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I. Introduction

The domain subject is cosmetic ingredients that are used for skincare and make-up products. There are numerous products available in the market, however, I find that consumers often make a cursory decision only relying on brand names and value or even just attractive packaging when choosing a product rather than figuring out how a product would benefit us since we are not familiar with chemistry, and the ingredients are regarded as incomprehensible. The website will guide users to find the right information whether it is for a product or an ingredient so that users can become smart consumers who know what they put on their skin and where their money would best be spent.

II. Design Approach

i. Domain expert interviews, desk research and domain model

As the domain topic is rather complicated and unfamiliar, I started off looking at some cosmetic online shopping malls such as cultbeaty.co.uk and lookfantastic.com to gather information about what kind of cosmetic products are sold to consumers in the market. I then looked up several websites to find out whether there are similar websites to the one I was planning that provide information regarding cosmetic ingredients. There were several websites such as incidecoder.com and curiouschloride.com which allow users to look up a specific ingredient or provide a full list of ingredients for a specific product and their descriptions. Desk research helped me to identify the pros and cons of the competitor products and how to develop my interviews to glean useful insights from domain experts that would consolidate my findings and ideas in order to generate a better outcome to meet the goal of the project. The domain expert interviews were conducted to uncover areas I was unfamiliar with and validate my findings from desk research. It also helped me to understand the domain from the experts' perspectives so that abstract ideas about the topic could be clarified and materialized in relation to various kinds of information about the domain topics and their relationships. On top of this, the creation of the domain model was also established so as to make clear the relationships between different entities and provide a holistic view of the domain, which allowed me to organize the structure of the sitemap in accordance with its main goal; to provide a robust solution that would facilitate users to find the right information that would suit their needs in multi-faceted ways. In short, a diad structure was adopted for the domain model so that I could focus on the main topic as a starting point and depict everything else branched off to define their relationships with its main topic. In particular, it was somewhat challenging to define the relationships and lay out the model in the beginning as it had become too convoluted with too many nodes and lines as the domain has such depth and breadth of information. Eventually, I had to reorganize and restructure the domain model. As Brown (2011)[1] suggested, a domain model has to provide a foundation for inspiring, informing, and establishing context to keep it practical for the target audience and the structure of the website in the design process.

ii. Sitemap

The project aimed to deliver a website that would allow users to access critical information with more ease and options depending on users' needs, purposes, and comprehension in the domain. Given how all the entities and their examples were grouped out to establish the relationship of different entities with the domain model, the creation of a sitemap was focused on how to define the hierarchy of information and how to overcome the drawbacks of competitor products. They usually have limited options to find information regarding cosmetic ingredients whereby user experience appears not to have been considered. For instance, optical character recognition was the main delivery for one of the products in line with cosmetic ingredients information. Furthermore, it was necessary to scale down the information that would be provided on the website taking into consideration of the depth and breadth of the domain. As Brown (2011)[2] stated, the purpose, audience and context of the sitemap influence its structure as they are integral parts of information that would determine the backbone of the website which affects the planning, designing and decision-making of its content and navigation system overall. As the primary goal of the website is to provide multiple ways to find information for users, the global search with faceted classification was chosen as a scope of the coursework to conduct tree testing whereby the classification details that were validated by the test could be

widely adopted within the website. Without demographic segmentation as the website could be employed by anyone, a total of 5 participants took part in the tree test and the result was satisfactory. Out of 8 questions for the faceted search, 6 of them showed over 80% success and the other two indicated that task questions could be ambiguous to them, however, it was also very insightful to learn other people's perspectives such as how they tried to solve the same problems with different approaches. In a real-world scenario, this would be taken into account to improve the database design which would reflect general users' mental models to create a more scalable design. In addition, polyhierarchical IA can be found throughout the sitemap as the more complex information the website serves, the greater the multitude of variations in how users' mental models are matched can exist (Laubheimer, 2018), and many cosmetic ingredients could also be classified in various ways depending on its usage.

iii. User journey

Figure 3 is focused on the demonstration of satisficing as the time and effort that users would spend on the website cannot be predictable so this depicts that users would be given flexibility and control to find information depending on their needs with lower interaction cost by utilizing filtering and sorting options within each page (Whitenton[2], 2014). Even though this user journey was devised for a specific goal, users would be given several ways to utilize the website to find the right information or at least, suboptimal information in general. In particular, it shows that users' mental models determine how to interact with the website and what steps they would take, which was a rather surprising revelation as opposed to my expectation during tree testing. Therefore, flexibility was a primal part of the user journey to ensure that complexity could be resolved by alternative options with simpler logic of a flow to provide a better user experience, for instance, finding an ingredient from the ingredients page rather than trying to find one using a faceted search. As the user journey has been developed from an abstract idea of how users would utilize the website to a concrete idea to facilitate the sequential interaction between users and the website within a certain context whereby a user tries to find the cosmetic ingredients information for a product, it would be apt to create corresponding wireframes.

iv. Wireframes and evaluations

a. Wireframes

As Rosenfeld et al. (2015) stated, wireframes are relatively confined two-dimensional spaces that include content and information architecture, and they create constraints in conjunction with choices and interaction for users. As the structure of the website had already been established with the sitemap and user journey for a specific task, wireframes were created to deliver the most efficient and effective wayfinding to the right information depending on users' needs and interests taking into account the constraints mentioned above in line with the user journey. It defines how the right information can be grouped together and the visual presentation of granularity, modularity and reusability of the information and the demonstration of the interaction cost consideration for users who may be very likely unfamiliar with chemistry and cosmetic ingredients while using the product in a less abstract way. In addition, they are specifically medium-fidelity wireframes, focused on delivering optimal user flows and content structure within the given context such as faceted search (Dam and Siang, 2022).

Figure 4 represents the homepage of the website named 'Cosmetic Guide' and there are two visual cues that denote what the website is for and about; firstly, the search input bar says saliently that the website is primarily designed to find information related to cosmetics along with its title. Secondly, a nugget of cosmetic ingredient information manifests what kind of information can be found on the website so that users can easily assume what they will find when looking up information. Notably, the format of cosmetic ingredient data should be designed with consideration of consistency, modularity and reusability and it can be flexible in terms of its scale.

Figure 5 demonstrates how faceted navigation can be adopted within the rich information system. It would benefit users to navigate the complex system without having a good understanding of the content space (Whitenton[1], 2014).

Figure 6 is the search result page corresponding to a specific brand product. In order to help users to navigate the website with ease and show the hierarchy of the content, the breadcrumb is provided. Apart from the general product information, users can select a specific ingredient from the list and detailed information regarding the ingredient will be displayed at the bottom of the screen.

Figure 7 was designed to show how users would find ingredient information alternatively in case the database does not have the corresponding product information they looked up for the user journey. However, it can be employed by users who want to find a specific ingredient or are more knowledgeable in cosmetic chemistry. Since it could potentially provide a myriad of information within a page depending on users' choices, filters could narrow down the large content sets to match different dimensions that suit users' needs. Specifically, users can choose either to display the content in order of update of the database or in alphabetical order of cosmetic classification for this wireframe.

b. Evaluations and future improvements

Three rounds of moderate user testing were conducted in order to evaluate the system using the wireframes. The findings were as follows; First, A product page in *Figure 6* can adopt the faceted search options on top of its page in case users are directed to the page after searching for a product using faceted search. With the faceted search within the page, they could navigate the website to find the right information with more ease and flexibility, and with less interaction cost that could be incurred over time as they need to go back to the home screen to employ the faceted search again with the current design. Furthermore, users would lose their search history depending on the architecture of the website as it may be impossible to retain the previous search history once they were relocated to the home screen and searched for another item. Having the faceted search options within the page would increase the utility and usability of the system.

Second, the ingredients on its label could have filters so that users could find a certain ingredient more quickly. The current composition is a conventional way to display all the cosmetic ingredients used in a product and the order of the ingredients implies the quantity that is consisted in the product. However, the legibility, findability and discoverability of a specific ingredient are not efficient as there is only one way to find it; skimming the entire list until it's found. Filters for ingredients' benefits, cosmetic classification and allergen could help users to find the right information that meets their needs, and it would increase the usability of the system as well.

Last, the tab navigation in *Figure 7* could switch its order as general users may not be familiar with cosmetic classifications, they would be more likely to start with the INCI name option to find ingredient information that would suit their needs. Moreover, participants were not familiar with the term INCI, it was suggested to find an alternative option as they were not sure what it was for until it was explained.

In general, labelling can be reassessed and revised to improve the user experience as the website deals with the advanced level of terminologies that are usually used by domain experts, some of the current labellings may not provide any clarity for general users who want to utilize the website without constraints.

Appendix I: Domain Model

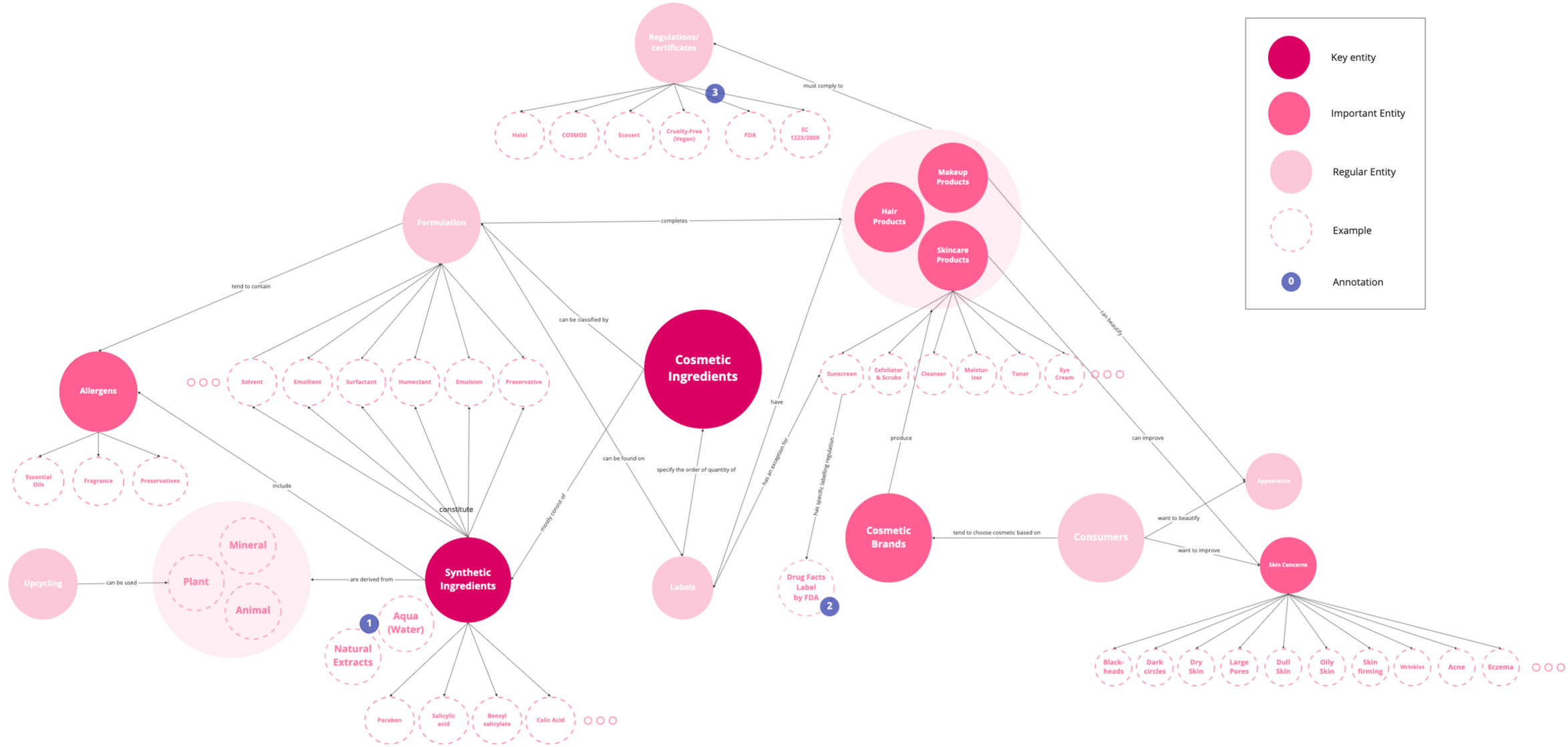

Figure 1. Cosmetic ingredients domain model

1	Generally speaking, most ingredients are regarded as synthetic ingredients, however, some cosmetic products use 'Natural Extracts' as a marketing buzzword to entice consumers. Depending on the specific natural extract, it could have a different interpretation; it may just be an ingredient often from nature such as a herb or it may not contain any synthetic ingredients such as preservatives. One of my domain experts claimed that many cosmetic products use the term primarily for marketing purposes even though they contain a very small amount of natural ingredients with no proven efficacy.
2	In the US, sunscreen has a discrete label regulation, unlike other cosmetic labels which are written in the order of quantity of ingredients used in each product, called Drug Facts labelling. This labelling should provide information regarding a Sun Protection Factor (SPF) test, which is a clinical measurement to see a product's ability to protect against sunburn (primarily by UVB), and the Broad-Spectrum Test which measures the protection level against both UVA and UVB radiation. It could also include Water resistant claims.
3	Precisely speaking, FDA and EC 1223/2009 are the regulations controlled by the government bodies, respectively the US and EU. The rest are certificates that are governed by commercial organizations. They are adopted by some brands or products to promote their authenticity and ethos to meet various aspects of societal, religious and environmental concerns.

Table 1. Annotations for the domain model

Appendix II: Sitemap

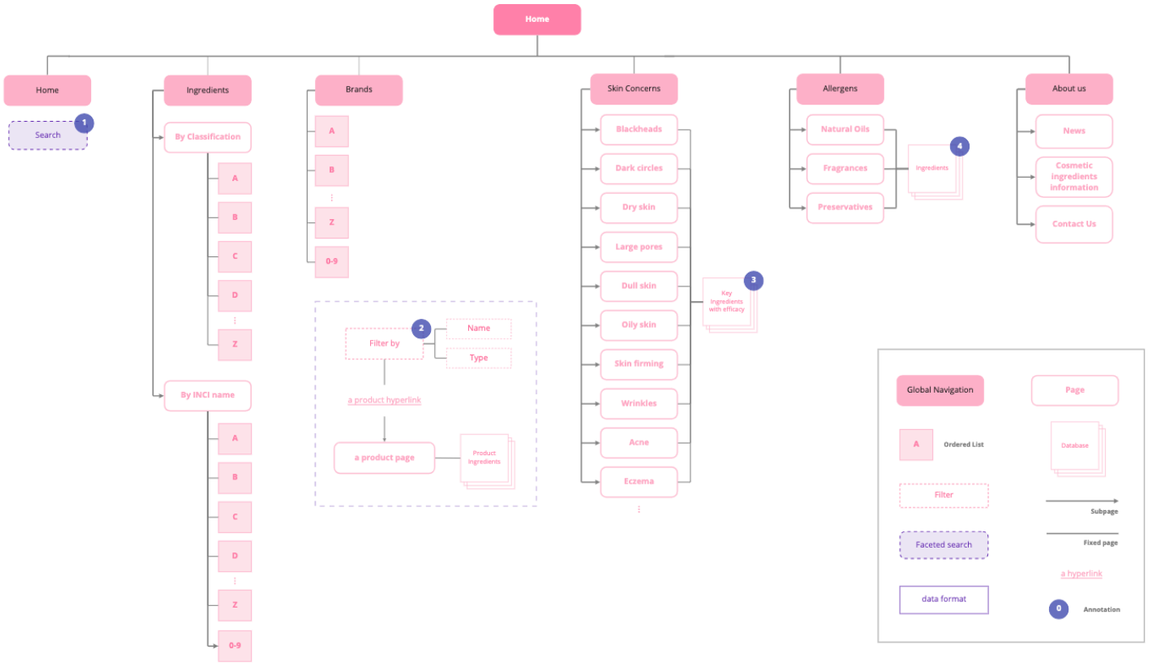

Figure 2. The sitemap for Cosmetic Guide

1	Faceted classification for global search within the website
2	Exact organisation scheme (Alphabetical) based on cosmetic brands; to find the right product, users can either filter products by their names or product type within each brand screen
3	Polyhierarchy as some ingredients may have multiple efficacies and serve various purposes.

4	Ingredient databases should be designed with the consideration of scalability, granularity and reusability as they are expected to provide different types of information depending on a context.

Table 2.Annotations for the sitemap

Appendix III: User Journey

User journey goal	As a smart consumer, I'd like to know what my moisturiser (ex. AESOP PARSLEY SEED ANTIOXIDANT FACIAL HYDRATOR 60ML) contains, such as any allergens, what kind of ingredients are used, what they do and how they actually help keep my skin moist.

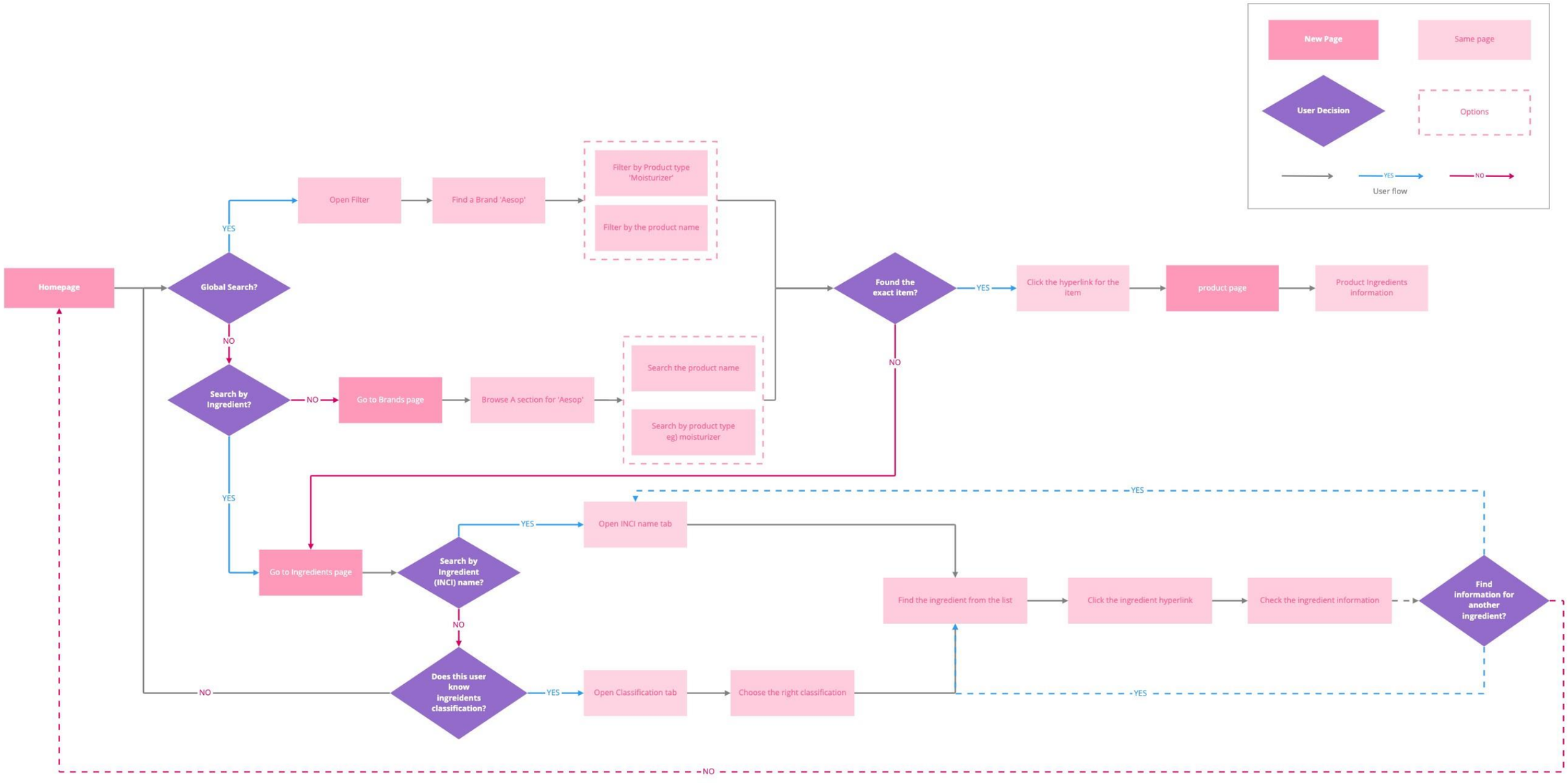

Figure 3. A user journey to find ingredient information for a specific moisturizer

Appendix IV: Wireframes

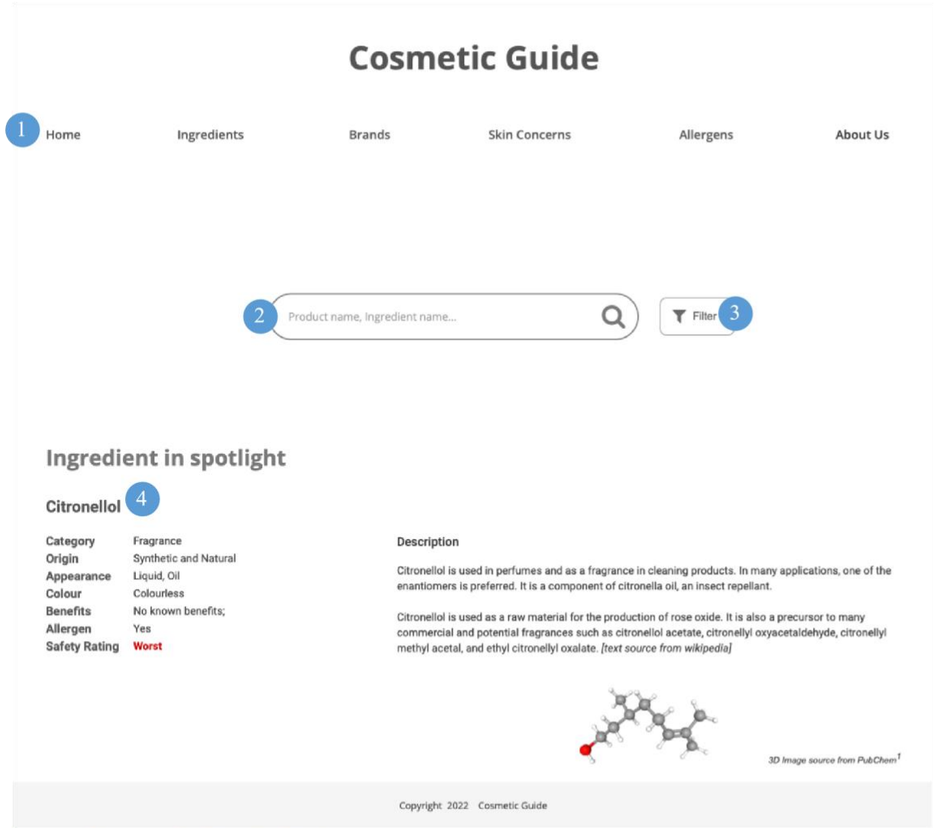

Figure 4. Homepage for Cosmetic Guide

1	Global navigation consists of the main topics to increase the findability of information based on consumers' interests and needs so that they can find the right information more efficiently.
2	A search input field where users can find information related to a specific product name or an ingredient name.
3	Faceted search button which will open a modal as shown in *Figure 5* to obtain a more accurate and personalized result in case users are not sure what to look up such as a specific product or ingredient.
4	Cosmetic ingredient information for visitors on the home screen. This element has two purposes; firstly, it provides contextual information about what the website is for to first visitors and secondly, it provides ingredient information which can be found in various products ubiquitously. The format of ingredient information should be reusable, consistent, extendable, and modulable throughout the website.
5	In order to allow multi-select options for users, the checkbox option is chosen for the classifications such as brands and product categories.
6	These buttons can be multi-selected just like the checkbox options; however, these classification options are unlikely to be used by consumers without relevant knowledge. The button UI is given with the expectation that would provide better visual clarity and less cognitive load for users contrary to providing too many options when they do not know what to choose.
7	The toggle UI element will allow users to discover cosmetic ingredients with or without allergens.

Table 3. Wireframes Annotation for Figures 4 & 5

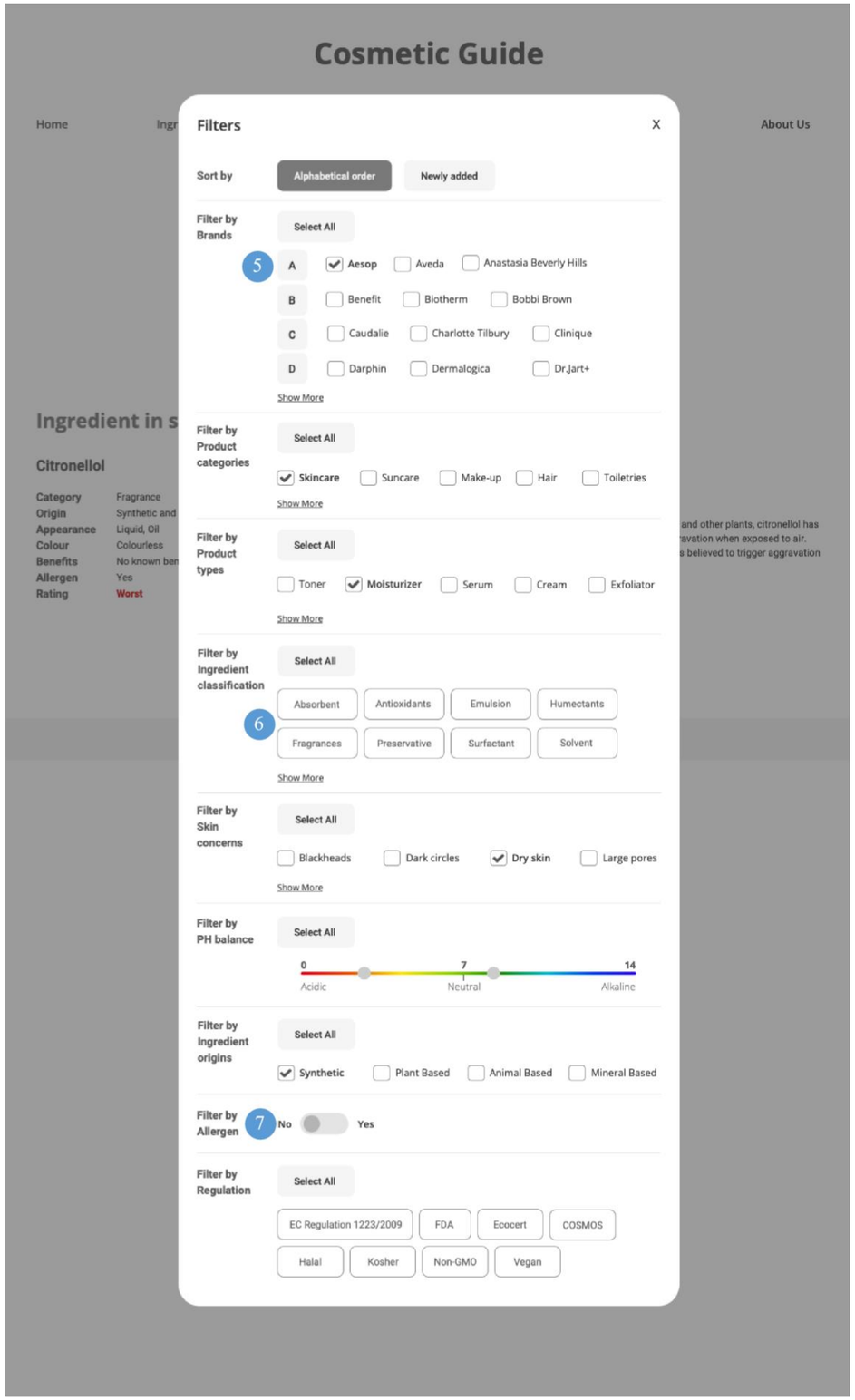

Figure 5. Faceted search from homepage

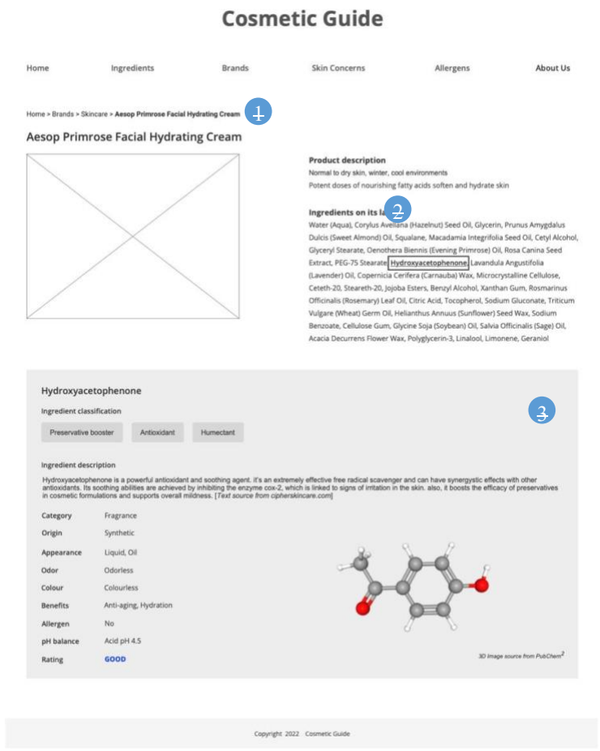

Figure 6 A specific product page

1	Breadcrumb denotes the location of the current page and the hierarchy of the website content. It would allow users to navigate the website more freely.
2	A list of the ingredients for a cosmetic product; users should be able to click an item to see relevant information underneath as shown in 3.
3	The detailed information for a chosen cosmetic ingredient from list 2. The format of ingredient information should be reusable, consistent, extendable, and modulable throughout the website as was specified before.
4	Users can find ingredient information either by cosmetic ingredient classification or INCI (International Nomenclature Cosmetic Ingredient) name which is usually used in labelling. Cosmetic ingredients have both INCI names and classifications; therefore, this tab navigation would provide flexibility and suitability depending on users' interests and needs.
5	The cosmetic classification can be shown in alphabetical order and there are a number of options; users can choose specific types to narrow down the scope of the results.
6	As shown in 5, users chose to see all the ingredients corresponding to the classification, Absorbent. This is the list of the ingredient links belonging to Absorbent. Users can see the total number of ingredients and pagination.

Table 4. Wireframes Annotation for Figures 6

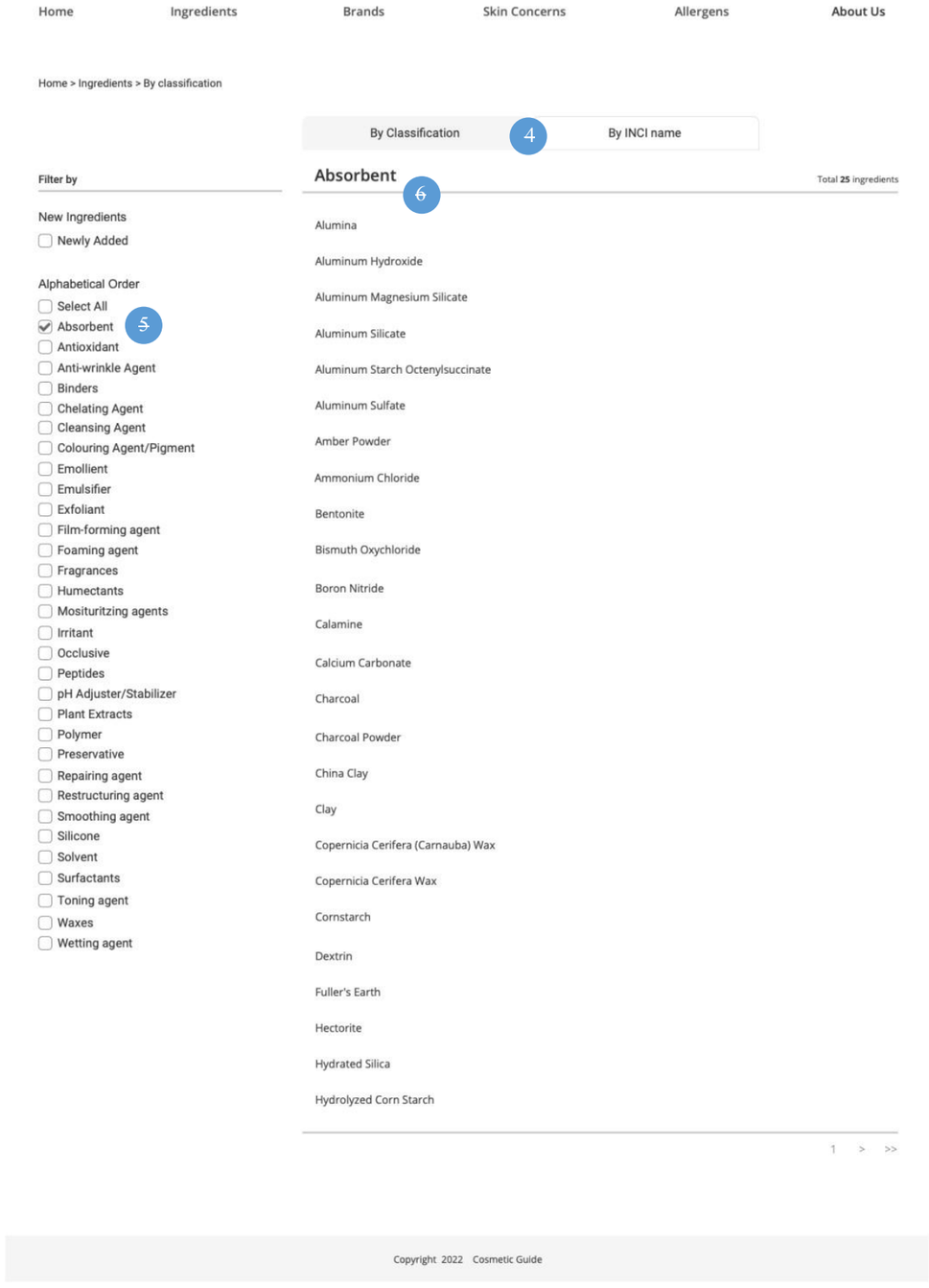

Figure 7. Ingredients page with the classification filter