KNOWLEDGE-BASED HIJAB PRODUCT SELECTION RECOMMENDATION SYSTEM AT CANDY SCARVES

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Abstract

The primary objective of this study is to construct a knowledge-driven hijab product selection recommendation system for Candy Scarves. This system is designed to help customers find hijabs that match their criteria by utilizing customer characteristics and product attributes. The study uses a knowledge-based recommendation approach supported by case-based techniques. The construction of the system is orchestrated through the application of the Rapid Application Development (RAD) paradigm, encompassing a sequence of iterative stages—ranging from requirement formulation and architectural design to accelerated prototyping and eventual deployment—thus privileging adaptability and user-centered refinement over linear progression. Data modeling using sample data totaling 25 hijab products and 6 attributes. The system provides recommendations based on criteria for hijab models, materials, hijab colors, skin colors, motifs, and prices. The empirical findings reveal that the hijab item exhibiting the utmost degree of similarity is the Umama Hijab with voal material, mocha hijab color, brown skin color, and plain motifs with a result of 0.90303. The results of this analysis are able to provide personal recommendations effectively and have the potential to increase customer satisfaction and product sales.

Keywords: Recommendation System, Selection, Hijab, Knowledge Based Recommendation, Rapid Application Development (RAD)

Abstrak

Penelitian ini ditujukan guna mengembangkan sistem rekomendasi pemilihan produk hijab berbasis knowledge-based di Candy Scarves. Sistem ini dirancang untuk membantu pelanggan dalam menemukan hijab yang sesuai dengan kriteria mereka dengan memanfaatkan karakteristik pelanggan dan atribut produk. Penelitian menggunakan pendekatan knowledge-based recommendation yang didukung oleh teknik case-based. Dalam proses perancangan sistem, diadopsi pendekatan Rapid Application Development (RAD) yang meliputi tahapan perumusan kebutuhan, konstruksi desain, elaborasi pengembangan, hingga implementasi fungsional. Pemodelan data dilakukan menggunakan sampel sebanyak 25 entri produk hijab dengan enam atribut penentu. Rekomendasi sistem disusun secara dinamis berdasarkan integrasi variabel model hijab, material, warna hijab, warna kulit, motif, serta rentang harga sebagai parameter preferensi pengguna. Hasil pengujian menunjukkan bahwa produk hijab dengan nilai kemiripan Paling tinggi yaitu Hijab Umama dengan bahan voal, warna hijab mocca, warna kulit sawo matang, dan motif polos dengan hasil 0.90303. Hasil analisis ini mampu memberikan rekomendasi yang personal secara efektif serta berpotensi meningkatkan kepuasan pelanggan dan penjualan produk.

Kata kunci: Sistem Rekomendasi, Pemilihan, Hijab, *Knowledge Based Recommendation*, *Rapid Application Development (RAD)*

INTRODUCTION

Transformation technology information has become catalyst change deep in various realm life human , no except in ecosystem business and strategy marketing . E-commerce, as product evolutionary from digital technology , presenting dynamics transcendent transaction to limitation space and time , so that expand autonomy consumer in the purchasing process (Kotler & Keller, 2021). The phenomenon This participate give positive stimulus to sector fashion , in particular hijab commodity , which shows trend growth exponential in a number of year last (Nasution, 2022)

Hijab does not only function as a cover for the aurat, but also becomes part of the lifestyle and fashion trend for Muslim women. Various variations of hijab such as models, materials, colors, and motifs provide a wide choice for consumers, but at the same time present challenges in choosing the product that best suits personal preferences (Rahmawati & Hidayat, 2023). Hijab fashion has evolved beyond merely being a clothing trend; it has become a widespread phenomenon both domestically and internationally. This development is supported by numerous Indonesian hijab designers who consistently introduce innovations and the latest styles in the hijab fashion industry (Alkahfi et al., 2022). However, the many variations in models, materials, and colors of hijab can confuse consumers in determining the right product choice (Ismail & Fauzi, 2020)

In context Here , Candy Scarves is a hijab store that offers a variety of hijab choices with variations in color, material, and model. However, with so many product variations, customers often have difficulty choosing a hijab that suits their preferences. Some factors that influence the choice of hijab include the type of material, color, motif, skin color, and current fashion trends. This difficulty can cause customers to be confused in determining the most suitable product for them.

To overcome these problems, a recommendation system is the right solution. This system helps users find relevant products based on their preferences (Ricci et al., 2020).One of the widely used recommendation system methods is *knowledge-based recommendation* , which is a system that works based on matching user needs and product attributes based on logical rules (Burke, 2021). This approach is very suitable for stores like Candy Scarves that have limited user data but complete product descriptions.

This method has several advantages, including being able to provide personal and relevant recommendations, easy to explain to users because it is based on logical rules, and suitable for stores with limited data. This system works by utilizing customer characteristic information and product attributes to produce appropriate recommendations, so that it can help customers find the right hijab based on their needs and preferences. The use of knowledge-based recommendation systems is very suitable for use in retail environments such as hijab stores that have complete product descriptions but limited user history (Adomavicius & Tuzhilin, 2020).

Customizing product choices based on customer preferences such as skin tone, patterns, and budget can enhance satisfaction and foster user loyalty (Kurniawan & Yuliana, n.d.). Research shows that personalized recommendations can increase the perceived value of an e-commerce platform (Setiawan et al., 2022). Research by(Hanafi et al., 2024) also demonstrated that knowledge-based recommendation systems can improve the accuracy and relevance of suggested products in the fashion industry.

The application of knowledge-based systems in the fashion world has been validated through case studies showing improvements in user interfaces and decisions (Permatasari & Wijaya, 2023). Such systems are in line with the principles of user-centered design and can be developed using the Rapid Application Development method (Wahyuni & Ramadhan, 2021).

The RAD method allows for rapid iteration and direct user input, which is very useful in developing web-based recommendation tools (Santoso & Maulana, 2022).

This study aims to develop a knowledge-based Hijab Product Selection Recommendation System at Candy Scarves. With this system, it is expected that customers can easily find hijabs that match their criteria , improve their shopping experience, and help Candy Scarves increase customer satisfaction and product sales.

RESEARCH METHOD

Data Types and Sources
1. Primary Data:
   Data collected through the observation process in a way directly at the candy scarves hijab shop with observe criteria candy customers in choosing hijab.
2. Secondary Data
   Information collected from literature related , such as journals , articles , or document previously related with system recommendation knowledge- based .

Method Data collection
1. Observation
   This process implemented through observation participatory with observe in a way direct dynamics operations taking place at the Candy Scarves hijab outlet .
2. Interview
   Exploration empirical in the form of interaction ask answer direct with candy scarves for employees get information .
3. Studies Library
   Collecting data studying and processing literature , theses , journals , books ,

dissertations , and related written media with system recommendation knowledge-based (Utami & Zein, n.d.) .
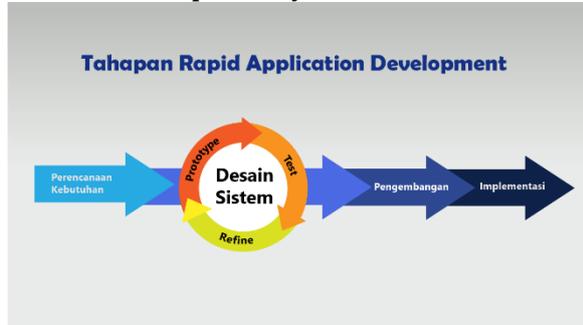
Method Development System

Figure 1. RAD method

Method *Rapid Application Development (RAD)* applied to research This . Method This chosen Because give potential development more system flexible , efficient and feed - based come back user (Aryanti et al., 2021) . The stages used in the method This that is

1. Planning Need
   At the stage this , identify need customers and ongoing business processes from Candy Scarves hijab shop , features , website design and tools used .

2. Design System
   Stage This covers making design interface as well as design channel system using UML, including *use case diagrams* and *wireframes.*

3. Development System
   At the stage this , development system done For change needs that have been identified become a web that can implemented . This digital platform designed through utilization Language PHP programming combined with framework Laravel work , use ensure architecture a structured , efficient system , and adaptive to need development sustainable .

4. Implementation
   Stages This represent phase initiation from realization concrete on design conceptual that has been arranged previously . System realized as prototype system recommendation use *knowledge based recommendation*

RESULTS AND DISCUSSION

NEEDS PLANNING
At the stage This done identification to need customer and the business processes that run in the *Candy Scarves* hijab shop . Information obtained through observation directly and collecting data regarding need system . Stages This is phase beginning in development system , namely design and development . The results of analysis system show that problem main issues faced customer is difficulty in search and select hijab products based on attribute such as hijab models, materials , hijab colors , colors skin , motif, and price.

System recommendation election This hijab product developed as aids in the process of taking decisions by customers , such as in determine suitable hijab products as criteria they (Fariha Aswarina et al., n.d.). This system works by matching the user's specified criteria to the available product data to produce relevant and accurate recommendations. With this, the system This expected capable increase efficiency as well as satisfaction customer in choose product .

For analysis required analysis functional and non- functional . Needs analysis functional explains the processes that run on the system and what is needed for the system to function. with good . System designed For accessed by 2 users namely admin and customer . Admin manages product data and attributes recommendations , while customer can to browse product , do search and fill recommendation product .

Analysis to non- functional requirements to make it necessary fulfillment aspect technological , good in form device hard and soft (Saputro et al., 2024) . As for device hard accommodated namely the Lenovo Thinkpad L380 Yoga with Intel Core i5-8250U processor , CPU speed 1.60GHz to 1.80 GHz, 8GB RAM, and Internet Connection . While Specification device software used namely , System Windows 11 Pro Operation , balsamiq as tool For make design appearance system and Draw.io are used For design *Use Case.*

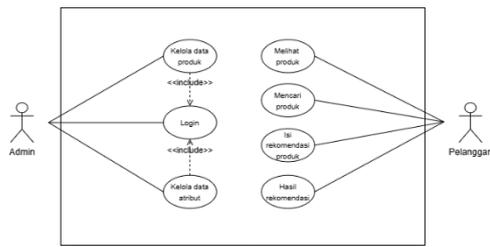**SYSTEM DESIGN**
1. Use Case Diagram

Figure 2. Use Case Diagram

There are 2 actors in design *Use Case Diagram* , namely admin and customer . Admin is responsible for do hijab product data management and managing attribute data in the system hijab recommendations . Customers can see hijab products , looking for hijab products , filling recommendations and results . The *Use Case diagram* is shown in Figure 2.

2. Wireframe

At the stage This designed based on design *use case* image 2. Here This is design design interface as description a number of page system recommendation For election hijab products at candy scarves.
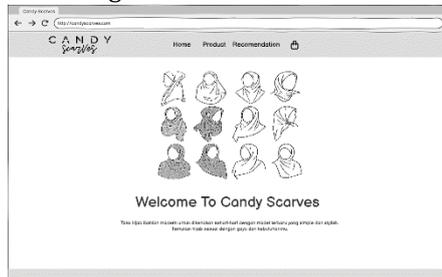
a) Home Page

Figure 3. WireframeHome

Description beginning page *home* on the Candy Scarves website displays several hijab models with different hijab styles . There are welcome and description short about candy scarves shop . Customer can see hijab models on the page *home.*

b) Page Product

In the picture page product , customer can see various hijab model options available at Candy Scarves. The products displayed accompanied by with image , information price and

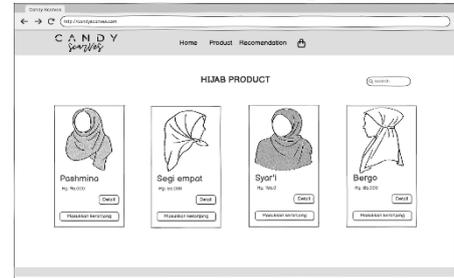product details so that make it easier customer in the selection process .

Figure 4. Product Wireframe

On the page This equipped with feature column possible search customer find product in a way fast without need scrolling entire product list and find product in accordance with criteria customer in a way efficient .

Moment customer enter keywords or criteria certain , for example " aspect four ", system will display results relevant search and display all hijab square four available . Here are results search for square hijab four in figure 5.
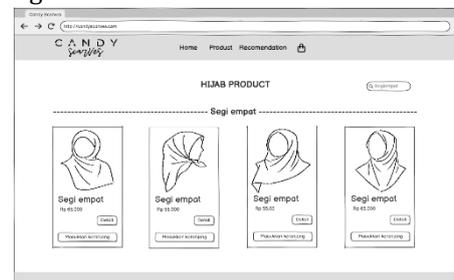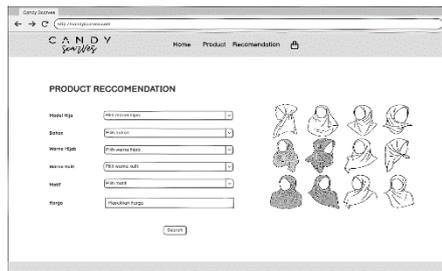

Figure 5. Search Wireframe

c) Page Recommendation

On the page this is , it is description page recommendations that contain 6 attributes namely hijab model, material , hijab color , color skin , motif and price . Customers can fill out the form for determine product in accordance with desired criteria customers at Candy Scarves.

Recommendation Form Wireframe

d) Recommendation Results Page

On the page this is , it is description results recommendation after customer finished fill out the form. Illustration the shown in the picture following .
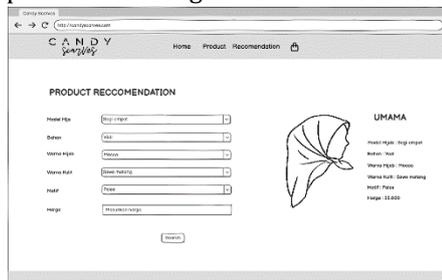

Figure 7. WireframeResults

DEVELOPMENT

Sample data on hijab products sold at Candy Scarves is the data applied in the research. This . Method development system use *knowledge based recommendation,* 25 samples used hijab products and has 6 attributes on each hijab products . Hijab product data is shown by the table following This :

Table 1. Hijab Product Data

Brand Headscarf	Model Headscarf	Material	Color Headscarf	Color Skin	Motive	Price
Zoya	Pashmina	Silk	Mocha	Sapodilla ripe	Plain	95,000
Zoya	Pashmina	Silk	Khaki	Yellow complexion	Plain	95,000
Azara	Pashmina	Crinkle	Dusty Pink	White	Plain	85,000
Voila	Pashmina	Voal	Navy	Yellow complexion	Plain	85,000
Voila	Pashmina	Voal	Beige	Sapodilla ripe	Plain	85,000
Miranda	Pashmina	Satin	Peach	White	Plain	95,000
Miranda	Pashmina	Satin	Purple	Yellow complexion	Plain	95,000
Azara	Pashmina	Ceruty	Black	Sapodilla ripe	Plain	65,000
Azara	Pashmina	Ceruty	Olive	Sapodilla ripe	Plain	65,000
Azara	Pashmina	Ceruty	Lilac	White	Plain	65,000
Azara	Pashmina	Ceruty	Baby Blue	White	Plain	65,000
Azara	Pashmina	Ceruty	Lavender	Yellow complexion	Plain	65,000
Azara	Aspect four	Ceruty	Army Green	Sapodilla ripe	Abstract	60,000
Azara	Aspect four	Ceruty	Mocha	Sapodilla ripe	Plain	60,000
Umama	Aspect four	Voal	Gray	White	Plain	55,000
Umama	Aspect four	Voal	Dusty Pink	White	Flower	65,000
Umama	Aspect four	Voal	Cream	Yellow complexion	Abstract	65,000
Umama	Aspect four	Voal	Maroon	Sapodilla ripe	Flower	65,000
Umama	Aspect four	Voal	Mocha	Sapodilla ripe	Plain	55,000
Arrafi	Sharia	Ceruty	Baby Pink	White	Mote	165,000
Arrafi	Sharia	Ceruty	Black	Sapodilla ripe	Mote	165,000
Arrafi	Sharia	Ceruty	White	White	Lace	155,000
Umama	Bergo	Crinkle	Chocolate old	Yellow complexion	Plain	95,000
Umama	Bergo	Crinkle	Light blue	White	Plain	95,000
Rabbani	Bergo	Jersey	Navy	Sapodilla ripe	Plain	75,000

This study was conducted by forming a knowledge-based recommendation model with technique *case based* For counting mark *similarity* of existing products with need customer (Safitri et al., 2023) .

Similarity is matter important in count mark similarity a product with other products to customer based on preferences and criteria customer (Atina & Hartanti, 2022).

In knowledge-based modeling , the formula used For count mark *similarity* as following :

$$Sim(user, item) = W1 * S1 + W2 * S2 + \cdots + Wn * Sn$$

Information :

1. $Sim(user, product)$ = value similarity
2. W = Weight Attribute
3. S = Comparative Value

In the research This used 6 attributes hijab products in the calculation of which consists from the hijab model, material , hijab color , color skin , motif and price . Here This weight attribute from every product headscarf :

1. Hijab model = 20% →0.20
2. Material = 25% →0.25
3. color = 20% →0.20
4. Color skin = 15% →0.15
5. Motive = 10% →0.10
6. Price = 10% →0.10

Based on table 1 sample data hijab products , if customer Want to look for hijab products with criteria following This :

1. Hijab model = Square model
2. Material = Voal
3. Hijab color = Mocha
4. Color skin = sapodilla ripe
5. Motif = Plain
6. Price = 50,000

Criteria the put into operation as framework Work in system recommendation based on knowledge (*knowledge-based recommendation*)

for use direct selection hijab products offered by Candy Scarves more structured and relevant . The hijab model chosen by the customer is a square hijab model four so from 25 sample data hijab products get 7 recommendations suitable hijab products with criteria customers . Data obtained based on the hijab model chosen by the customer shown in table 2.

Table 2. Products Aspect four

Brand Headscarf	Model Headscarf	Material	Color Headscarf	Color Skin	Motive	Price
Azara	Aspect four	Ceruty	Army Green	Sapodilla ripe	Abstract	60,000
Azara	Aspect four	Ceruty	Mocha	Sapodilla ripe	Plain	60,000
Umama	Aspect four	Voal	Gray	White	Plain	55,000
Umama	Aspect four	Voal	Dusty Pink	White	Flower	65,000
Umama	Aspect four	Voal	Cream	Yellow complexion	Abstract	65,000
Umama	Aspect four	Voal	Maroon	Sapodilla ripe	Flower	65,000
Umama	Aspect four	Voal	Mocha	Sapodilla ripe	Plain	55,000

From 7 hijab products four filtered ones step furthermore count *similarity* with method *knowledge based recommendation* For count level similarity based on criteria customer includes hijab models, materials , hijab colors , colors skin , motif and price . Price sell peak For hijab products at Candy Scarves are listed of 165,000. The calculation process mark *similarity* that is :

Product 1
Product 1 is available mismatch with criteria customers on the material , hijab color , and motif. This product uses a different type of ceruty material from criteria customers (*Voal*), as well as *Army Green* hijab color and *Abstract motif* that is not according to . Price product This Rp10,000 more expensive than criteria customers . However Thus , the compatibility color skin Already in accordance with preference Customer (*Sapodilla) Ripe).* Calculation results *similarity* between product 1 with criteria customer that is :
$Sim(user,product 1)$ = (0.20*1) + + (0.25*0) + (0.20*0) + (0.15*1) + (0.10*0) + (0.10*(10000/165000) = 0.20 + 0 + 0 + 0.15 + 0 + 0.00606 = **0.35606**

Product 2
Product 2 has the difference in the materials , namely use *Ceruty* No *Voal* like criteria customers . However , the color of the hijab (*Mocca*), the color skin (*Sapodilla) Ripe*), motif (*plain*), and criteria price own difference of more than Rp. 10,000 tall from criteria customers . In overall , product This Enough approach criteria customers in aspects

color and pattern. Calculation results *similarity* between product 2 with criteria customer that is :
$Sim(user,product 2)$ = (0.20*1) + + (0.25*0) + (0.20*1) + (0.15*1) + (0.10*1) + (0.10*(10000/165000) = 0 , 20 + 0 + 0 , 20 + 0 , 15 + 0 , 10 + 0 , 00606 = **0 , 65606**

Product 3
Product 3 conforms to the aspects material Because use *Voal* . However , the color of *the* hijab (*gray*), the color skin (*white*), and the price is Rp. 5,000 more expensive than criteria Customer . Product motif This Already according to (*Plain*). The results of the similarity calculation between product 3 with criteria customer that is
$Sim(user,product 3)$ = (0.20*1) + + (0.25*1) + (0.20*0) + (0.15*0) + (0.10*1) + (0.10*(5000/165000) = 0 , 20 + 0 , 25 + 0 + 0 + 0 , 10 + 0 , 00303 = **0 , 55303**

Product 4
Product 4 already in accordance from side material (*Voal*), but own differences in hijab color (*Dusty Pink*), color skin (*white*), and motifs (*flowers*) that are not in accordance with criteria Customer . Price product This Rp. 15,000 more expensive compared to desired price . The results of the similarity calculation between product 4 with criteria customer that is :
$Sim(user,product 4)$ = (0.20*1) + + (0.25*1) + (0.20*0) + (0.15*0) + (0.10*0) + (0.10*(15000/165000) = 0 , 20 + 0 , 25 + 0 + 0 + 0 + 0 , 00909 = **0 , 45909**

Product 5
Product 5 is suitable for the material (*Voal*), but own mismatch in hijab color (*cream*), color skin (*yellowish yellow*), and motif (*abstract*). In addition that , price product This Rp. 15,000 more expensive compared to criteria customers . The results of the similarity calculation between product 5 with criteria customer that is :
$Sim(user,product 5)$ = (0.20*1) + + (0.25*1) + (0.20*0) + (0.15*0) + (0.10*0) + (0.10*(15000/165000) = 0 , 20 + 0 , 25 + 0 + 0 + 0 + 0 , 00909 = **0 , 45909**

Product 6
Product 6 already according to the material (*voal*) and color skin (*Sapodilla) Ripe*). However , the color of the hijab (*Maroon*) and the motif (*Flower*) are not in accordance with criteria Customer . Price product This Rp. 15,000 more expensive than desire customers . The results of the similarity calculation between product 6 with criteria customer that is ;

Sim(user,product 6) = (0.20*1) + + (0.25*1) + (0.20*0) + (0.15*1) + (0.10*0) + (0.10*(15000/165000) = 0 , 20 + 0 , 25 + 0 + 0 , 15 + 0 + 0 , 00909 = **0 , 60909**

Product 7
Product 7 has high compatibility with criteria customer . Material (*Voal*), hijab color (*Mocca*), color skin (*Sapodilla) Ripe*), and the motif (*plain*) is ready in accordance with preference customers . Only only , there is difference price Rp. 5,000 more expensive than desired price . The results of the similarity calculation between product 7 with criteria customer that is :
Sim(user,product 7) = (0.20*1) + + (0.25*1) + (0.20*1) + (0.15*1) + (0.10*1) + (0.10*(5000/165000) = 0 , 20 + 0 , 25 + 0 , 20 + 0 , 15 + 0 , 10 + 0 , 00303 = **0 , 90303**
Based on calculation level similarity use *knowledge-based recommendation,* the most adaptive product with criteria customer that is product 7 with mark *similarity* 0.90303.

IMPLEMENTATION
At this stage, is presented findings implementation a number of pages and features that have been designed as part from system recommendation For hijab selection at Candy Scarves.

1. *Home* Page

Figure 8. *Home* View

On display This customer can see various models and styles of hijab on the page *home* Candy Scarves.
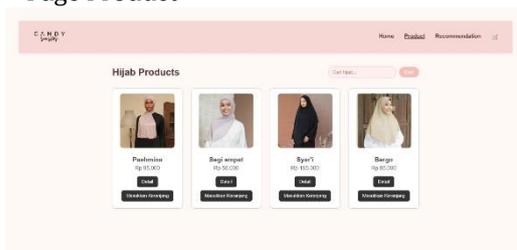
2. Page Product

Figure 9. Product View

Page product This used For display full list all product available hijab or sold at Candy Scarves. Customers can enter criteria for the hijab that is sought and automatic system will display suitable product with criteria customer .
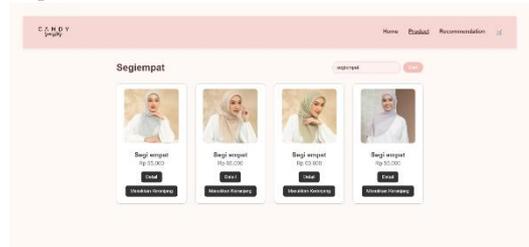

Figure 10. Display Product Rectangular

In figure 10 it can be seen results if customer looking for square hijab four so search square hijab appears four . Meanwhile, in figure 11 it is also seen if customer looking for pashmina then will The pashmina hijab model appears .
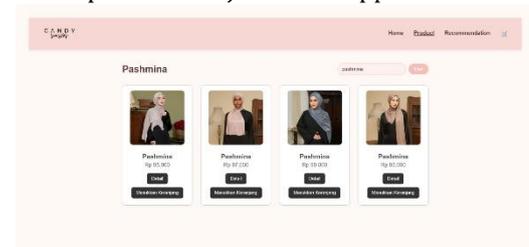

Figure 11. Display Pashmina Products
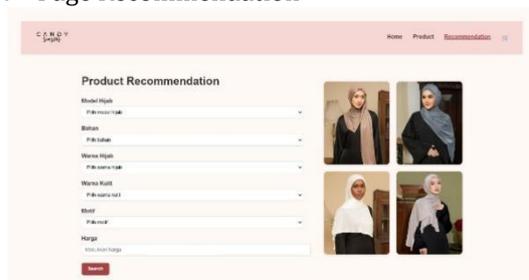
3. Page Recommendation

Figure 12. Recommendation Form View

Page recommendation This play a role in serve form easy search customer in look for product with criteria they with fast . Customer can filtering product based on the form provided .
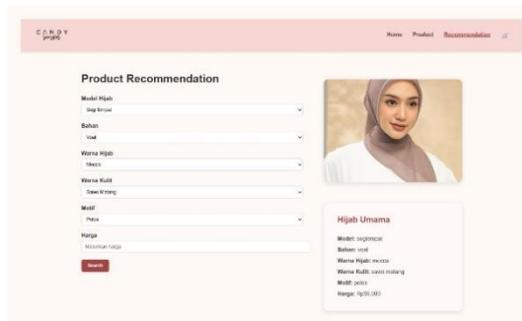
4. Recommendation Results Page

Figure 13. Result View

On the page this , customer can see results recommendation hijab products after fill out the form, system will display recommendation in accordance with the criteria they choose .

CONCLUSION AND SUGGESTIONS

Conclusions

In this research , the application system *knowledge-based* hijab product selection recommendations at Candy Scarves designed to help customers find hijab products that match their criteria by utilizing customer characteristic information and product attributes, such as hijab model, material, hijab color, skin color, motif, and price.

Making system This use approach *Rapid Application Development* (RAD) with planning stages requirements , system design, development, and implementation. The system utilizes a *knowledge-based recommendation approach* supported by *case-based techniques.* in calculating the similarity value between customer criteria and available hijab products.

From the test results, it was obtained that the product with the highest similarity value was the Umama brand Hijab with voal material, mocha color, suitable for tanned skin tones, and has a plain motif, with a similarity score of 0.90303. This value indicates that the product is very much in accordance with customer criteria and can be used as the main recommendation.

Thus, the system built has proven to be effective in presenting recommendation in accordance needs . In addition to increasing customer convenience in the product selection process, this system also has the potential to increase customer satisfaction and increase hijab sales for the Candy Scarves store.

Suggestion

For the process that has been designed in the knowledge-based recommendation system in candy scarves, there are several things that can be considered for further system development, namely:

a. The system interface should continue to be refined to be more user-friendly and other features can be added such as payment methods.

b. In addition to the parameters that have been used (model, material, color, motif, etc.), the system can be developed to consider the latest fashion trends, customer reviews, or product stock availability levels.

c. More extensive system testing is needed with a larger and more diverse number of respondents to obtain a more comprehensive evaluation of the system's performance and effectiveness.

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