

Mobile Apps-Based Cosmetic Equipment Selection Decision Support System Use Simple Additive Weighting (SAW) Method

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Abstract : Currently, more and more types of cosmetic products are appearing on the market, thus making cosmetic users confused in choosing cosmetics that suit their skin type and usage. Not a few people who use cosmetics wrongly which has a lot of bad effects on their face and has to be touched up repeatedly. This application facilitates users with 5 types of skin types, lip types and types of use that can be selected to make it easier for users to choose cosmetics that suit their skin type and usage. The application was built with a Decision Support System (DSS) using the Simple Additive Weighting (SAW) method to make calculations for selecting the most appropriate Make Over cushion and lipstick product for the user. In this application, the user can enter their skin type and then the system will calculate using the SAW method to get the Make Over cushion and lipstick that is most suitable for the user. The final result of the system will display the Make Over cushion and lipstick and their description with the highest calculated value to the user. Based on testing, this application is able to display cushion and lipstick products whose compatibility with users reaches 98%.

Keywords: Cosmetic, System, SAW, Make Over, Cushion

INTRODUCTION

Industry competition is currently getting tighter, especially with the existence of industry 4.0 and society 5.0, social media is now used as a sales market, for example Tiktok, Instagram, Twitter, Facebook, and many other applications. According to Rahayu (Hendarsyah, 2019), based on the results of Google research included in the 2018 SEA e-Conomy report, e-commerce transactions in Indonesia reached Rp. 391 trillion. In addition, Zuraya (Hendarsyah, 2019) said that the Director of Informatics Empowerment, Directorate General of Informatics Applications of the Ministry of Communication and Information of the Republic of Indonesia 2018, Septriana Tangkary said that the growth of e-commerce value in Indonesia reached 78%, which is the highest growth rate in the world. One industry that has experienced a rapid increase in the era of industry 4.0 and society 5.0 is the cosmetics industry, characterized by the increasing demand in the market and the number of new brands that have sprung up. Due to the rapid development of the cosmetics industry, Airlangga Hartato (Minister of Industry, 2018) has placed the cosmetics industry as one of the mainstay sectors, as stated in the National Industrial Development Master Plan 2015-2035.

With the existence of industry 4.0 and society 5.0, it is certainly easier for buying and selling transactions, both for sellers and buyers because it is considered more practical and more efficient in terms of energy and time, not spared for the cosmetics industry. However, there is another concern for cosmetic users in online shopping, namely confusion when choosing various products and types of cosmetics for their skin. Rahmawati as Minister of Industry 2021 (Hardum, 2021) said that there are 749 cosmetics companies in Indonesia and 95% of them are medium and small companies. These companies are constantly creating products that meet consumer needs and are relevant to trends. As a result, there are more and more varieties of cosmetics circulating in Indonesia. With that many brands, it is only natural for cosmetic users to feel anxious when shopping online, especially with many cosmetics circulating that contain harmful ingredients for the skin.

One of the local cosmetic brands that has been officially registered with BPOM so that its cosmetic ingredients are trusted and proven to be able to compete with foreign products is Make Over. Until March 2022 Make Over occupied the second set of best-selling products in Indonesia after Maybelline, a brand from USA (Haasiani, 2022). Make Over is a well-known cosmetic brand that provides a large selection of shades, color choices or skin types, for example, cushions are available in 20 shades for dry skin and 20 shades for oily skin (Agustin, 2022). The large number of choices will make it difficult for Make Over users to choose cosmetics that are suitable for them,

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especially when shopping online. Sometimes consulting the seller via chat is not the right solution because of the slow response or even no response at all from the seller due to too many messages received in one day.

To overcome the confusion and unrest of consumers in choosing a cosmetic tool that is suitable for their face can be done with the help of a Decision Support System (DSS). DSS is a computer-based system that helps decision making by complementing it with information from relevant processed data (Febriyanto & Rusi, 2019). DSS has several benefits for users, including being able to make predictions, help compare existing alternatives and load models so that they can help decision users in choosing rational alternatives and in accordance with the type of decision required among the many alternatives available (Sari, 2019). One of the methods in DSS is Simple Additive Weighting (SAW). The SAW method can be done with the concept of finding the weighted sum of the performance ratings of each alternative on all criteria. The SAW method requires a normalization process of the decision matrix (x) to a scale that can be compared with all existing alternative ratings. Decision making using the SAW method will be more accurate because it is based on the criteria value of the predetermined preference weights and the calculation of matrix normalization in accordance with the attribute value (benefit/cost) (Ismanto & Effendi, 2017).

Based on the above background, an Informatics Project entitled "Mobile Apps-Based Cosmetic Tool Selection Decision Support System Application Using Simple Additive Weighting (SAW) Method" is made which focuses on Make Over cosmetics.

LITERATURE REVIEW

"Decision Support System on Skincare Selection Based on Oily Facial Skin Type Using the Analytical Hierarchy Process (AHP) Method", a web-based system that can help users with oily facial skin to choose skincare based on user age, product contents, price, and quality, and product weight. This system was built using the AHP method, using the PHP programming language, and using the MySQL database (Novirda et al., 2022).

"Decision Support System for Skincare Selection in accordance with Facial Skin Type Using Fuzzy Logic", research that can facilitate users in obtaining information and providing knowledge about various types of facial foam products that are good for use based on the user's skin type, pH level, packaging, and product price. Users can choose answers according to their needs and desires on the facial foam selection menu so that users can understand about the selected product. The application is made using Basic for Android (B4A), with the Basic programming language (Maarif et al., 2019).

"Lipstick Selection Decision Support System with Analytical Hierarchy Process (AHP)", research that can facilitate and simplify decision making by lipstick users based on brand, texture, packaging and product price. This system is web-based with the PHP programming language and MySQL as the database, and was built using the AHP method (Ajny, 2020).

"Decision Support System for Determining Skincare for Facial Skin Using the Decision Tree Method (Case Study on Wardah Cosmetics)", research that can make it easier for consumers to find out information from a series of wardah skincare and help buyers be more careful in choosing and using which type of skincare is suitable based on facial skin. This system was built based on a website using the PHP programming language. In this study applying the Decision Tree method. Tests carried out using functional testing with the black box testing method (Sari & Hadikurniawati, 2020).

"Implementation of Fuzzy-AHP Method in Facial Wash Product Selection Decision Support System", research that can make it easier for users to choose a facial wash that is suitable for them based on the user's skin type, pH level, packaging, price and product texture. This system is web-based and built using the PHP programming language, and the calculations are based on the Fuzzy-AHP method (Kasmadani, 2022).

"Decision Support System for Skincare Selection Based on Facial Skin Type Using the Weighted Product (WP) Method", a website-based system that can help users to choose skincare based on user skin type, product price, user age, and product quality. This system was built using the WP method, using the PHP and HTML programming languages, and using the MySQL database (Haslindah et al., 2022).

The explanations above show the differences between the currently designed research and relevant previous research. For more conciseness and clarity, see the following comparison table:

Table 1. Comparison of current research with previous research

No	Title	Author (y)	Technology	Tools (programming languages, databases, etc.)	Method	Product	Determining Criteria
1	Decision Support System on Skincare Selection Based on Oily Facial Skin Type Using the Analytical	Adelia Zaskia Novirda, Rusmin Saragih, Magdalena	Web	PHP, MySQL	AHP	Skincare	Product content, price, age, quality, and product weight

	Hierarchy Process (AHP) Method	Simanjuntak (2022)					
2	Decision Support System for Selection of Skincare that Suits Facial Skin Type Using Fuzzy Logic	Vadlya Maarif, Hidayat Muhammad Nur, Tri Ayu Septianisa (2019)	Web Mobile	Basic for Android (B4A)	Fuzzy	Skincare: facial foam	Skin type, pH level, packaging and price
3	Lipstick Selection Decision Support System with Analytical Hierarchy Process (AHP)	Awaliah Nur Ajny (2020)	Web	PHP, MySQL	AHP	Cosmetics : Lipstick	Brand, packaging, texture and price
4	Determination Decision Support System Skincare for facial skin using the "Decision Tree" method (Case Study on Wardah Cosmetics)	Lenny Estika Sari, Wiwien Hadikurniawati (2020)	Web Mobile	PHP	Decision Trees	Skincare: Wardah	Skin type
5	Implementation of the Fuzzy-AHP Method in the Decision Support System for Facial Wash Product Selection	Giska Dwi Kasmadani (2022)	Web	PHP	Fuzzy-AHP	Skincare: facial wash	Skin type, PH level, packaging, price, and texture
6	Decision Support System for Skincare Selection Based on Facial Skin Type Using the Weighted Product (WP) Method	Andi haslindah, Suharni, Nadiya Mujahidah, Sanpratiwi (2022)	Website	HTML, PHP, CSS, MySQL	WP	Skincare	Skin type, price, age, and product quality

METHOD

The resulting data comes from 150 people aged 17 – 48 years, both women and men who have filled out the questionnaire provided. Of the 150 people who filled out the questionnaire, several data were obtained, namely 68% of the interviewees were women and the other 32% were men; 56% of people always use cosmetics before doing activities outside the home, another 32.7% sometimes use cosmetics and another 11.3% never use cosmetics; 66.7% of people think that using a cushion as a make-up base is important and another 33.3% think it is not important; 67.3% of people still have difficulty choosing the type of cushion that suits their skin type, while the other 32.7% have no difficulty; There are several parameters that are taken into consideration by resource persons in choosing a cushion, namely leather type, price, brand, packaging, durability/quality, texture, composition, and product weight/size; cushion from Make Over is the most widely used of 7 other cosmetic brands with a percentage of 45.3%; 78.7% of people have chosen the wrong cushion and experienced several impacts, namely the appearance of acne, acne, skin looking dull, the surface of the skin becoming uneven, skin getting drier, facial skin turning gray, and the appearance of blackheads.

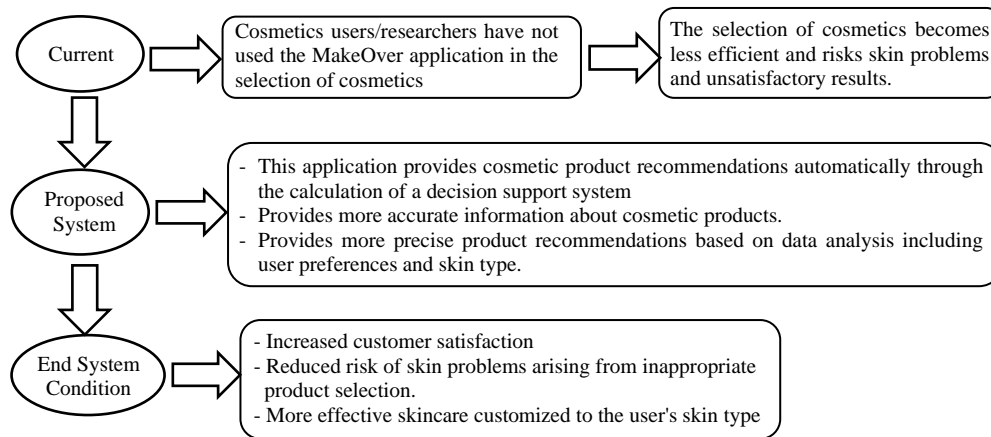


Figure 1. Business Rules

This business rule shows a comparison of the conditions before the system existed or the current conditions, the conditions at the time the proposed system existed, and the final conditions when the system already existed. Below you can see a picture of the research framework in Figure 1.

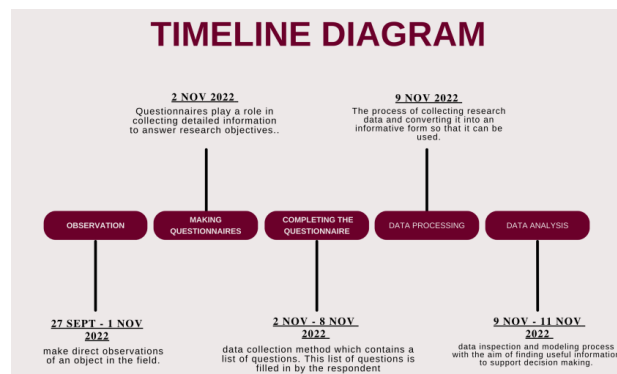


Figure 2. Timeline Diagram of Research Stages

RESULT

System Analysis consists of analysis of systems currently running, and analysis of functional and non-functional requirements.

1. Running System Analysis

Currently there are none system that makes it easier for cosmetics users to choose cosmetics that suit their skin type, lip type, and function according to their needs, so that many cosmetics users experience bad impacts due to incompatibility with cosmetics and even have to touch up many times because of inappropriate cosmetic choices. according to daily activities.

2. Analysis of the Proposed System

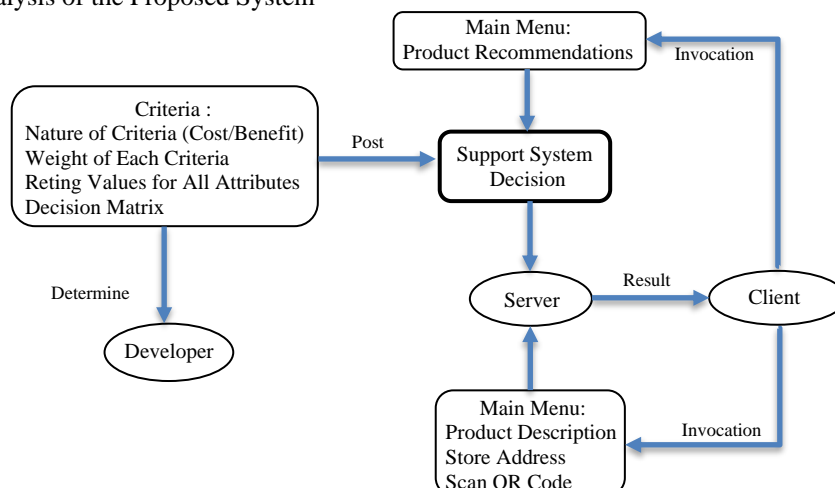


Figure 3. Proposed System Analysis

3. Functional and Non-Functional Analysis

Functional requirements include input requirements, process requirements and output requirements, while non-functional requirements include software requirements and hardware requirements.

Analysis of the Simple Additive Weighting Algorithm Method

In analyzing the SAW algorithm method, there are several 2798 actors that must be considered, namely criteria, attribute rating values for each criterion, alternative and suitability rating values, as well as solutions in carrying out calculations. The flow of the SAW algorithm method analysis can be seen more clearly in the image below:

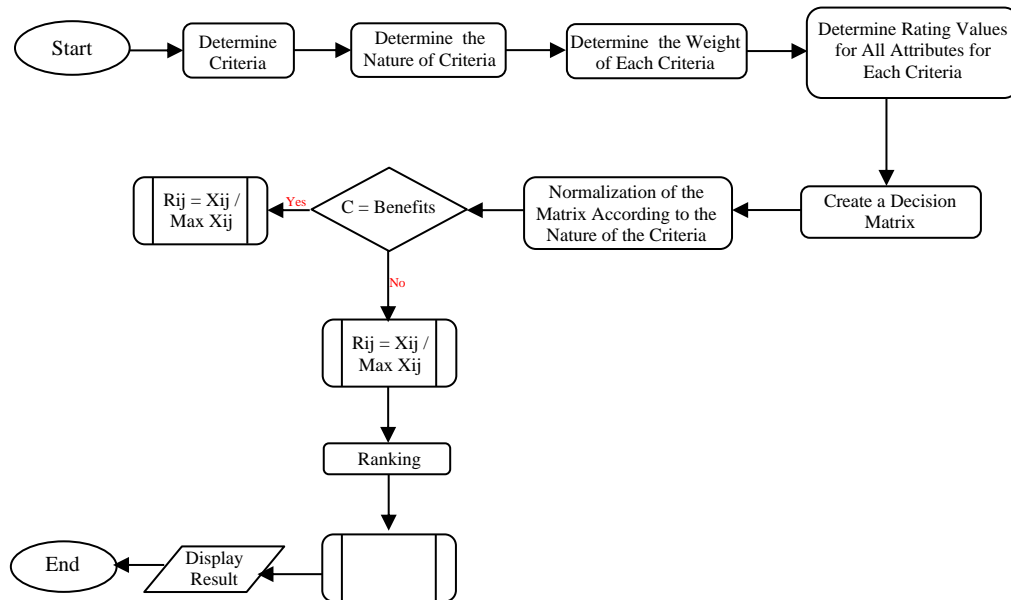


Figure 4. DSS algorithm for the SAW method

Cushion Selection

1. Criteria

The selection of cosmetics using the SAW method is done by determining the criteria, the nature of the criteria and the weight value of the criteria to get a cushion that suits certain skin types. The criteria table set in the study can be seen in the following table:

Table 2. Cosmetic Selection Criteria

Code	Criterion Name	Nature (benefit/cost)	Value Weight
C1	Skin Type	<i>Benefits</i>	40%
C2	Price	<i>Cost</i>	20%
C3	Quality	<i>Benefits</i>	20%
C4	Texture	<i>Benefits</i>	10%
C5	Packaging	<i>Benefits</i>	10%

2. Attribute Rating Value for Each Criteria

The attribute rating value of each criterion used in this system varies depending on its nature (benefit/cost). The attribute rating value of each criterion used in this system can be seen in the following table.

Table 3. Attribute Rating Values for Each Criteria

C1	C2	C3	C4	C5	Mark
Very suitable	Very cheap	Very good	Very good	Very good	5
Suitable	Cheap	Good	Good	Good	4
Moderately suitable	Quite expensive	Fairly good	Fairly good	Fairly good	3
Less suitable	Expensive	Bad	Bad	Bad	2
Not suitable	Very expensive	Very Bad	Very Bad	Very Bad	1

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3. Alternatives and Suitability Rating Values

The number of alternatives used in this study are 2, namely Cushion Powerstay and Cushion Hydrastay, Make Over production. Existing alternatives are measured for feasibility based on compatibility with predetermined criteria.

Table 4. Suitability Rating for Normal Skin

Alternative	Criteria				
	C1	C2	C3	C4	C5
Powerstay Cushion	3	3	5	4	5
Hydrastay Cushion	3	3	4	5	5

Table 5. Suitability Ratings for Dry Skin

Alternative	Criteria				
	C1	C2	C3	C4	C5
Powerstay Cushion	4	3	5	4	5
Hydrastay Cushion	1	3	4	5	5

Table 6. Oily Skin Suitability Rating

Alternative	Criteria				
	C1	C2	C3	C4	C5
Powerstay Cushion	1	3	5	4	5
Hydrastay Cushion	4	3	4	5	5

Table 7. Suitability Rating for Normal, Tends to Dry Skin

Alternative	Criteria				
	C1	C2	C3	C4	C5
Powerstay Cushion	5	3	5	4	5
Hydrastay Cushion	1	3	4	5	5

Table 8. Suitability Rating for Normal to Oily Skin

Alternative	Criteria				
	C1	C2	C3	C4	C5
Powerstay Cushion	1	3	5	4	5
Hydrastay Cushion	5	3	4	5	5

System schematic

The system scheme includes a main menu flowchart, cushion selection menu flowchart, lipstick selection menu flowchart, product description menu flowchart, store location menu flowchart, and QR Code scan menu flowchart. For a clearer view of the flowchart, you can see the pictures below.

1. Main Menu Flowchart

The main menu is the initial display that the user will see when opening the application. In the main menu there are 6 buttons, namely the cushion selection button according to skin type, lipstick selection according to lip type, product description, store address, scan QR code, and logout button. If the user presses the cushion selection button, the user will be redirected to the cushion selection page. If the user presses the lipstick selection button, the user will be redirected to the lipstick selection page. If the user presses the product description button, the user will be redirected to the product description page. If the user presses the store address button, the user will be redirected to the maps page for navigation. If the user presses the scan QR Code button, they will be redirected to the product QR Code scan page, and if the user presses the logout button, the user will exit the application.

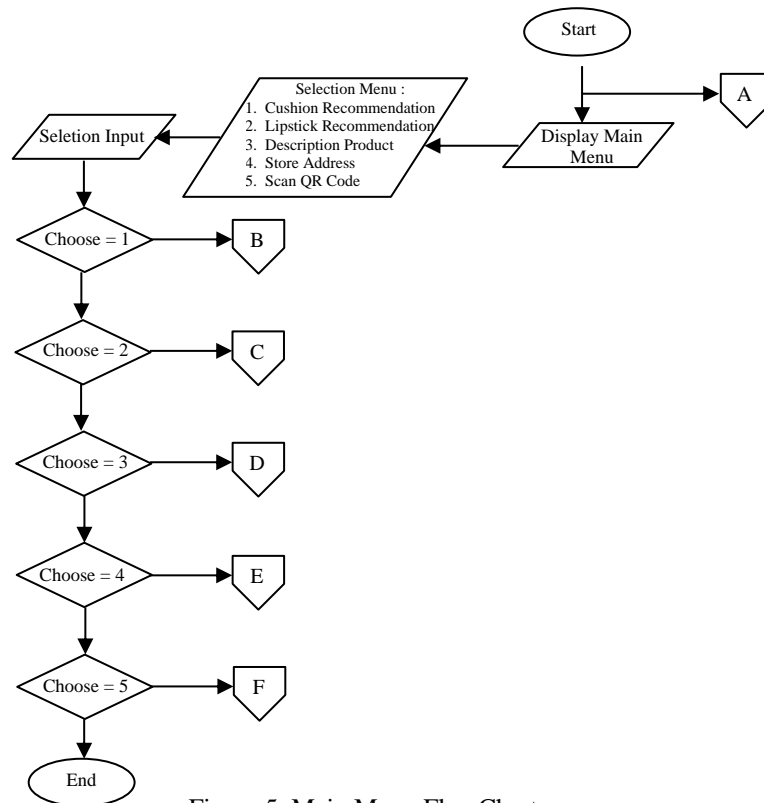


Figure 5. Main Menu FlowChart

2. Cushion Selection Menu Flowchart

In the cushion selection menu, the user will find a skin type select button consisting of normal skin, dry skin, oily skin, normal skin tends to be dry, normal skin tends to be oily. After the user selects their skin type, the system will then calculate the user's choices, then display the products that are most suitable for the user. After that, the user can return to the main menu to determine the next step he wants. The following is a flowchart image of the cushion selection menu used in this system:

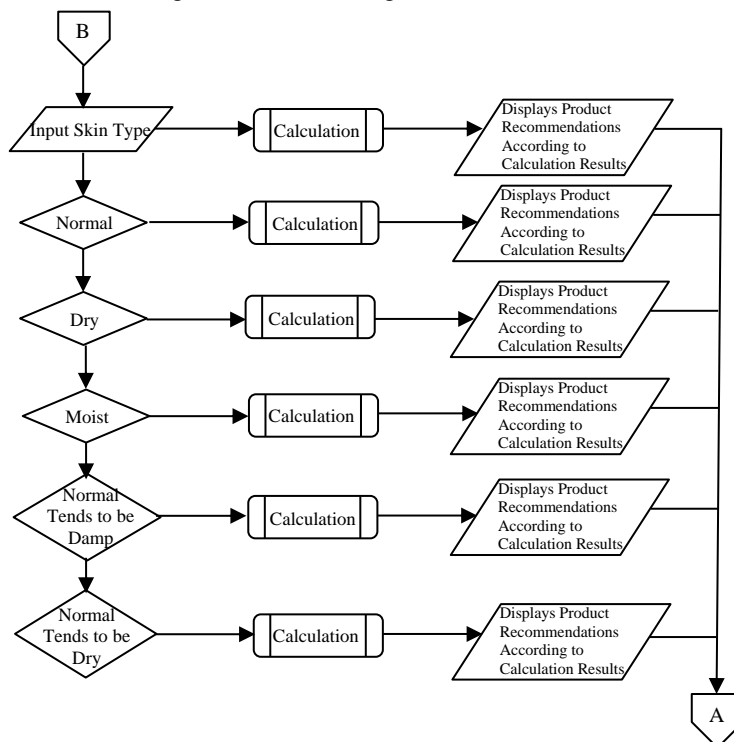


Figure 6. Cushion Selection Menu Flowchart

3. Lipstick Selection Menu Flowchart

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In the lipstick selection menu, the user will find a lip type select button consisting of dry, dry and chapped lips, tends to be dry, tends to be moist, and moist. After the user chooses their lip type, the system will then calculate the user's choices, then display the product that is most suitable for the user. After that, the user can return to the main menu to determine the next step he wants. The following is an image of the lipstick selection menu flowchart used in this system:

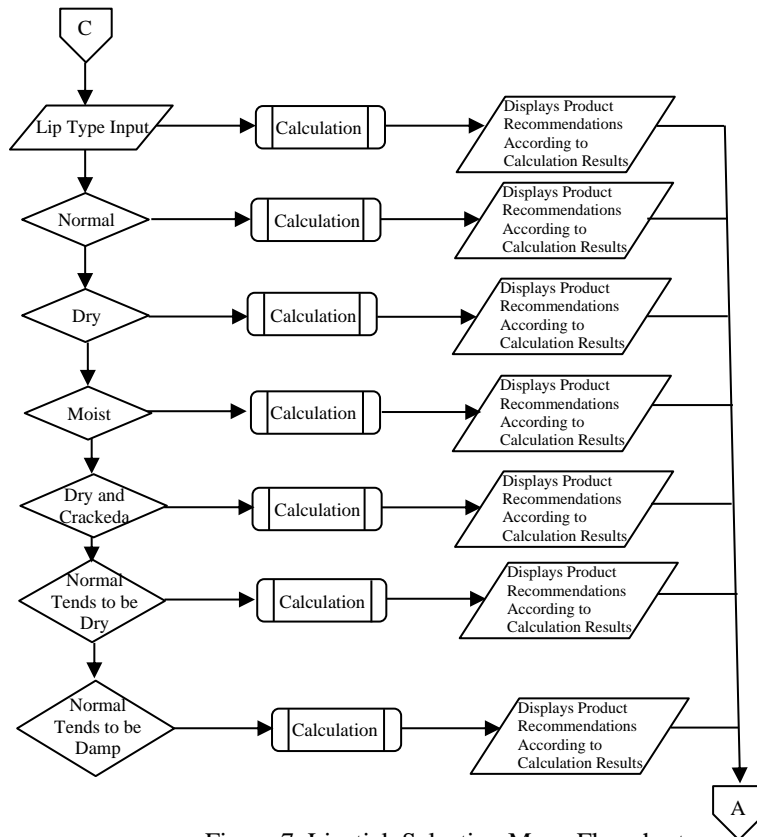


Figure 7. Lipstick Selection Menu Flowchart

4. Store Location Menu Flowchart

In the store address menu, users can see the location of the make over store easily and redirect directly to navigation mode which will provide step by step instructions for reaching the Make Over store. Instructions will be displayed visually on the screen. For more details, see the flowchart image below:

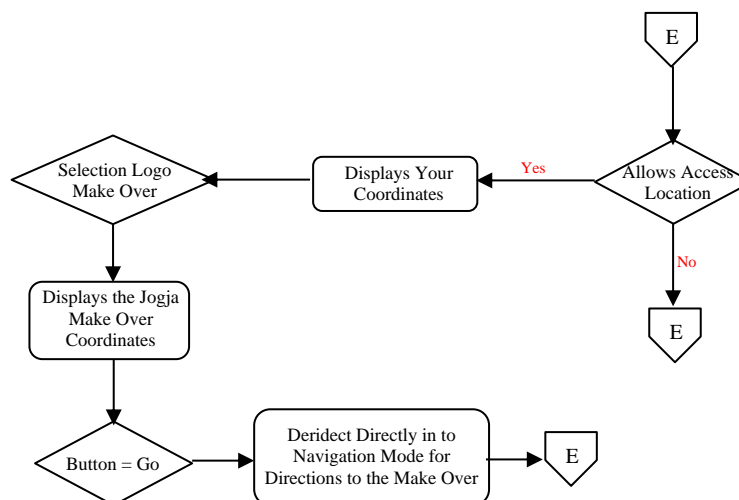


Figure 8. Store Location Menu Flowchart

5. Flowchart Menu Scan QR Code

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On the QR Code menu, users can scan the QR code to access the information contained in it. This feature allows users to easily access and use the information associated with the QR codes they scan. For more details, see the flowchart image below:

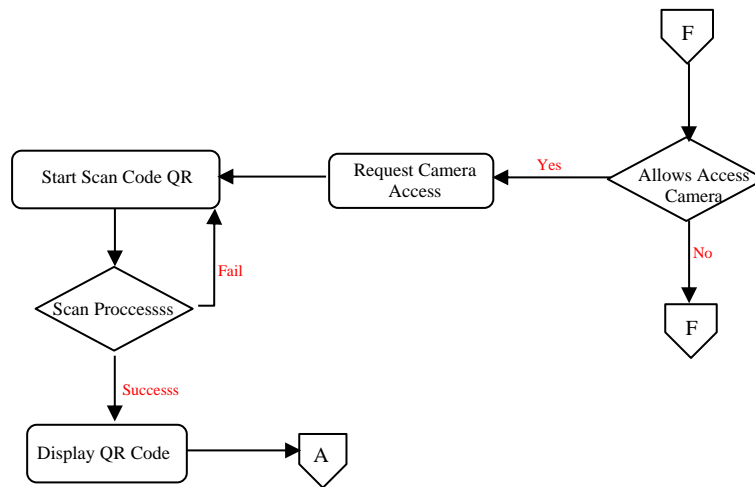


Figure 9. Store Location Menu Flowchart

6. Product Description Menu Flowchart

In the product description menu, users can see descriptions of the products that have been provided. When you have finished viewing the product description, the user can return to the main menu to determine the next steps he wants. For more details, see the flowchart image below:

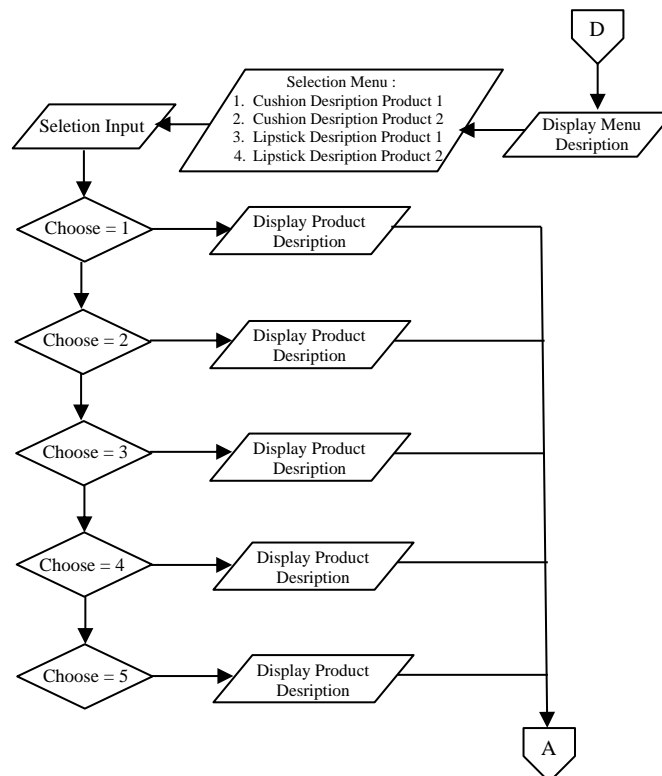


Figure 10. Product Description Menu Flowchart

System Flow Design

The design of this system flow includes designing a use case diagram, designing a main menu activity diagram, designing a cushion selection menu activity diagram, and designing a product description menu activity diagram. For more details, see the pictures below.

1. Use Case Diagrams

Figure 10 is a picture of the use case diagram used in this system. This use case diagram will be detailed in the activity diagram. The following is an image of the use case diagram design for this system:

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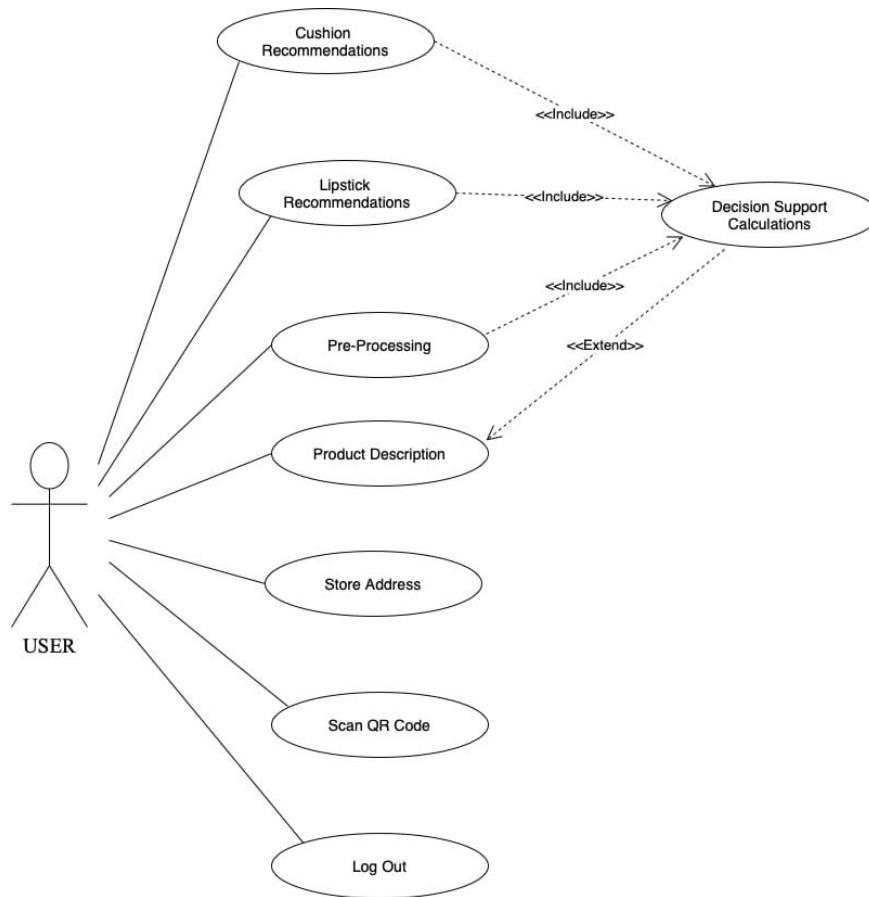


Figure 11. Use Case Diagram

2. Activity Diagram Main Menu

On the main menu, users can choose one of the 6 buttons provided. The following is an image of the main menu activity diagram used in this system:

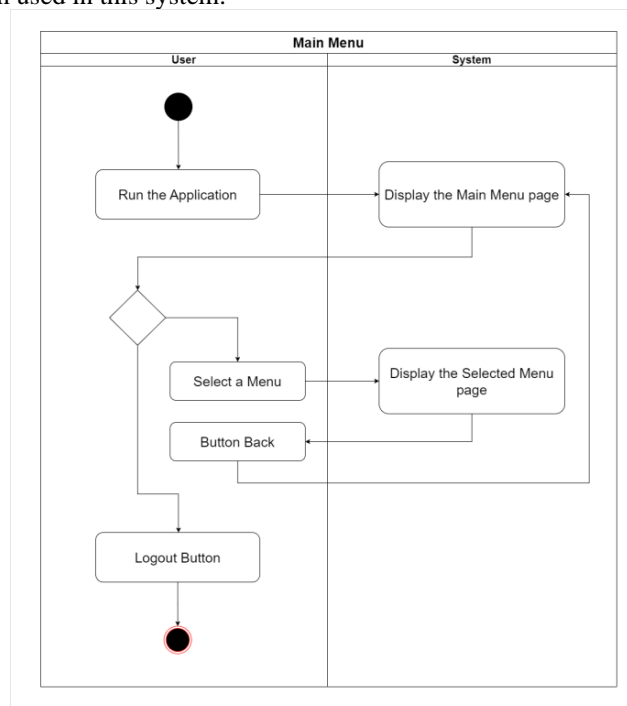


Figure 12. Main Menu Activity Diagram

3. Activity Diagram Cushion Selection Menu

In the cushion selection menu, users can choose one of the 5 available skin types. After selecting the appropriate skin type, the system will then calculate what products are suitable for the user and then display it to the user. The following is a picture of the cushion selection menu activity diagram:

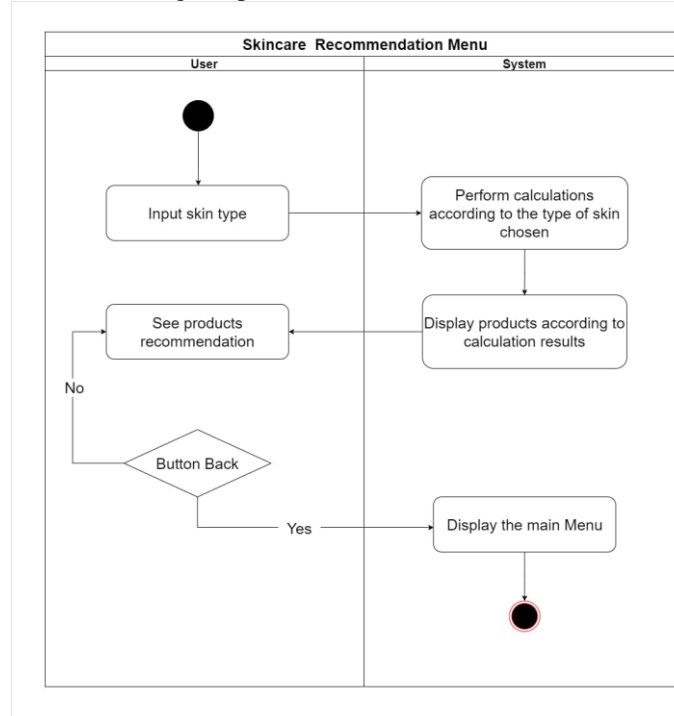


Figure 13. Activity Diagram for Cushion Selection Menu

4. Activity Diagram Lipstick Selection Menu

In this menu, the user can choose one of the 5 existing lip types. After selecting the appropriate lip type, the system will then calculate what products are suitable for the user and then display it to the user. The following is a picture of the lipstick selection menu activity diagram:

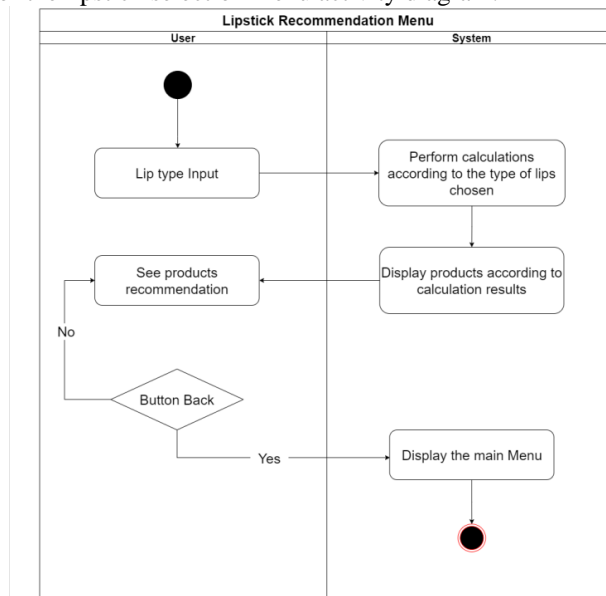


Figure 14. Activity Diagram for Lipstick Selection Menu

5. Activity Diagram Menu Store Location

In this menu, users can choose which products they want to see descriptions of. The following is an image of the product description menu activity diagram used in this system:

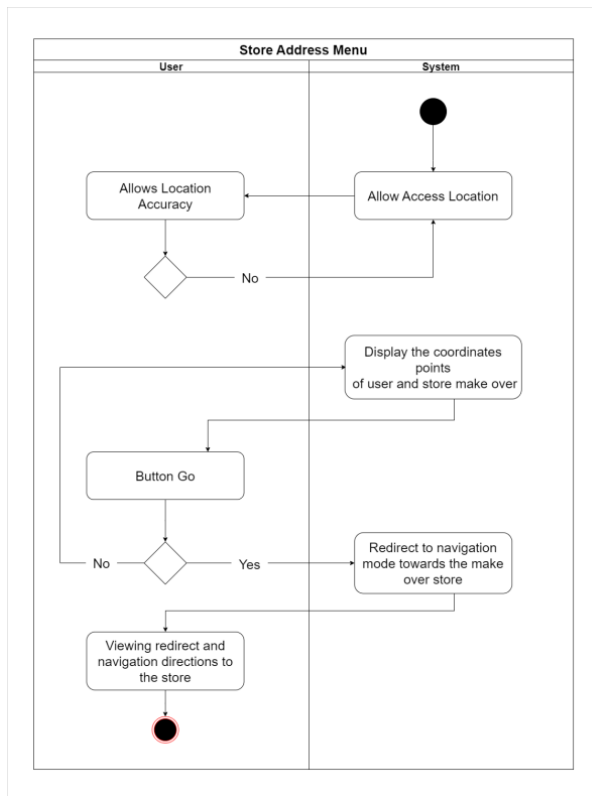


Figure 15. Store Location Activity Diagram

6. Activity Diagram Menu Scan QR Code

In this menu, users can scan the QR Code to see information from the QR Code that has been successfully scanned. The following is an image of the QR Code scan menu activity diagram used in this system:

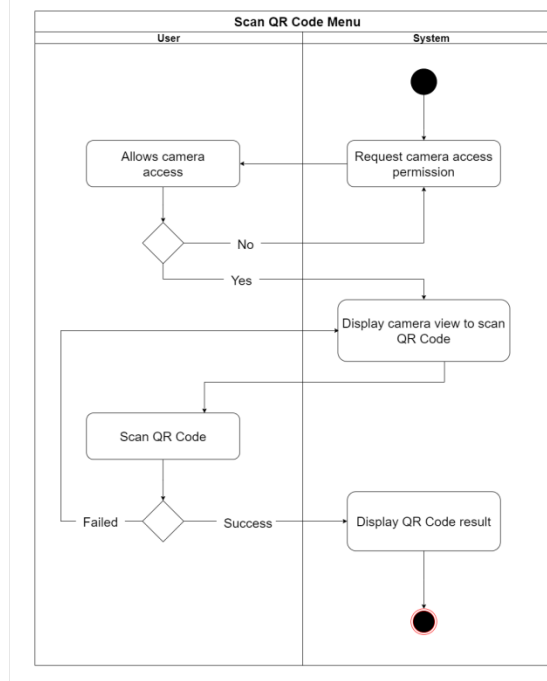


Figure 16. Activity Diagram Scan QR Code

7. Activity Diagram Menu Product Description

In the product description menu, users can choose which product they want to see a description of. The following is an image of the product description menu activity diagram used in this system:

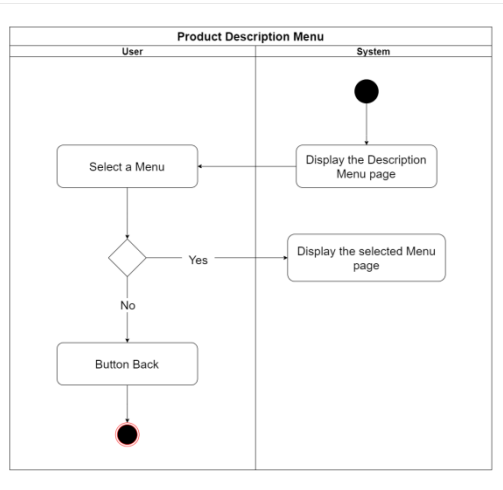
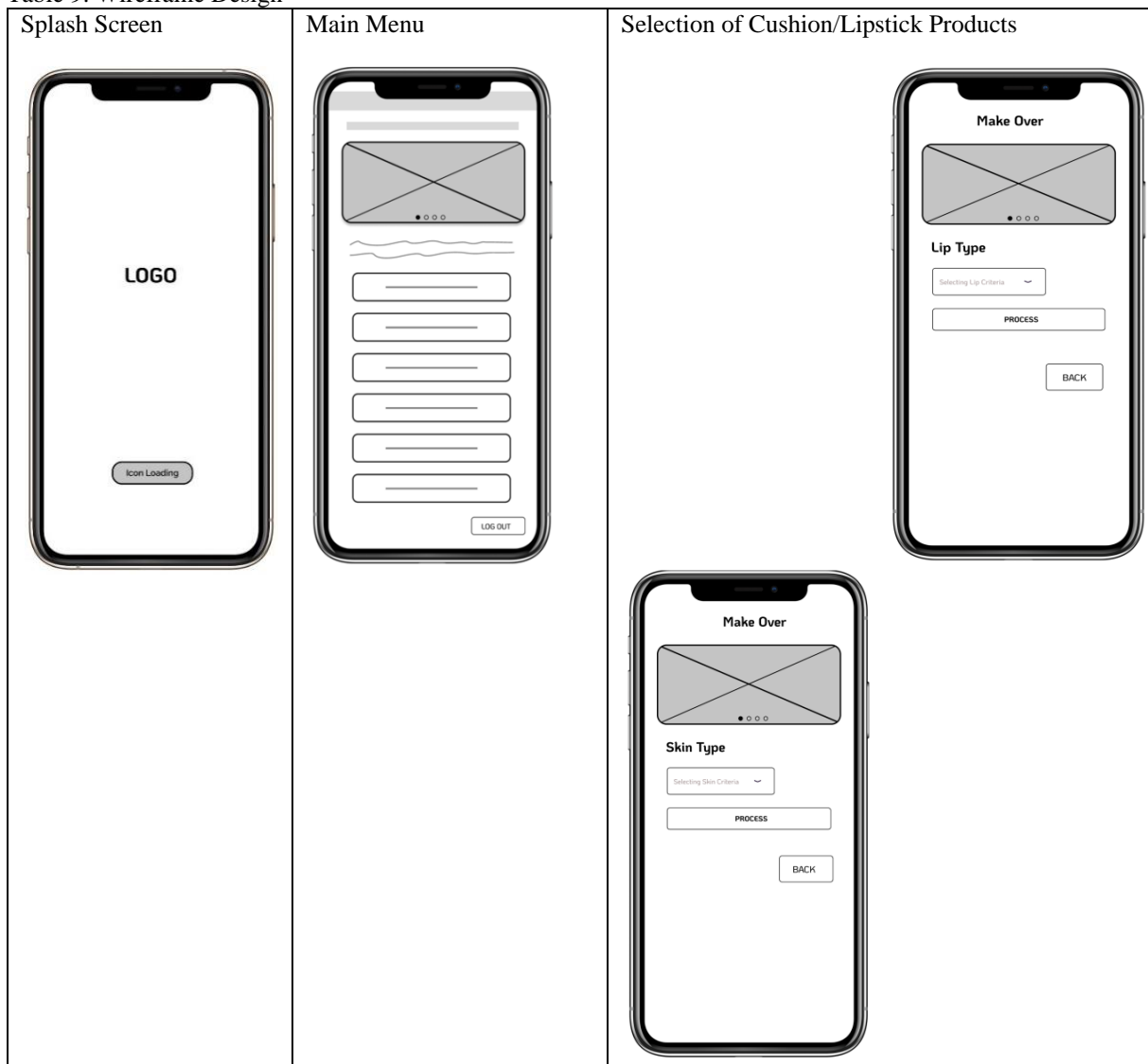


Figure 17. Product Description Activity Diagram

Physical Design

This physical design includes the design of the wireframe used in this system. A wireframe is a rough sketch of the appearance of an application or website. Wireframe design is a stage created to display a framework for arranging items on an application page. Our goal in creating this wireframe is to enable us to easily develop the structure and direction of the application. The wireframe design can be seen in the following pictures:

Table 9. Wireframe Design



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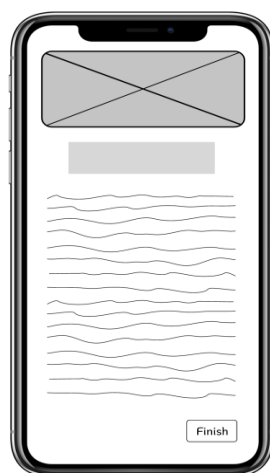
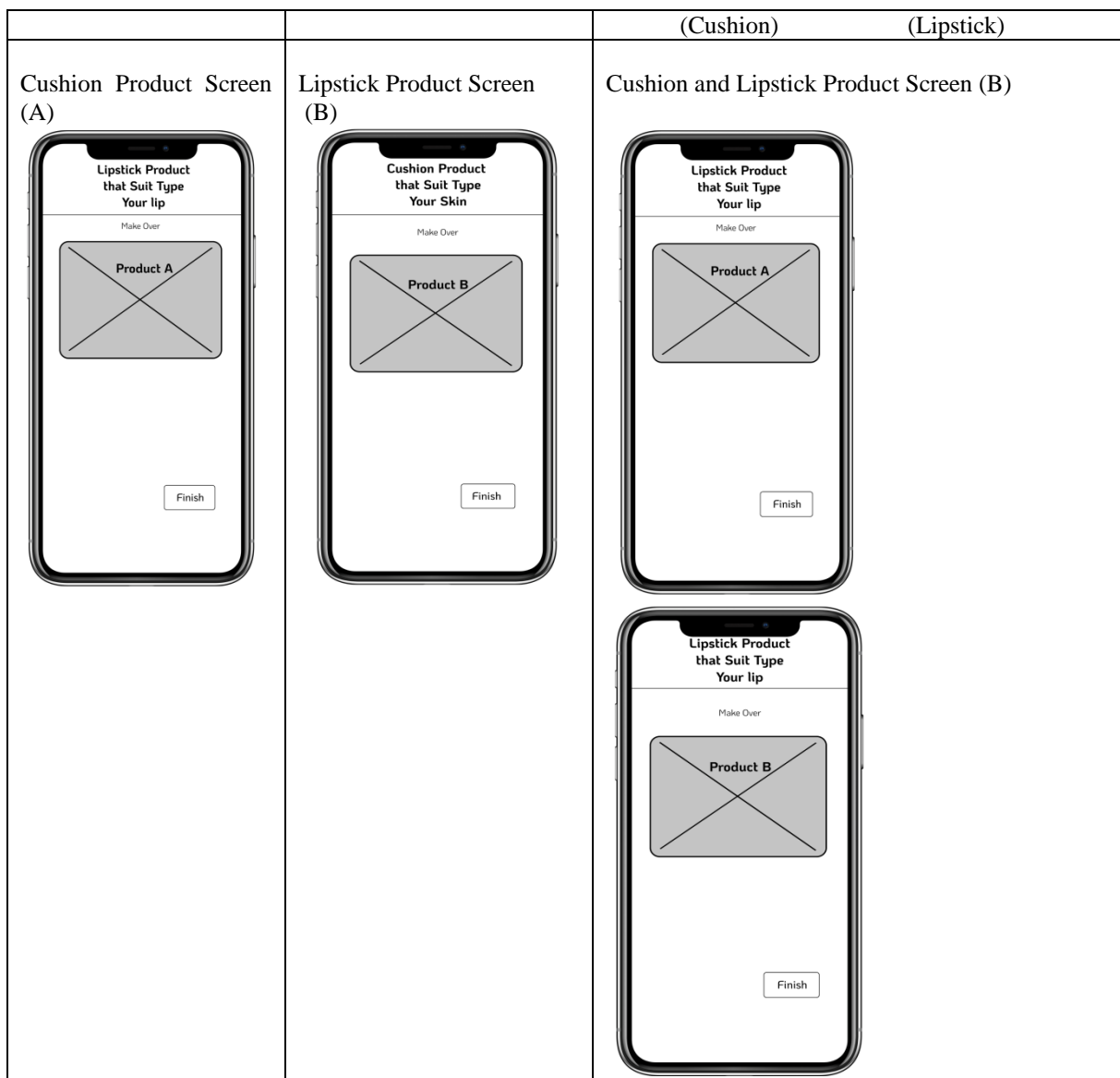


Figure 18. Product Description Screen

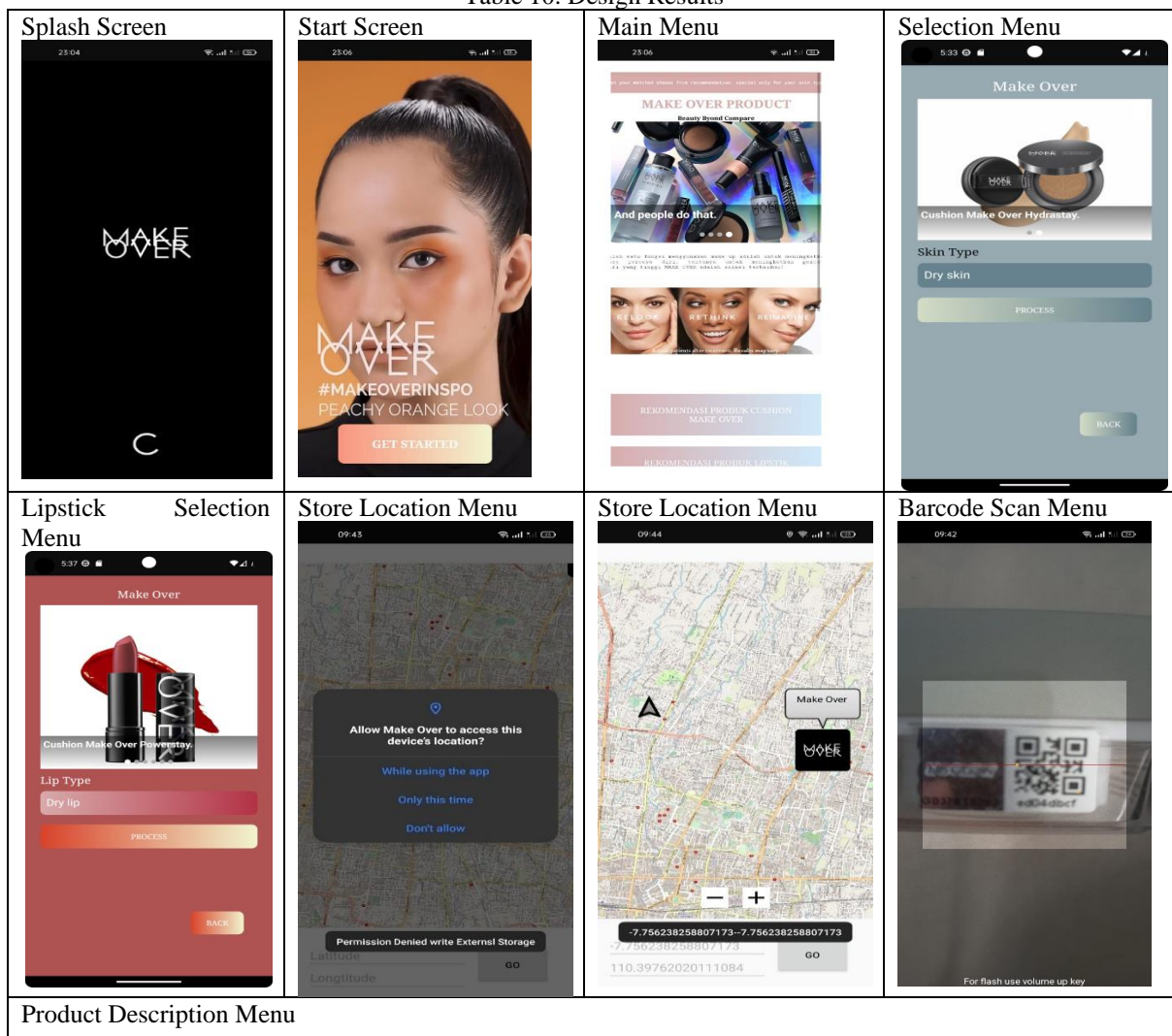
DISCUSSIONS

In this system, prototyping is carried out using Python and Android Studio application tools. Then, the prototype built in Python and Android Studio was connected using the Ngrok application (Mariko, 2019).

After all the prototypes have been built, a result will be obtained in the form of an application that can calculate DSS using the SAW method to make it easier for Make Over users to choose cosmetics that suit their skin type and lip type. The application display can be seen in the pictures below.

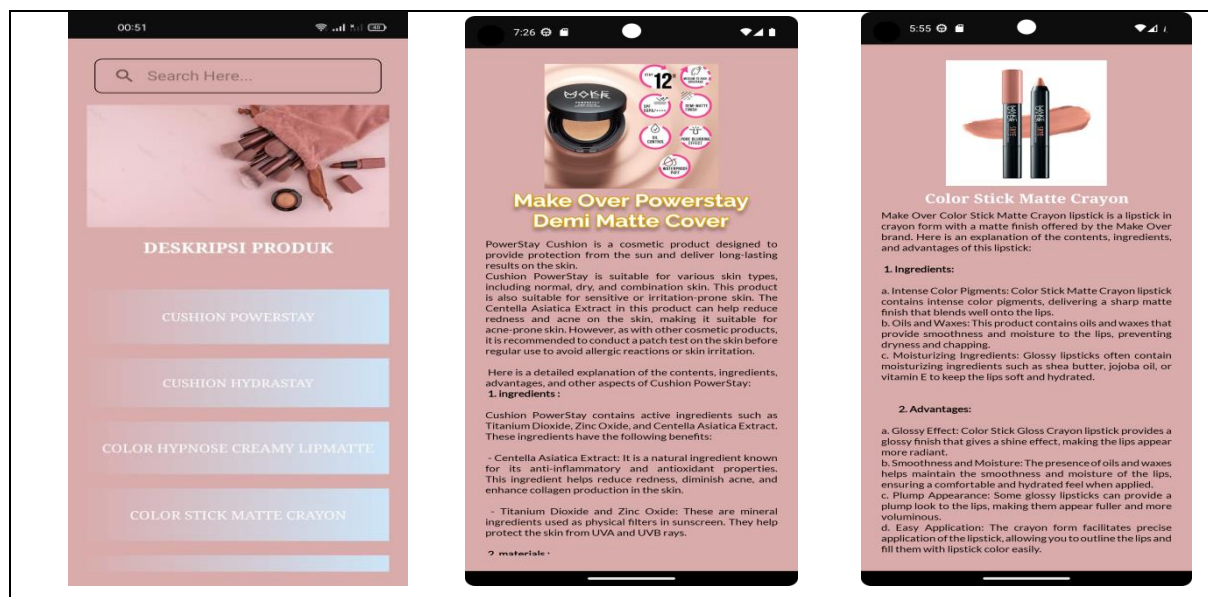
After all the prototypes were successfully completed, several tests were carried out. The results of these tests show that the calculations carried out by the system are in accordance with the results of calculations carried out using Microsoft Excel. This success was because the prototype built in Python was in accordance with the stages and equations in solving problems using the DSS SAW method. Then the digital prototype built in Android Studio also met expectations. This is indicated by the user being directed to the UI/UX according to the menu option he chose.

Table 10. Design Results



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However, during testing or when the application is to be run, it must be ensured that the Ngrok and Python applications are active and connected so that the system can carry out the calculation process. If Ngrok and Python are not active and connected, the application can still be opened and the user can see product details, but the user cannot carry out the product selection process, either for cushion or lipstick, and cannot navigate the store location and scan the QR Code. Therefore, the use of Ngrok should be replaced with hosting.

The calculation results obtained by the system are very satisfying because they have reached a level of 98% for cushion selection and 100% for lipstick selection. However, this system does not take into account the different financial levels of users so that the price criteria in the system calculations are only based on the decisions made by the researchers. Apart from that, when selecting lipstick, this system does not consider different uses such as normal use and use that involves frequent eating/drinking, only based on the provisions set by researchers. However, the type of lipstick in this system is a type of lipstick that is suitable for use when eating/drinking frequently, so it is also suitable for normal use.

CONCLUSION

Based on the results of simulations conducted on the Mobile Apps-Based Cosmetics Selection Decision Support System Application Using the Simple Additive Weighting (SAW) Method, it can be concluded that this application is proven to be able to help cosmetic users, in this case choosing Make Over cushions and lipsticks that suit their skin and lip types. In addition, this application is also able to provide information to users about Cushion Make Over products that they want to know, can scan the BPOM barcode of the product, and can find out the location of the nearest store from their location using the maps feature.

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