condition	Percentage of people affected
Mood Swing	21%
Increasing Stress Level	21%
Increasing stress level	14%
Relationship	14%
Sleep	13%
Hobbies	12%
Work	11%
Low bad mood	31%
Embarrassment or self-consciousness	31%
Worry Anxiety	19%
Social Isolation	12%

Table 2.2 The outcome of Skin Condition [3]

Skin conditions impact various aspects of the relationship, such as sexual function, sexual intimacy and romantic relationships. Barison et al. investigated four key themes to examine skin conditions and their impacts on relationships and sexuality. These themes include embarrassment and shame, impaired sense of attractiveness and sexual avoidance, relationship issues, and lack of professional support. [3]

2.2.2 Skin Condition and Mental Disease

Mind and skin are intimately related to each other. The skin problems such as acne,eczema,hives,rosacea,psoriasis,alopecia (hair loss), vitiligo (depigmented white spots on the skin), trichotillomania (hair-pulling) and self-mutilation disorders, many skin disorders have their deep association with the human psyche. That is why the interrelated skin and mental problems are also referred to as "psychodermatology." [17] It is a study of human mental and emotional states and their relation to their skin condition. The field of dermatology has now embraced an integrative approach by collaborating itself with psychology and psychiatry. This collaboration may help dermatologists think of intervention strategies such as counseling and relaxation therapies for patients with skin diseases. One exam-

ple elaborated in the research is acne. When the patient's stress level becomes high, the body releases stress hormones that can increase the oil production level of the skin and eventually, it may cause pimples on the skin. [18] While explaining the causes behind the connection of skin condition and its association with a psychological condition, the research articles state that the brain and skin grow from the same cells during the womb development process. Therefore, when people feel stressed out, this stress is reflected on their skin.

2.2.3 Skin Condition and Self-Esteem

Skin condition is among the most prominent reasons for decreasing self-esteem. The findings of the survey conducted by the British Skin Foundation have been mentioned in this report. In this survey, 729 people were asked questions related to their skin disease and self-esteem. All-Party Parliamentary Group on Skin referred to the report related to skin problems and self-esteem. Almost half percent of the participants (47 percent) stated that they were the victims of verbal abuse. [19] The key cause behind their low self-esteem was that they were rejected, stigmatized and discriminated against due to their skin condition. The impact of skin conditions on teenagers' self-esteem is devastating, according to the report. The children receive negative reactions on their skin which leads to decreasing their self-esteem. They are likely to develop body-specific shame. The shame and distress among the children regarding their skin condition continue in their adulthood also. Hair loss is also one of the dermatological diseases that adversely impact women's sense of femininity. In some studies, it was also revealed that women are more vulnerable to skin-related distress than men. Green enlists the following psychological problems that occur due to skin conditions.

➢ Anger

➢ Anxiety

➢ Avoidance

➢ Bullying

➢ Depression

➢ Embarrassment

➢ Exhaustion

➢ Frustration

➢ Guilt

➢ Helplessness

➢ Increased Alcohol Intake

➢ Irritability

➢ Low Confidence

➢ Low Self-esteem

➢ Performance Issues

➢ Poor Body Image

➢ Relationship Issues

➢ Resentment

➢ Secretiveness

➢ Sexual Problems

➢ Sleep Deprivation or Sleeplessness

➢ Social Isolation

➢ Stress

➢ Suicidal thoughts

➢ Suicide

➢ Teasing

➢ Withdrawal

(Source: [20])

Figure 2.3 Psychological Issues Due to Skin Conditions

2.2.4 Skin Condition and Suicide

In the last century, some cases of suicide were reported. Cotterill and Cunliffe's study referred to the two dermatologists' investigations of the individuals with dermatological problems. According to the authors, it led to investigate the prevalence of suicidal ideation and attempt at suicide in dermatology. They committed suicide. [21] Another study of 480 patients with different skin issues such as non-cystic facial acne, alopecia areata, atopic dermatitis, and psoriasis. These patients had depressive symptoms and suicidal ideation. The suicidal ideation among the patients was due to interpersonal relationships caused by the skin problem. Chronic skin diseases significantly impact their quality of life and restrict them from fulfilling their social roles. In a recent study conducted by Pronizius and Voracek in 2020, three dermatologists reported some patients who committed suicide in 2017. They were suffering from atopic dermatitis, psoriasis, or acne. Blemished skin is also embarrassing for the patients, and it is one of the causes of their low self-esteem and consequent suicidal ideation. Dermatologists can help these patients in identifying the skin diseases and prevent them from any suicidal thoughts. [22] Picardi and his fellow research state that dermatologists can help individuals with suicidal thoughts due to their skin condition. They have a very important role in preventing self-harm in patients with skin disease. However, they

must seek support from psychologists, psychiatrists, counselors and other mental health professionals. This collaboration will help to understand the mental need of the patient with skin problems. Ultimately, dermatologists will significantly prevent suicidal cases among patients with skin diseases. [23] MacMillan, in her article discussesEczema, one of the inflammatory skin diseases. Around 18 million people in the United States are suffering from this skin disease. [24] The people with this disease carry a heavy psychological burden. The author referred to research published in JAMA Dermatology, in which a meta-analysis of 15 studies was conducted. Along with this study, 300,000 eczema patients were researched. [24] It was observed that around 44 of people have suicidal thoughts, and 36 percent of them have tried to commit suicide. [24] The researchers mentioned in their research paper that patients with eczema feel ashamed of themselves due to the visibility of this disease on the skin. It is also painful for them due to consistent itching, burning and dry skin. It can also result in sores or painful blisters. [24] Along with physical pains, embarrassment, some patients with eczema also face financial hardships because the medical cost for eczema treatment is significantly high. [25] Additionally, they have to miss their days of employment due to this disease. They also feel fatigued due to this skin condition. All these factors eventually lead to suicidal thoughts, attempts and actual suicide. The study also found that patients with eczema can die by jumping from tall heights or poisoning themselves. [25] It was also observed that dermatologists tend to overlook mental problems such as anxiety and depression in patients with eczema. [25] For the patients, the only way to end their pains and embarrassment is death. Therefore, they follow the path of suicide.

2.3. Skin Care Thru Advanced Technology

2.3.1 Previous works of Skin-Scanner

The unprecedented advancement and technological innovations have transformed the field of Dermatology. With innovative technologies, the skincare industry has grown, modernized and become sophisticated. With the emergence of new technologies, consumers are looking for personal care products accompanied by

new technologies in the innovative formulation [1]. In this section, a review of those technologies has been taken.

2.3.2 Novel Cosmetic Delivery Systems

Arora, Agarwal, and Murthy (2012) studied advances in cosmetic formulation technology and novel cosmetic delivery systems presented in the following table.

Vesicular Delivery Systems	➢ Liposomes ➢ Niosomes ➢ Silicone vesicles and Matrics ➢ Multi-walled delivery systems
Particulate Systems	➢ Microparticulates ➢ Porous Polymeric Systems ➢ Nanoparticulates
Emulsion Delivery systems	➢ Microemulsions ➢ Liquid Crystals ➢ Multiple Emulsions ➢ Nanoemulsions ➢ Pickering emulsions
Other Delivery Systems	➢ Cyclodextrin complexes ➢ Carbosomes ➢ Dendrimer and hyperbranched Polymers ➢ Nano Crystals
Delivery Devices	➢ Iontophoresis ➢ Cosmetic Patches

(Source: [1])

Figure 2.4 Novel Cosmetic Delivery Systems [1]

2.3.3 AI, Home Base Applications

Elder. elucidate the role of AI in customized skincare and hair care. The authors referred to the Startup from California called PROVEN Beauty which offers the consumers a customized skincare product. Before making these skincare products, the companies conduct a survey examining the clients' skin and hair characteristics and the desired aesthetic outcomes. The customer information is procured from the Beauty Genome Project, a massive database of skincare. This database includes customers' reviews, academic peer-reviewed journals and articles regarding skin conditions and care, skin products and various ingredients used in skin

products. [26] Based on the information procured from customers' surveys and the database, the company makes tailor-made products that suit each customer's skin.

2.3.4 Augmented Reality

Augmented Reality, a type of AI, is another technology used in the skincare industry. The world-leading cosmetic company L'Oreal has two Augmented Reality Apps; In the first app analyzes skin conditions through Vichy Skin Consult AI Website. This app helps the customers to know the skin condition, and it also predicts the changes that are likely to take place in the future. The skin conditions such as dyschromia, dryness, and wrinkles are assessed. The second application is Neutrogena's Skin360 App uses a smartphone's camera to assess skin problems such as dark spots, under-eye circles, wrinkles, and fine lines. According to Merothiya, Augmented Reality is a great experience for consumers. It is a fine blending of brick-and-mortar and online experience. Augmented Reality blends consumers' real-time video and thus creates a new experience. A virtual makeup app helps the consumers check the product's impact on their skin on the screen in front of them. By using this app, they can buy beauty and skin products without physically visiting the store.

2.3.5 Professional Applications and their Significance

Dermatologists and skin care specialists widely use the VISIA Skin Analysis System device for a systematic and comprehensive skin condition analysis. [27]. It helps to analyze the skin conditions, including wrinkles, Ultra-Violet Impact, skin texture, spots, red marks. A portable 3D photography system is used to conduct clinical trials on skin conditions and anti-aging skincare regimens like this device. Avadhanula et al. state that AI and AR have revolutionalized the diagnosis procedures. The applications such as Olay skin advisor analyzes users' photo or image and tells the age of his/her skin. It also focuses on other areas of skin conditions such as skin damage, and the products are suggested to the clients based on the diagnosis. However, this app is not useful for detecting any fatal skin diseases. DoctorMole is one more application developed to differentiate between normal

and cancerous moles. The users can take a snap of their problematic mole and put it in the application for testing. The application tells whether the mole is normal or any disease is there. The formula is that if the dimension of the mole is symmetric, it is a normal mole. The Emergence of AI and AR is driven by the recent market trend and consumers' changing demands. The companies are keen to use AI and AR technologies because the consumers' possibility of purchasing beauty products gets increased when they use these technological devices. The enhancing experience motivates the customers to spend money on beauty products when they take a virtual experience of their skin conditions after applying them. The millennial generation prefers to use YouTube, Instagram, and other social networking sites and virtual platforms to make decisions about purchasing products rather than taking advice from any makeup advisors. AI and AR technologies are the best solutions to keep these consumers engaged. Trying out and testing the whole product collection without using a single tissue is convenient for the customers. AI and AR are also used to show the impact of the products on the face and skin. The customers can see their transformation through these sophisticated technologies. AI and AR medical diagnosis thus are beneficial for two primary reasons. The key activities related to skin diagnosis are performed using the technology, which saves a significant amount of time. In the absence of such technology, the work must have been done manually and required a substantial number of medical experts. Moreover, there are some skin problems and conditions that are hard to identify for humans. Machine and technology are the only alternatives to identify them and assess the complicated skin issues. Detecting some cancer cells manually is indeed difficult, probably not possible. Technological innovation is a blessing for identifying, preventing and managing several complicated skin issues.

2.3.6 HIFUMIRU APP

introduction to the APP

In the process of research, the authors found a program that can be borrowed from its model, the name of which is HIPOKURA, a program dedicated to specialized physicians. This application will allow doctors to share their experiences

and processes with other doctors who is having the problem, as well as to answer questions to novice doctors or to share information in areas they do not understand, reaching results when doctors can help each other shown as Figure 2.5.

(Source: https://hpcr.jp/product/)

Figure 2.5 HIPOKURA

In this application, they not only provides with the answers to doctor's doubts, but they also provide many other services as a platform, such as: article and research searching engine, using the most advanced search algorithm and system, which allows you to search accurately and efficiently. It can be as easy as a Google search or as advanced as a professional search. Medical news from around the world. There are more than 1,000 medical-related news articles published every day. From these, the supervising physician selects news related to medical trends every day.

2.3.7 Consulting About Skin Condition Problems

In addition to the services described above, the most important thing is that the service provide consulting services for the patients with medical help needs. Utilizing the quality medical resources on the platform, this service have many doctors from not only major departments but also minor departments. Especially

for dermatology and ophthalmology, the user for this service will receive one-on-one consultations with specialists. For other areas, the users can feel free to consult with them "on the couch" in the application.

On this platform, you can take pictures of the details and problems you are more concerned about, and the doctor can promptly prescribe the right medicine for your illness and assist you one-on-one to help you understand and assist you with the healing process.

(Source: HIFUMIRU)

Figure 2.6 HIPOKURA APP [2]

Pros and Cons

The advantage of this platform is that through the communication with the doctor, you can gain an awareness of your skin condition and get a general process and information on how to manage your skin. Also, because of the resources of the doctors on this platform, you can achieve a very professional review and understanding.

But this platform also has some inadequate points, as opposed to those who have appearance anxiety, to zoom in and take pictures of their most dissatisfied parts, and then get the so-called cure through the comments of doctors, especially very professional ones with all the medical terms, will on the other hand gives them a vibe of being sick and will mis-leading them to dis-confidence, and this will achieve an anxiety counter-effect for them.

2.4. Summary of Related Works

The literature review helped to explore empirical evidence related to skin conditions and various skin issues. Healthy and glowing skin is one of the inevitable beauty parameters. Several factors are responsible for the changes in skin conditions. The previous studies focused on two key factors; intrinsic and extrinsic. Previous scholars have also focused on the strategies to keep the skin healthier and refreshing. The review also focused on the socio-cultural aspects that have a close connection to skin color. People carry several conceptions regarding skin. Some of them are myths, while some of them have proved true with some scientific evidence. These myths are related to the role of water, creams, and skin complexion. The LR focused on various skin conditions, diseases, and their impacts on individuals' day-to-day lives. The skin condition and issues have their direct association with mental health. It lowers the self-esteem of the person. Anxiety, depression and suicidal ideation are the adverse outcomes of skin problems. The previous studies were extensively reviewed concerning this factor. Lastly, the studies were explored to discover the emerging technologies that have transformed the skincare and beauty industry. It was observed that many smart apps are developed to assess skin conditions and enhance the facial look. The researcher is experimenting with such an app to beautify the skin and assess the skin treatment. A device inspired by a kaleidoscope is also in the experimental stage. In this context, the findings derived from the literature review are certainly useful. In the subsequent chapter, the design of the app and device is explained thoroughly.

Chapter 3
Design of Kaleido-Skin

As explained in the previous chapters, lots of people are facing uncertain and misunderstanding of beauty and anxiety towards their skin-condition because of the lack of understanding and mis-leading information regarding treatment that can be taken place. Issues like this is very difficult to consult, and I've also did several previous research on it in the literature review session. Therefore, this design is intended to mitigate the problem by designing the picture instead of text and the design concept of Kaleidoscope to solve the established problem from a new direction.

At the beginning, the author had a rough idea of using Kaleidoscope as the model for the design, the Kaleido-Skin is a platform where people can be able to get to understand and learn, from their flaws using the tool of Kaleidoscopic picture/image based on their actual problem. And using the picture/image to redefine the uniqueness as beauty standard in order to achieve the goal of empowerment.

The design objective of Kaleido-Skin is to create the skin condition learning platform that is based and focused on using images to ease the anxiety of seeing pictures of flaws on skin or actual medical names that can make people feels anxious. The research questions that will be addressed as base for the design are the followings

3.1. Overview of the Complete design

Kaleido-Skin is designed to ease the anxiety of individual users who suffer from appearance anxiety due to skin problems. The prototype is divided into three main parts: understanding, learning, and enhancement.

Kaleido-Skin is a mobile app based on scanning the skin using a mobile camera. It is a quick scanning to know the type of skin. It will be easy and user-friendly, and any individual can easily take a selfie of the skin and scan it.

The author was motivated to design to address the acute socio-psychological issue of wrong parameters of ideal and beautiful skin. The author have observed the issue among my friends who are not satisfied with their skin and anxious about it. In media also the author have learned that young people take drastic actions due to the anxiety created by the negative self-image of their skin. Previous studies focused on the suicide risk due to their perceived skin condition. Therefore, it is necessary to convince young people that the idea of beauty and ugliness is subjective, and they should respect and accept them as they are. Young people should take care of their skin (regardless of its color and condition) and make it fresh and healthy in its original form.

Through out the design and the map and flow of the Kaleido-Skin experience, the goal is to get people to understand and learn about their own condition, and by rewarding the user using check-in features in order to achieve the goal of being able to ease the worries and empower their own beauty.

3.1.1 Design Inspiration

Concept of Kaleidoscope

Because of the difference in aesthetics and the lack of self-awareness, many women have been experiencing frequent problems of appearance anxiety in recent years. The author has expressed the critical nature of this problem in the first two chapters, and after talking about these social problems the author will bring her solution to this problem and her design inspiration.

The author's design concept and inspiration comes from an optical instrument - the kaleidoscope. A kaleidoscope is an optical toy that appears as a beautiful "flower" when you look into the eye of the tube. Turn it a little and another

flower pattern will appear. It is called a "kaleidoscope" because the pattern keeps changing as it is turned. The structure of the kaleidoscope is to place a brightly colored object at one end of the cylinder, place a prism in the middle of the cylinder, and seal the other end with a hole in the glass, so that a beautiful symmetrical image can be observed by looking through the hole. The images in the kaleidoscope are always unique and remind me of the uniqueness of beauty used by every human being.

The mystery of the beauty of the kaleidoscope lies in its intricately designed mirror structure and flowing patterns. Like its name KALEIDOSCOPE, the kaleidoscope brings together the beautiful Greek words KALOS (beautiful), EIDOS (shape) and SCOPE (see) to encapsulate its most important features, as shown in Figure 3.1. The name design of this design also follows this Greek allegory, following the part of KALEIDOS = KALOS (beautiful) + EIDOS (shape), plus Skin meaning skin, the implication being that this design is intended to be depicted in the pattern of picture shapes: no matter how the skin is, it has its own beautiful point.

(Source: Oxford English Dictionary [28])

Figure 3.1 Definition of Kaleidoscope

16 Types of Skins

In addition, the authors found that since in the kaleidoscope, pictures/images are created by small shapes in the kaleidoscope machine, and the authors also found in their research that skin types can actually be categorized into 16 different types, and the influencing factors only include four major directions: Dry vs oily, Sensitive vs resistant, Pigmented vs non-pigmented, and Wrinkle-prone vs tight.

(Source: Baumann Skin Type Indicator [15])

Figure 3.2 16 skin personalities

The sixteen different skin types are in fact impressed by these four factors, as shown in Figure 3.2. Therefore, there is a degree of similarity between the two, and the kaleidoscope of special features is used to create the skin special would also be a good way to express it. In Baumann Skin Types system is a skin-type classification system defining 16 skin personalities, as shown in Figure 3.2.

In the figure we can also see that although there are 16 different skin personalities, there are four fixed known factors of the two levels to determine out, so in the design, only four groups of contrasting colors need to be used for the design of the graphics.

3.1.2 Pre-Study

Before starting the design, the author was able conducted a 16-question survey and a more detailed interview with two representative users in order to understand the real needs and context of the users.

Pre-Survey

In this Pre-survey, I asked the participants to answer 16 questions about their skin and about shape shapes through multiple choice and open ended. The first 6 questions were multiple choice questions about their knowledge and understanding of their skin, the middle 5 questions were about skin management, and then the next 5 questions I asked them how they felt when they saw some shapes in an open ended format.

This survey was finally participated by 37 people. They were from Japan, China, the United States, Korea, etc., all aged 18-35, of whom 4 were male and the rest were female.

On skin awareness and understanding:

More than 87% said they cared a lot about their skin, and even often felt anxious about their skin.

More than 63.6% said they have experienced skin anxiety, especially about common skin problems such as acne and some blackheads.

More than 42.4% said they were very concerned about their skin being oily and other problems.

And more than 34% said they were very concerned about their dry skin and other problems.

On skin management:

More than 47% said they are very concerned about their skin but don't have enough resource or acknowledgement to conduct the proper help to do their skincare.

More than 32.4% said they feel like they know about how to take care of their skin but at the same time feel like they need better skincare.

And only than 11.4% said they were very happy about their current situation.
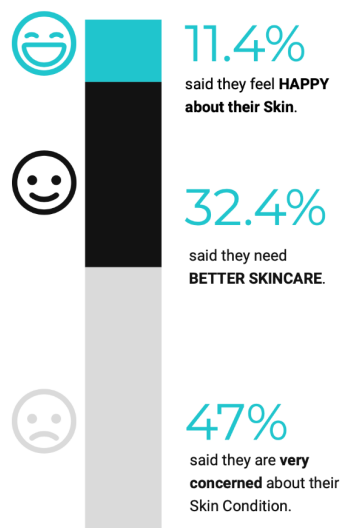
Figure 3.3 Pre-Survey Result

and on the figures:

The author gave out the following figures and ask the participant to discuss about their feeling after viewing the figures:

In this test questionnaire, the authors list two different methods of presentation that were tried, the first being a direct presentation of the skin problem with the use of real pictures as an adjunct to allow people to answer how they feel about seeing it. The second is to show the people answering the questionnaire some

pictures of Kaleidoscope and let people freely answer how they feel after seeing it.

The following four images are the corresponding images used by the author for this questionnaire. Figure 3.4 and 3.5 represent acne skin, some skin problems from acne causing water-oil imbalance:

Figure 3.4 Pre Survey Image for Acne Skin (Actual Picture)

Figure 3.5 Pre Survey Image for Acne Skin (Kaleidoscope)

In these two pictures, the real picture and the kaleidoscope picture represent oily and acne skin. The result is very clear, in these two pictures, many people feel uncomfortable seeing the first picture, while for the second picture, most people give a more positive or even "aesthetic" evaluation.

Comments are as below: "I don't want to see (Figure 3.4) because I have acne too and this picture makes me feel insecure about my look." while same person

comments for Figure 3.5 is : "This makes me feel like it's fun to see, while it gets me nostalgia feeling for playing Kaleidoscope in my childhood! "

In the next question, the authors showed the respondents who participated in the survey two identical pictures of freckles one representing the actual skin photos and the other – a kaleidoscope graphic representing the spots on the skin.

Figure 3.6 Pre Survey Image for Freckles (Actual Picture)

Figure 3.7 Pre Survey Image for Freckles (Kaleidoscope)

The author choose a blue and black based kaleidoscope picture because freckles are mostly appears in Summer after going to a beach or such, and the black parts

stands for the actual freckles.

Because people of varying skin colors, different nationalities, and aesthetic differences between Europe, America and Asia, the resu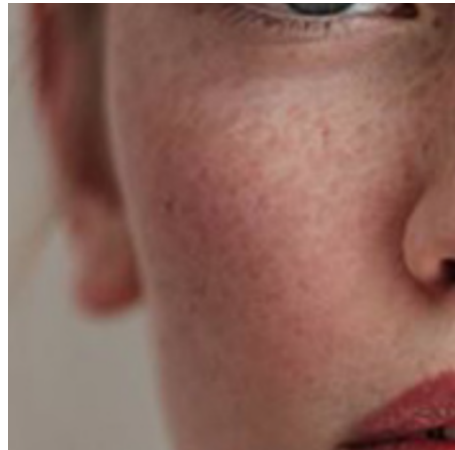lts for Figure3.6 were very divided. Many participants from the United States said that this picture also looks comfortable and perhaps even their preferred look of freckle. But many people in Asia, especially people from Japan, said they didn't like this skin condition. So there was a big difference in this picture due to the aesthetic background. However, for Figure 2, all agree that this is a very comfortable photo for people to look at.

Ethnographic Study and Analysis

In order to better understand the context of people who has concern about their skin and is willing to fix the problem the author conducted another ethnographic research observing Joanne Kim, an international student from Korea now studies in the United States. After knowing that she has been struggling with skin condition problems ever since she started study aboard, the author decided to join her for her skin management (daily routine) to see how she knows and how much she knows about her skin. Hence the author did ethnographic research by joining her daily skincare routine on the night of April 6th, 2020.

The author arrives at the house of Joanne Kim (later refers as Kim), and after entering Kim's house. The author finds Kim's home, in addition to the toilet vanity, she also has mirrors by her bed, as well as skincare products on her desk. she describes herself as placing mirrors in every place within reach to check her appearance at all times. The author also found that Kim had not only a single brand of skincare products, but also at least two to three bottles of lotion, three or more bottles of moisturizer, and even five or more different makeup removers in the place where the skincare products were placed.

When she arrived home, after washing her hands and changing her clothes, the first thing Kim did was to get one of the bottles of makeup remover oil and cotton pads on her desk and go to the washroom to remove her makeup. She said that because her skin is prone to acne, she removes her makeup as soon as possible every day or else it will cause her skin to smother out acne because of the makeup cover up. But because of the dissatisfaction and lack of confidence in their own

skin, she will choose to wear a thicker base makeup to go out, she also said she felt that it would be a vicious circle, but will still choose to make such a choice because of lack of confidence.

Figure 3.8 Kim Doing Skincare routine

After the makeup removal was completed, Kim skillfully wiped away the excess water with her own towel and started the face washing session. She said she actually didn't have much knowledge about the skincare routine she should do, and had seen many tutorials and tips on the internet, but always felt that she didn't find the most suitable one for herself, so even if she had some skin problems, she was still always looking for the most suitable one for herself. The solution. After washing her face, she turned on her "moisturizing machine" and began to say that she had actually been to a dermatologist to see why her skin was more prone to acne, but the doctor had always said that it needed to be toned, and hadn't

given too specific a tutorial on maintenance. Even if there are some tutorials, Kim said she feels that because the skin condition is changing every day, she also feels that it is very unscientific to keep solving it in the same way.

After using the "moisturizing machine" (a 10-minute process), she sat down in front of the desk without opening the mirror and took out her lotion, cotton pads, essence oil and night cream and some other skin care products. She skillfully dabbed the cotton pad with the lotion and patted her skin from bottom to top. Kim said that she generally avoids looking in the mirror after removing her makeup because it brings a certain amount of anxiety to her mood, which sometimes leads pick on her own skin for hours and it has largely affects on the times for her school work. After, she applies more than 5 different products on her face, mask, toner, moisturizing lotion, moisturizing cream, and then essence oil. before she finally headed to bed.

After conducting ethnographic research on Joanne Kim, the author analyze what the author has observed by using the Mental model, shown as Figure 3.9.

Mental Model

When	Solution
When she gets home	she wanted to remove her make-up immediately;
When she dry her skin	she feel pressure and needed to apply moisturizing machine on her skin;
When she is done with removed her make-up	she wanted to do avoid looking into the mirror;
When she is applying her products	she feel anxious about applying it with the wrong method;
When she is applying her products	she is curious about her own skin condition.

Figure 3.9 Kim's Mental Model

3.1.3 Concept Skit and Concept Sketch

Based on the studies and analysis conducted, the author performed a skit (Figure 3.11) in which one of the tester was played the role of user of Kaleido-Skin concept

performs.

Figure 3.10 Concept Skit

3.1.4 Target Persona

The Kaleido-Skin is designed for every individual but especially for the individual who is dissatisfied with their skin color, tone, and the type and has misconceptions about the beauty parameters of the skin.

Nowadays, almost every young person has a smartphone and is capable of using it for various purposes. The youngsters are more conscious about their skin and keen to improve it as per the trend.

The concept prototype is designed to help those who are willing to change from the negative influence that they might have received from skin condition problems and starting their own new beauty standard.

3.2. Design Progress

In the this section, The author will be explaining about the Kaleido-Skin prototype that the author have come up helping the people with appearace anxiety and target user of Kaleido-Skin to achieve the goal by three steps of: understanding, learning, and empowerment.

Kaleido-Skin is an app targeting individuals worldwide who are not satisfied with their skin condition. Millions of people even had severe mental problems as a result of their skin condition. The app offers them features like identifying skin conditions from the scanned or Kaleidoscope to "look through" your skin, using the picture of your actual problem to match you will a Kaleidoscope image and from there you can get information regarding your problem and even get personalized guidance on the skin condition after receiving the image of the skin conditions.

As also stated in the section above, because the idea of this design is to invoke the uniqueness of the kaleidoscope to express the different ideas of beauty that each different person possesses, but each person will be a very beautiful individual. Therefore, the author blended several different skin colors in the design of the background of Kaleido-Skin. And because the uniqueness of this program is to use the unpredictable yet unique and beautiful graphics of the kaleidoscope to describe the unique beauty of each human beings , an inspiration from the kaleidoscope was used in the design of the logo.

These design can be seen in Figure 3.11.

Figure 3.11   The Opening page of the app

3.2.1 Understanding, Learning, and Empowerment

The novelty of Kaleido-Skin is that, unlike other applications, it will use your skin photo to find the corresponding Kaleidoscope image of your skin issues and use it to provide you with a deeper understanding of your skin. Most of the existing programs on the market are based on the fact that they will let you look at your flaws and provide you a solution, but looking at the issues or flaws directly, especially seeing the real photos of your flaws can lead to increased anxiety in many cases.

At the same time, because many people with appearance anxiety, especially those with skin problems, try to understand their problems in through searching engine and find explanation or solving method thru words, but in fact, many medical names are difficult and complicated for them to remember and understand, and to some extent, people who feel anxious because of these words and terminology, this program will let them know what is wrong with them or what they need to improve in a more indirect but non-invasive form through pictures. And also provide them a chance to see that flaws can also be beautiful and they are not the only one struggling with these problems.

Finally, through a check-in session designed in Kaleido-Skin, it encouraging these users who were "sign with an image" to keep up with the solution that is provided by the advisor in the app, and solve some bad habits with their own efforts to appreciate their own special beauty.

3.2.2 Design regarding Understanding Your Skin

As mentioned in the sessions above, Kaleido-Skin is an app targeting individuals worldwide who are not satisfied with their skin condition. The first feature of the Kaleido-Skin is to offer a platform to get to know your skin condition better. The app offers them features like identifying skin conditions from the scanned photo and personalized guidance on the skin condition. In the future, new inventions in the app and kaleidoscopic device may offer a platform that will enable the users to take a photo of their skin and send it to the licensed dermatologist, who will respond with 24 to 48 hours after receiving the image of the skin conditions. The first purpose of this invention is to identify skin conditions.

Figure 3.12   Scanner Page of Kaleido-Skin

As shown in Figure 3.12, When the authors designed this prototype, the main priority was given to the design pattern for the kaleidoscope.

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In this screenshot of the prototype, we can find that when the user takes a picture of their skin with the front camera, what they will be able to observe is a random kaleidoscope of images, not the real status of condition or appearance of their skin.
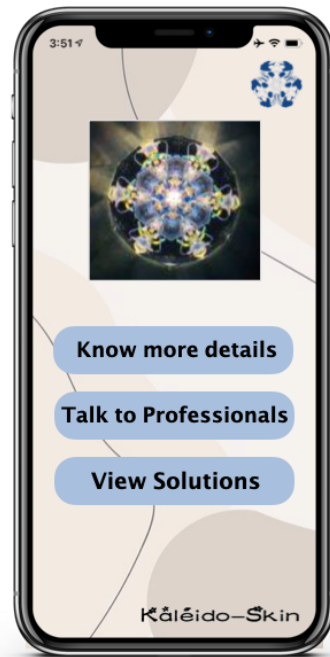
Figure 3.13 Main Page of Kaleido-Skin

After the user takes a picture of their skin problem or overall skin quality with Kaleido-Skin, the backend of the program will forward these pictures to our two professional skin managers, who will evaluate and select a picture that best matches the user's skin and present it to the user end. After getting this photo, the user will be able to click on the related photo and get the related information regarding their skin condition.

3.2.3 Design regarding Learning Your Skin

As explained in the last sub-section, after the user is given their associated kaleidoscope image, there are four options, which are learning more details about the Skin problem, Get a private session with a professional, and view solution and instruction to the problem.(Shown as Figure 3.14, Figure 3.15, and Figure 3.16)

"Talk to Professionals" session will also provide accurate information such as suitable beauty products, ways of taking care and keeping it healthy for skin color. In this research, I was fortunate to have the support of Japanese professional skin advior, Miku, and with her help, Kaleido-Skin gave one-on-one text Skincare advice to the tester of this research.
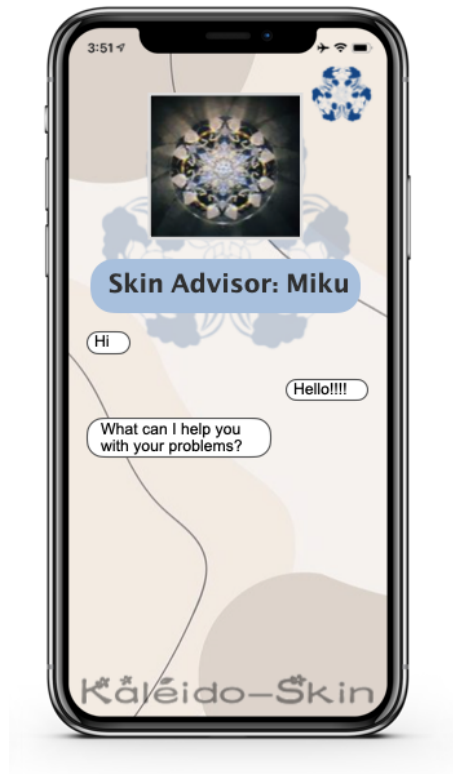
Figure 3.14 Counselling Page of Kaleido-Skin

And if the user clicks on "Know More details" on the main page, Kaleido-Skin will lead them in to a page called – "Personal Page", this page will shows the user

other users with similar problems and their kaleidoscope photo, in order to help
the user feel better about not being the only one with the skin problem.

Figure 3.15 Personal Page of Kaleido-Skin

Finally, select the option "View Solution" from the main page, it will lead the
user to a screen called "Solution Page", in this interface, there will be more de-
tailed by professionals to put together more targeted treatment and daily skincare
methods specifically for the user's skin type.

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Figure 3.16 Solution Page of Kaleido-Skin

3.2.4 Design regarding Empowerment from Learning and Understanding

In this study, the authors also designed a check-in system as a support and enhancement system for those who are willing to improve their skin condition. The reward system is that users will be able to read the above mentioned detail page, solution page, or counseling page to receive a check-in medal for the day, and there is also a consideration of sending out individual skincare samples in a cumulative form to motivate users to improve This is a way to motivate users to raise their awareness and improve their skin condition as the final step of the design – empowerment.

The lay out of the design for check-in page is shwon as Figure 3.17.
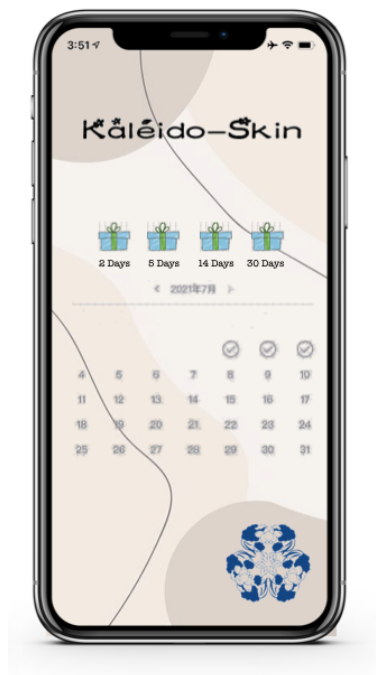
Figure 3.17 Check-in Page of Kaleido-Skin

3.3. Evaluation

The evaluation was conducted online thru a post-survey session among 12 tester who were picked as the target persona and had experienced Kaleido-Skin.

The participants suggestions and advice are focused on 3 aspect. One is customization and rewards of the app, the second is about the private sharing contents in Kaleido-Skin, and the last is gaining the interaction among user.

Chapter 4

Proof of Concept

4.1. Introduction

In this chapter, the author will be verifies the concepts and the validations of Kaleido-Skin by conducting post-survey and interview sessions. All the 15 participants were female between the age group of 18 and 35. The prototype was still in the experimental stage; however, the participants were given audio instructions regarding the interface and the features of Kaleido-Skin. Later, the results were procured through a questionnaire survey and interview.

The Kaleido-Skin interface has three primary goals. The first goal is to help the users understand their present and future skin condition by using the images of Kaleidoscope to avoid uncertain anxious caused by seeing close-up pictures of flaws. The second is to help the users learn more about their own skin. The third goal is to help them make their skin attractive and healthy. The most important thing is to keep it healthy and fresh and let the user understand the uniqueness of each other and rises the standard of beauty.

4.2. Target Users

As already mentioned in the previous Chapter as well as the previous session, the target user of Kaleido-Skin will be mainly but not only females but also men who has been struggling with appearance anxiety especially regarding their skin condition and is willing to seek for solution for the struggle. And especially those who are feeling anxious after seeing closely at their flaws but at the same time is willing to change the condition, or improve the condition of their skin.

Moreover, the main target user will be aiming at females at the age of 20s to 30s,

Participant	Nationalities	Nickname	Age	Skin Perception
Airi	Japanese (Asian)	A	28	Acne
Yuyan	Chinese (Asian)	B	23	Oily skin and Acne
Francesca	Italian (White)	C	31	Freckles

Table 4.1 Skin Conditions and Daily Life factors

who cares about the appearance of themselves and feels the pressure or anxiety of judging because of appearance more especially specific as skin condition.

4.3. Survey and Interview

After a carefully selection conducted, three participants, Airi(Asian at age 28), Yuki(Asian at age 23), Francesca(White at age 31) has been picked as the key participants in the validation research. In the following session, the author will be looking closely into the answers of the survey that was conducted with these participant. All three of them are in their early 20s to 30s. They used to or is still very anxious because of the status of their skin condition. Their further details is listed in the Table 4.1.

4.3.1 Test Scenarios

The flow and test scenario for evaluation with the participant is states as below:

Step 1: All participants (Participants A, B and C) will enter the Kaleido-Skin process and will be asked to fill in personal information.

Step 2: they are asked to fill out a Pre-Survey (included at the end of this paper as Appendix A).

Step 3: After completing the Survey, they will be asked to fill out an additional question and answer about their skin.

Step 4: A skin test is conducted using the Kaleido-Skin and the corresponding results are obtained after this

Step 5: The author observes their first reaction to the results and records them

Step 6: Interview 1: Find out about the feelings after the first contact

Step 7: arrange for personal coaching by the corresponding Skin Advisor to address their questions

Step 8: Second interview one week after using Kaleido-Skin

Step 9: Have them fill out a Post-Survey questionnaire (included at the end of this paper as Appendix B)

4.3.2 Participant A

Profile of Participant A
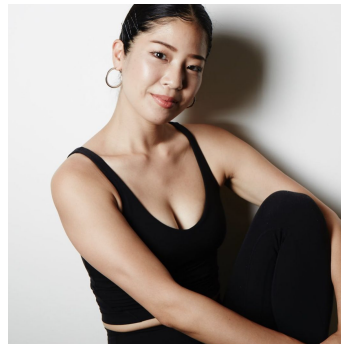
Figure 4.1 Participant A: Airi's Profile Picture

Participant A is a Japanese born and raised in Japan. Unlike other Japanese natives, participant A moved to a U.S. Army base in Japan for school when she was 12 years old due to her parents' work, then moved to Texas to follow her parents' work transition, and then moved around the U.S. through Texas, Florida, California, and other places. At the age of 25, she moved back to Japan because of her personal work needs.

Because of Paricipant A's background and her parents' occupation, her vision of beauty was very different from most Japanese and American locals. Although she was troubled by this, she was a person with a passion for beauty, so she chose the cosmetology subject in college without hesitation and started working in related positions afterwards.

Survey Answers and Interview Feedback

In the survey, she first claims that she is satisfied with her skin, although it is dry. Participant A said that she has always been a person who is more confident about her looks because she has been in a small number group and she thinks she is not comparable to others. But because of the recent Covid-19 epidemic, everyone needs to wear a mask when they go out, and wearing a mask has brought her the biggest trouble about her appearance in her life. The long hours of covering her skin with a mask has taken a huge toll on her own skin. Her skin, which was once relatively clean, started to get oily under the mask and started to break out in the lower part of her nose. So, she, who was once confident about her appearance, started to feel anxious about her skin under the influence of Covid-19.

In this state of anxiety, she took some actions, such as starting to visit the dermatologist more often and changing her skincare routine. However, in the dermatology department, she frequently encountered patients with more serious skin diseases than her own, and she slowly began to lose confidence in herself, thinking that she would one day become like these people.

When she started using Kaleido-Skin, she initially did not fully understand the way the Kaleidoscope graphic represented the problem, saying that seeing the graphic did not bring anxiety, but also made her feel that she did not have a clear enough understanding of the skin problem. But this idea slowly changed after a conversation with the team at the ADVISOR. When she used Kaleido-Skin for five days and her skin started to improve because of the professional guidance, she completely changed her mind. She said: Although she felt that the instructions were unclear at first, she felt very relieved because of the human service afterwards, and indeed, the fact that she didn't have to zoom in with the camera to see the skin problems she was worried about, somehow alleviated some of her low self-esteem.

She said that she would like to continue using Kaleido-Skin for skin management in the future if she has the opportunity, because the check-in system has certain rewards, so it gives her the motivation to stick to the daily skincare that she needed for maintain confidence.

4.3.3 Participant B

Profile of Participant B

Figure 4.2 Participant B: Yuyan's Profile Picture

Participant B is an international student from China now studies in Japan. She has been in Japan for a short period of time and is now in her second year in Japan.

Although Participant B has a Chinese background, she grew up loving Japanese secondary culture and modern art, and studied in the US, where she has a relatively open-minded perception of aesthetics.

Survey Answers and Interview Feedback

When she was in China, she was not confident about her skin because she had a tendency to break out, so she would try to cover up her skin by using too much concealer and other cosmetics when she didn't need to, or by wearing a mask to cover up her skin.

When she first came to Japan, her skin was particularly in a worse condition because she hadn't been here long enough to get used to the weather in Japan at first. Because of her lack of confidence in her looks, she was not very willing to go out and make new friends for a long time after she came to Japan. The

author asked her why she didn't go to a dermatologist for help before starting this experiment, and she said she had some resistance to going to the hospital. Because of her PTSD from being sick in the hospital when she was a child, she wanted to avoid going to the hospital or talking to a doctor when it was not necessary.

While using Kaleido-Skin, she showed a great interest in this its. She expressed her interest in Kaleido-Skin as she has always actually wanted to change but did not find the motivation and entry point to improve herself. At the same time, she said she was relieved when she saw the use of the kaleidoscope format to show his skin problems. Because one of the reasons she hadn't been willing to go into medicine was because she didn't want to look at her problems in excessive detail, and although she knew that perhaps understanding the problem of being alive and seeing it in detail would provide her with a lot of help, she chose to avoid the problem.

Because of her own lack of interpersonal skills, she said that the ability to provide information about her skin problems from a distance without seeing people face-to-face has brought her great convenience and encouragement. She said she would choose to support similar products if she had the opportunity in the future, and because of this experience, she learned that she needs to start facing her problems and solving them instead of avoiding them.

Overall, she gave a very positive feedback to Kaleido-Skin and she was impressed by how much insecure she was feeling before she was using Kaleido-Skin, and how this experience has successfully raised the awareness of herself and helps her starting to take care of herself.

4.3.4 Participant C

Profile of Participant C

Participant C is an Italian girl who started studying make-up at a professional college in Japan due to her hobby after working in Japan for many years. Participant C is an Italian female student who started studying makeup at a Japanese specialized university due to her hobby after working in Japan for many years. Since she has lived in Japan for a certain length of time, she has a certain un-

Figure 4.3 Participant B: Francesca's Profile Picture

derstanding of Japanese society and her Japanese ability are significant better compared to most foreigners in Japan.

Because of the need as a make-up artist student, aesthetics and skin management are very important to her as a special makeup artist. Not only because of the demands of her job, but because of her own love for beauty, having what she considers to be excellent skin is one of the most important things to her personally.

Survey Answers and Interview Feedback

As a makeup artist, she says she knows a lot about the different charms and characteristics of each person's looks, and she believes that everyone has their own special and unique charms, no matter what their skin type is. Although she tries to convince herself that she spends more time with her face than many normal people because she does a lot of necessary tests with her face due to her work. Inside Pre-Survey she said that because she spends a lot more time facing her skin and looking at the mirror than the average person, she will find a lot of deficiencies in her skin without even realizing it. Also, because she was the only white person in her class, she was very concerned about the blemishes on her face, and she sometimes felt out of place with the other students in her class because of her imperfect skin.

When she started using Kaleido-Skin, she quickly noticed the similarity between her Freckles and the given kaleidoscope picture, and she jokingly told the author that the similarity was too obvious leading to the impression that Kaleido-Skin was connoting her. At the same time, she said that the graphic gave her great creative inspiration and that she thought she had found a new way of looking at her skin in this image.

As a worker whose work is slightly involved with skin, after using Kaleido-Skin for a week she said she did not learn anything new from it, but it was a great relief to see that there were other people in it who had the same anxiety about their skin as she did. Because of this shared feeling, she felt a little less self-conscious about herself.

Overall, she feels that the experience has given her back the confidence she once had, and understands that everyone has their own different skin issues, and is glad that she understands her own skin. She said that because she knew enough about her own skin, it led to many skin problems not spreading to a great extent, but after this experience she understood more that many people were more anxious about their skin problems compared to her, which made her feel more confident that she was not alone.

4.3.5 Brief Summary

The user experiences of the function and interface design was tested by survey and interview of the three participants.

- None of the participants found the app difficult to use.

- One the participants have some problems understanding the functions and was little anxious about not seeing the actual photo, however, after explanations from the advisor, she soon agreed that The most popular function is seeing other Kaleidoscope photos.

- Participant A and C mentioned they were having some worried about not getting enough information from the kaleidoscope image, but the image does make them feels a lot better than looking at an actual picture of the flaws and spots.

- Participant B claims that She really enjoyed the function of playing with Kaleido-Skin after using it. The Kaleido-Skin project experience has successfully raised the awareness of herself about the condition of her skin in a regardless

positive way. She said: "Now I feel like I should actually start to take care of it and try to improve the current status."

- In the Kaleido-Skin, the most popular function is the check-in service as a reward for encouraging the user to interact with Kaleido-Skin, the user claims that seeing how much days they've kept working on taking care of themselves truly encourage them to keep themselves on track.

4.4. Reflection on the Survey and Interview

The participants agreed that the Kaleido-Skin is an easy and user-friendly app. They agreed that the method of seeing graphics gives them a more secure feeling about their condition comapring to seeing the actual picture of the flaws or the uncomfortable parts on their own skin.They also agreed that it is an innovative method of knowing skin conditions and seeking timely help mitigate skin problems. They also agreed that this interface would help change the misconceptions about skin and beauty parameters in women's psyche.

Some of such mobile apps already exist. However, some of them also showed effectiveness and accuracy. However, these apps still cannot completely achieve the goal of rises the understanding of beauty standard about one's uniqueness. They opined that the research should look more some of the similar apps, find out their inadequacies and try to mitigate them in the newly designed of Kaleido-Skin.

The philosophy of the Kaleido-Skin is providing an opportunity to the young generation to know their skin type and condition, receiving customized graphics instead of picture analyzing about their skin condition, giving treatment and thru the rewarding system thus empowering them with positive thoughts to move towards increasing the condition regarding their skin.

4.5. Summary

The chapter discussed the validation and Discussion about the Kaleido-Skin app. The interface and function of the Kaleido-Skin app were explained in the Design Chapter. Using the survey and interview which was conducted before, while and after using Kaleido-Skin on three participant A, B, and C, in order to evaluate

the concept of using kaleidoscope photo as the image for skin and the efficacy of Kaleido-Skin. In the above chapter, it is clear that all three of the participant were able to understand their skin better and feels less anxious because of the kaleidoscope image instead of actual photo. And they gives out positive emotion change after using Kaleido-Skin.

Chapter 5
Conclusion

5.1. Research Summary

In this research, after a gradation analysis and study of relevant literature review and related studies, the authors designed a kaleidoscope-inspired prototype for Appearance Anxiety, Skin Anxiety in the modern society, and named it Kaleido-Skin.

Compared to other existing products and research on the market, Kaleido-Skin focuses more on softening the discomfort and anxiety caused by real or zoomed-in flaws with a graphic model, thus indirectly linking the anxiety of modern humans about their appearance and skin.

By analyzing the questionnaire that was conducted before making the prototype and post-questionnaire, and as well as observing the audience (From interview and also from the mood and facial expression while getting their results, using video recordings and listening to their feedback), this research has come to several conclusions regarding the facts, advantages, and disadvantages of the Kaleido-Skin program that was made in this project.

5.2. Future Approach from current Prototype

The author has after thinking about connecting the results from evaluation. And feels like the possibilities of having an actual product is also a future possible approach for this research. The author has started working on connecting an actual skin-scanner machine to the app platform as her second draft prototype, which is still making in progress.

First Draft

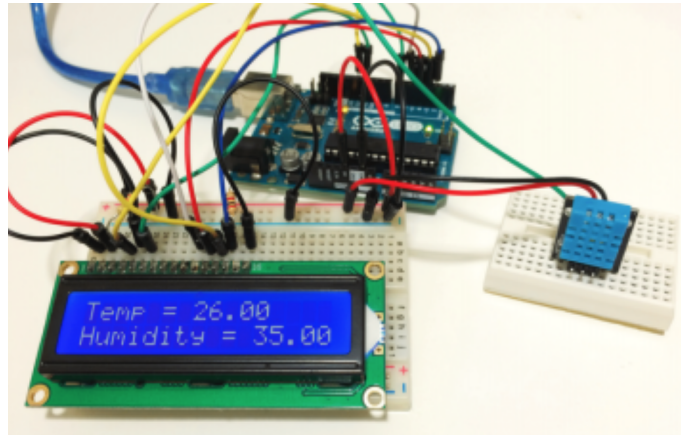The first draft of my design is made by the Arduino.

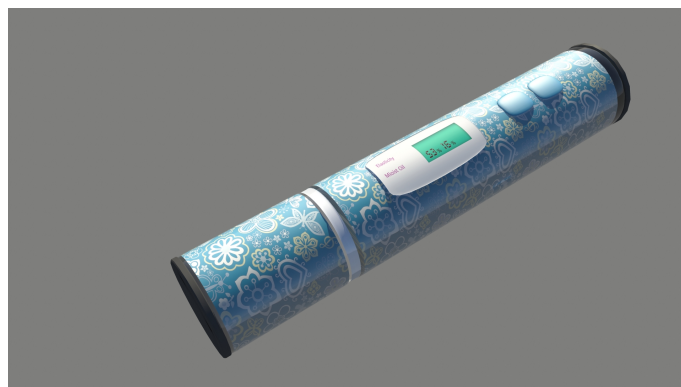Figure 5.1 Brief Arduino Draft for Future Approach

Design 3d Model

Figure 5.2 3D Model of KaleidoSkin

5.3. Result Limitation

Because of COVID-19, some results for my evaluation came from video testing, and some results with other nationalities and race I had to conduct the interview

completely in a remote environment. And because of that, maybe some facial expression and real emotion has been left out from the experience.

5.4. Suggestion for Future Research

As what has mentioned in the previous sub-section, research limitation, future of this research should be suggest to perform more similar test or experimental using offline interview and the same test machine.

5.5. Summary

After the prototyping and based on the results from evaluation, the author believes that the prototype and concept of Kaleido-Skin is an effective way to ease and help solving the problem of appearance anxiety regarding skin condition. And in the future, making Kaleido-Skin more accurate by improving services such as actual testing the skin of the user is a better way to gain more trust and detail information about the user in order to empower and encourages the user to take care of themselves skin conditional wise.

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Appendices

A. Pre-Prototype Questionnaires

A.1 Brief understanding

1. Are you satisfied with your skin condition?

2. Have you ever tested your skin? Was the diagnosis correct?

3. Do you frequently compares your own skin condition to other people around you?

4. Have you ever get picked on because of your skin condition?

5. Do you think about your skin condition and worries about it frequently?

6. What is your recent problem regarding skin, do you have any new problems recently?

A.2 Skin Management

7. What do you do to take care of your skin?

8. How do you explain peer/social pressure with reference to the skin condition?

9. How frequently do you think about your skin? What are your thoughts about your skin?

10. If you want to have a different complexion from which you are now, which color of skin would you prefer?

11. Have you every lost your confidence due to your skin issue?

A.3 Images VS. Kaleidoscope graphics)

12. What is your emotion when you see the image below? (Figure A.1)
Positive; Negative; Unknown.

13. What is your emotion when you see the image below? (Figure A.2)

Figure A.1 Pre Survey Image for Acne Skin (Actual Picture)

Positive/Negative/Unknown.

Figure A.2 Pre Survey Image for Acne Skin (Kaleidoscope)

14. What is your emotion when you see the image below? (Figure A.3)
Positive/Negative/Unknown.
15. What is your emotion when you see the image below? (Figure A.4)
Positive/Negative/Unknown.
16. What is your feeling when you see the four images above, please let me know your detailed thoughts.
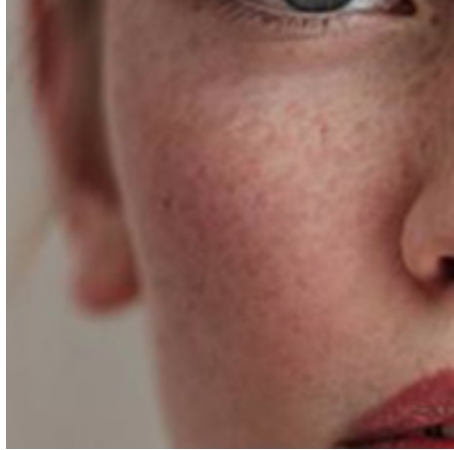
Figure A.3 Pre Survey Image for Freckles (Actual Picture)

Figure A.4 Pre Survey Image for Freckles (Kaleidoscope)

B. Pre-Survey Answer

Participant A

Questions Theme	Summary of Responses
Satisfaction perception	A stated that she is satisfied with her skin, although it is dry.
Skin Test	A has not done any skin test as of now.
Skin Care	A said that she uses moisturizer. She also uses ointment or cream and avoids lotion. Due to dryness, her lips get cracked, so she said she always uses a branded lip balm. She also uses olive oil and some traditional Arabic methods to keep her skin away from excessive dryness.
Thought about skin	She said she thinks of her skin only when she is in front of the mirror. But these thoughts are not upsetting or disappointing. They are neutral.
Social Pressure	A did not have experienced social exclusion
Embarrassment	She said that she had experienced embarrassment many times but not due to her skin conditions.
Loss of confidence	A did not have lost her confidence due to a skin problem.

Figure B.1 Pre-Survey of Participant A

Participant B

Questions Theme	Summary of Responses
Satisfaction perception	She is very dissatisfied with her skin due to her acne problem. E said that her face is always full of red and tender bumps. She is also fed up with her blackheads and pimples.
Skin Test	B said that she visited her dermatologist. A scraping of the lesion was taken for microbiological inspection. After testing, she was informed that her acne problem is hormonal. Her doctor also asked her whether she was going through any stress because that may be the reason for her skin problem.
Skin Care	She said that she uses some lotions, creams which claim to be perfect for acne-prone skin. When she visited the dermatologists, she was prescribed some medicines and creams. However, after finishing the course, she relies heavily on the market products
Thought about skin	Due to the mental harassment, she was constantly thinking of her skin. She tried out several market products after watching their ads on television. But these creams have not been able to resolve her acne issue.
Social Pressure	B said that when she was in high school, some of her classmates teased her for her red bumps on the skin.
Embarrassment	When she looks at the skin of some of her friends, she is embarrassed.
Loss of confidence	She is still not confident and feels that her self-esteem is low. She feels inferior. This inferiority complex is acute, especially when she looks at the beautiful skin of others

Figure B.2 Pre-Survey of Participant B

Participant C.

Question no. As specified in Table 4.3.	Questions Theme	Summary of Responses
	Satisfaction perception	C is partially satisfied with her skin. She is facing the problem of blemish skin with the frequency of pimples and blackheads.
	Skin Test	She has tested her skin to know the reasons for blemish skin. As of now, she has visited four dermatologists. Their diagnoses were almost similar.
	Skin Care	She cleanses her face daily, uses facial oil and uses creams and moisturizers prescribed by her dermatologist.
	Thought about skin	C tries to give up thinking about her skin problem, but when she looks at the mirror, she gets upset due to the consistent pimples on her face.
	Social Pressure	C is very uncomfortable, especially when she wants to attend parties, functions, picnics, or happy moments.
	Embarrassment	She feels embarrassed when she sees new pimples and marks on her skin
	Loss of confidence	The spots and pimples on the skin make her restless and upset. Sometimes she is conscious, especially while presenting herself in a new and beautiful dress and accessories.

Figure B.3 Pre-Survey of Participant C