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RESEARCH ARTICLE **Open Access**

Website-Based Liquid Selection Recommendation System Using Content-Based Filtering Method at Morevapor Gading Store

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Abstract: Liquid is a favorite product among various vape lovers. This product provides a variety of unique and refreshing flavors, attracting the attention of vaping lovers to always try new variants. The high cost of purchasing liquid vape makes many people prefer to buy products that are recommended according to their preferences, making MoreVapor Gading the main choice. This research aims to develop a recommendation system for selecting vape liquids using a content-based filtering mechanism with the TF-IDF approach. The TF-IDF approach was chosen because of its ability to give more precise weight to words that are relevant but not too common, resulting in more accurate recommendations compared to other methods. Practically, the results of this research provide significant benefits for MoreVapor Gading, namely increasing the accuracy of product recommendations which can minimize ordering errors and increase customer satisfaction and loyalty. This research method uses a waterfall model which consists of analysis, design, implementation and testing stages. The research results show that from 21 datasets, the system can provide five recommendations with the highest similarity values, namely "Cair Grape" (0.1445), "American Winter Grape Candy Magic" (0.1243), "Paradewa Grape Athena" (0.1151), "American Winter Magic Fanta Float" (0.0923), and "Foom Breeze Series Guava" (0.0918) based on user preferences. The recommendation system developed aims to provide recommendations that are accurate and in accordance with user preferences in choosing vape liquid.

Keywords: Liquid Vape; Content Based Filtering; TF-IDF.

1. Introduction

With the recent upward trend in vaping, innovative solutions are needed when it comes to selection of products. As one of the top vaporing product providers, the MoreVapor Gading Store has to deal with the challenge of providing the liquid that customers prefer. With many liquid options available: flavors, nicotine strength, brands, customers often have a hard time acquiring the product that suits them [1]. Sophisticated information technology such as a recommendation system that is incorporated into the website will offer the best plan to assist the person effectively and efficiently. User tasks such as recommendation systems, like content-based filtering, help users discover suitable items to their interest in different industries (books, movies, music, etc.) [2]. MoreVapor Gading menyediakan berbagai macam vape liquid yang terkenal seperti Freebase dan Salt Nic. While customers select the products that appeal to them, this can be difficult for novices to vaping. There are a lot of them who feel embarrassed to ask which very frequently making purchases wrong and to lose satisfaction.

A vape liquid recommendation system for MoreVapor Gading will be the solution to the problem. The system re-aids consumers in determining which liquid will work best for them, broken down into what type of liquid best matches their vape (freebase or salt nic), what kind of flavor they want (creamy or fruity), and what brand they tend to prefer This system provides recommendations based on user preferences and item descriptions, matching items that are similar to the items that users like by using content-based filtering, according to Zayyad, 2021 [3]. CupDrop system provides correct recommendations of liquid according to the customers need, This will also reduce the errors caused in the purchasing process and thus increasing the customer satisfaction. Nevertheless, little has been done in terms of recommendation systems on vaping liquid products [4]. While technologies like IoT and data analytics are already showing promise at enhancing user experience in the vaping realm, their specific applications for liquid recommendations are not exactly ideal yet. This gap consists of the missing literature that considers the features of liquid vaping goods, the combination of consumer preference information and product information, and how to address cold-start problems for new users [5]. The aim of this research is to help bridge this gap and assign innovative solutions on the scale of the MoreVapor Gading store that can facilitate customer satisfaction and customer loyalty, particularly through an accurate and personalized recommendation system. The subsequent testing of the system in a vaping retail setting will yield useful information for further advancement and application in other comparable shops [6].

Which is particularly useful for measuring the importance of a word in a specific, somewhat due to similarity across the whole data collection. In choosing the vape liquid, TF-IDF can identify the product description that has the highest scoring according to the frequency of terms contained in the user query. The novelty of TF-IDF is that it can give different weight to common words and the word that actually defines some unique property [7], of a liquid. Imagine even the word "wine" would come a lot, but that Which user like "cold" then for TF-IDF the word wine will give it the most weight, As a result, TF-IDF does a very good job of filtering and providing product recommendations that are tailored to the user's taste and needs, therefore enhancing the purchasing experience. This is where TF-IDF comes in - enable recommender systems to be efficient in identifying [8], and showcasing the right products, making it a potent tool to enhancing accuracy and customer satisfaction in the vape industry.

2. Research Method

2.1 Calculation Method

At this stage, the researcher applied the CBF method with the TF-IDF approach to calculate the similarity between items in the liquid morevapor database [9]. The calculation steps include:

1) Tokenization or creating Stopwords
   The description of the items in the database is broken down into tokens (separate words). Stopwords, which are common words that do not have much informative value, are removed to improve the accuracy of the calculation. Stopword Example : “dan”, “yang”, “di”, “untuk”, *etc* [10].

2) TF-IDF calculation
Term Frequency is used to measure the presence of a word in the document. The formula is the number of occurrences of a particular word ("query") in a document compared to the total number of words in the document with the following formula:

$$tf = \frac{number\ of\ occurrences\ of\ a\ word\ with\ "query"}{total\ number\ of\ words\ in\ the\ description}$$

The IDF (Inverse Document Frequency) formula calculation is used to reduce the weight of words that frequently appear in many documents and give more weight to words that rarely appear [11], with the following formula:

$$idf(query) = \log\left(\frac{total\ number\ of\ items}{number\ of\ items\ containing\ "query"}\right)$$

TF-IDF is used to assess the term weight so that it is possible to find the most relevant words in a given. The formula is:

$$\mathrm{tf} - \mathrm{idf} = tf \times idf$$

3) Similarity Calculation
Using TF-IDF values to calculate the degree of similarity between items in a database. Here is the formula:

$$Similarity(user, item) = \frac{2 \times TF - IDF(item)}{TF - IDF(user) + TF - IDF(item)}$$

2.2 System Development Methods

This study uses the SDLC Waterfall model methodology to develop a website-based liquid selection recommendation system at the MoreVapor Gading store. This model uses a systematic approach or organized process to build a system [12]. The Waterfall method was chosen because of its structured and sequential approach, this method emphasizes complete documentation in each phase, in the context of developing a liquid selection system, where the needs and specifications are relatively stable and clear from the start, the Waterfall method is the right choice [13]. This method consists of the following stages:

1) Needs Analysis
Identifying system needs through interviews, surveys, and literature studies to understand specific needs. The result is a system requirements specification document.
2) System Design
Designing system architecture, database, user interface, and content-based filtering algorithms. The output is a detailed system design document.
3) Implementation
Implementing system design into program code using web development technologies such as HTML, CSS, JavaScript, and backend frameworks such as Laravel, and databases such as MySQL.
4) Testing
Conducting unit, integration, system, and blackbox user acceptance testing, to ensure system functions run according to specifications. Any bugs found will be fixed.

By following the Waterfall model, this research is expected to produce a recommendation system that is accurate, reliable, and increases customer satisfaction and loyalty at the MoreVapor Gading store.

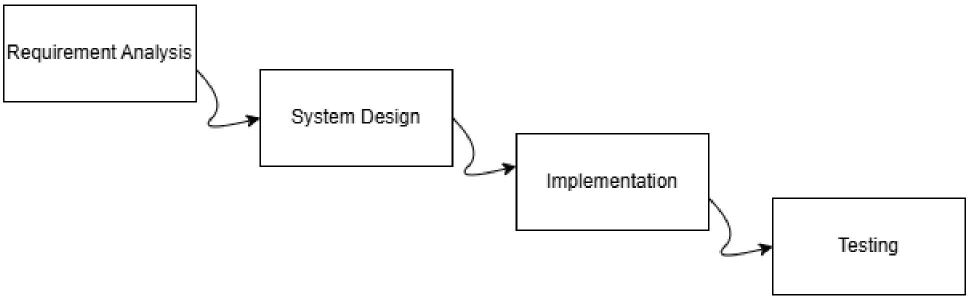

Figure 1. Waterfall Method [14]

3. Result and Discussion

3.1 Results

The system is used for liquid selection designed by applying the CBF method with the TF-IDF approach. This method works based on user preferences for items contained in the database. This system can recommend liquids that match user preferences, using information contained in the description column. This dataset contains 25 liquid data in the form of a My-SQL database.

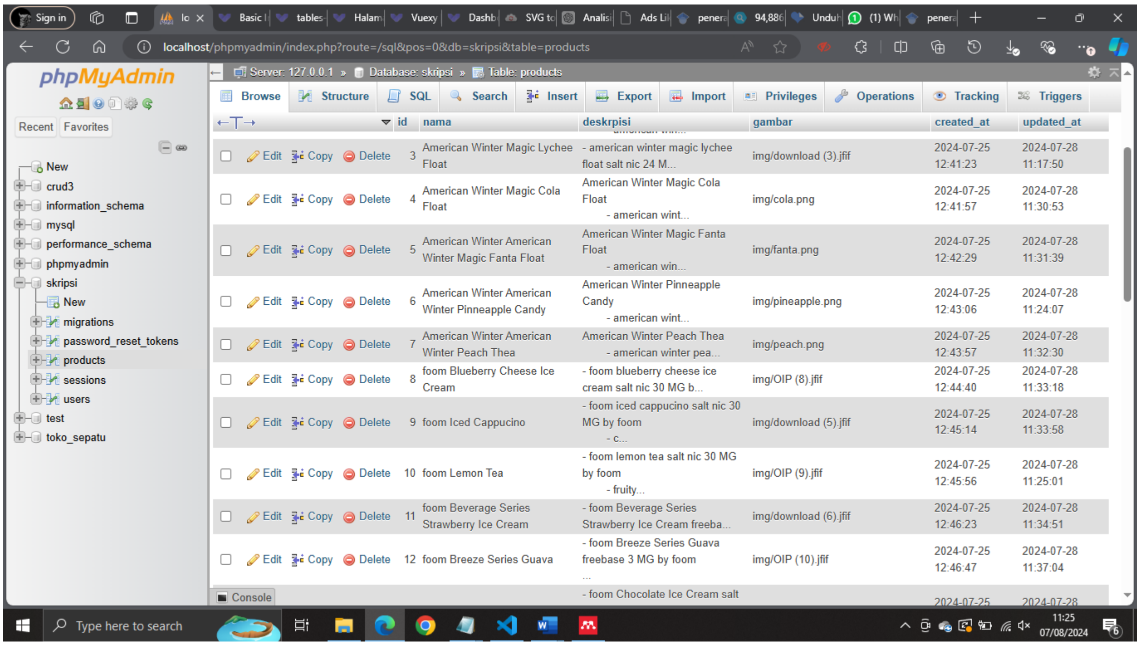

Figure 2. Liquid Dataset

In the Content Based Filtering Calculation stage, the calculation is carried out based on the liquid dataset that has gone through the stopword process. The purpose of the stopword process is to eliminate words that do not provide significant meaning to the sentence [15]. The following is the dataset after the stopword process used as a reference for the CBF calculation:

Table 1. Stopwords Results

Title	Description
American Winter Grape Candy Magic	Grape fruit flavor, additional sweet candy flavor, cool sensation of American Winter, pleasant vaping experience, Salt Nic 24 MG, volume 30 ML, affordable price range.
American Winter Magic Lychee Float	Sweet lychee fruit flavor, refreshing cool sensation, enjoyable vaping experience, Salt Nic 24 MG, 30 ML volume, affordable price range.

American Winter Magic Cola Float	Cola flavor sweet carbonated soft drink, refreshing cool float sensation, enjoyable vaping experience, Salt Nic 24 MG, 30 ML volume, affordable price range.
American Winter Magic Fanta Float	Fanta flavor sweet carbonated soft drink, refreshing cold float sensation, enjoyable vaping experience, Salt Nic 24 MG, 30 ML volume, affordable price range.
American Winter Peach Thea	Peach tea flavor is a blend of tea and peach flavors, just the right amount of sweetness, a cool American Winter sensation, a pleasant vaping experience, Salt Nic 24 MG, 30 ML volume, affordable price range.
American Winter Pinneapple Candy	Pineapple fruit flavor, additional sweet candy flavor, cool sensation of American Winter, pleasant vaping experience, Salt Nic 24 MG, volume 30 ML, affordable price range.
foom Blueberry Cheese Ice Cream	Sweet blueberry flavor, added ice cream flavor, strong sweet sensation, Salt Nic 30 MG, volume 30 ML, price suitable for beginners.
foom Iced Cappucino	Iced cappuccino coffee flavor, creamy sensation, Salt Nic 30 MG, volume 30 ML, price suitable for beginners.
foom Lemon Tea	Fresh lemon tea taste, pleasant cool sensation, Salt Nic 30 MG, volume 30 ML, price suitable for beginners.
foom Beverage Series Strawberry Ice Cream	Sweet strawberry flavor, additional ice cream flavor, strong sweet sensation, Salt Nic 30 MG, volume 60 ML, price suitable for beginners.
foom Breeze Series Guava	Sweet guava flavor, pleasant cool sensation, Salt Nic 30 MG, 60 ML volume, affordable price.
foom Chocolate Ice Cream	Chocolate flavor, creamy sensation, sweetness comes from ice cream, Salt Nic 30 MG, volume 30 ML, price suitable for beginners.
Paradewa Red Apple Zeus	Refreshing sweet apple flavor, Salt Nic 30 MG, 60 ML volume, Sweet and Cool sensation, affordable price.
Paradewa Manggahera	Refreshing sweet mango flavor, Salt Nic 30 MG, volume 60 ML, Sweet and Cool sensation, affordable price.
Paradewa Vanilla Olympus	Soft vanilla flavor, Salt Nic 30 MG, 30 ML volume, Sweet and Cool sensation, affordable price.
Paradewa Grape Athena	Refreshing sweet grape flavor, Salt Nic 30 MG, 30 ML volume, Sweet and Cool sensation, affordable price.
Paradewa Lychee Olympus	Refreshing sweet lychee flavor, Salt Nic 30 MG, 30 ML volume, Sweet and Cool sensation, affordable price.
Paradewa Watermelon Olympus	Refreshing sweet watermelon flavor, Salt Nic 30 MG, 30 ML volume, Sweet and Cool sensation, affordable price.
Cair Watermelon	Fresh sweet watermelon flavor, Ultimate Cool Sensation, Salt Nic 30 MG, 30 ML volume, affordable price.
Cair Lychee	Fresh sweet lychee flavor, Ultimate Cool Sensation, Salt Nic 30 MG, 30 ML volume, affordable price.
Cair Grape	Fresh sweet grape flavor, Ultimate Cool Sensation, Salt Nic 30 MG, 30 ML volume, affordable price.
Cair Mango	Fresh sweet mango flavor, Ultimate Cool Sensation, Salt Nic 30 MG, 30 ML volume, affordable price.
Cair HoneyDew	Fresh sweet melon flavor, Ultimate Cool Sensation, Salt Nic 30 MG, 30 ML volume, affordable price.
Grape Berry Blast	Sweet berry flavor, Ultimate Sweet Sensation, Salt Nic 25 MG, 15 ML volume, economical price.
Banana MilkShake	Sweet banana flavor, creamy milkshake, Ultimate Sweet Sensation, Salt Nic 25 MG, 15 ML volume, economical price.
Ketan Legend	Sweet sticky rice flavor, Ultimate Sweet Sensation sensation, Salt Nic 25 MG, volume 15 ML, economical price.

User requirements: "I want to find a liquid with a grape flavor that feels cold". Based on these requirements, it can be used to get similarity points by calculating TF (Term Frequency) & IDF (Inverse Document Frequency) and then calculating the similarity.

Table 2. TF-IDF Calculation Results

Product	TF-IDF "wine"	TF-IDF "cold"
American Winter Grape Candy Magic	0.20 * 0.50 = 0.10	0.15 * 0.30 = 0.045
American Winter Magic Lychee Float	0.00 * 0.50 = 0.00	0.15 * 0.30 = 0.045
American Winter Magic Cola Float	0.00 * 0.50 = 0.00	0.15 * 0.30 = 0.045
American Winter Magic Fanta Float	0.00 * 0.50 = 0.00	0.15 * 0.30 = 0.045
American Winter Peach Thea	0.00 * 0.50 = 0.00	0.15 * 0.30 = 0.045
American Winter Pinneapple Candy	0.00 * 0.50 = 0.00	0.15 * 0.30 = 0.045
foom Blueberry Cheese Ice Cream	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
foom Iced Cappucino	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
foom Lemon Tea	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
foom Beverage Series Strawberry Ice Cream	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
foom Breeze Series Guava	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
foom Chocolate Ice Cream	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Paradewa Red Apple Zeus	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Paradewa Manggahera	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Paradewa Vanilla Olympus	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Paradewa Grape Athena	0.20 * 0.50 = 0.10	0.00 * 0.30 = 0.000
Paradewa Lychee Olympus	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Paradewa Watermelon Olympus	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Cair Watermelon	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Cair Lychee	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Cair Grape	0.20 * 0.50 = 0.10	0.00 * 0.30 = 0.000
Cair Mango	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Cair HoneyDew	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Grape Berry Blast	0.20 * 0.50 = 0.10	0.00 * 0.30 = 0.000
Banana MilkShake	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000
Ketan Legend	0.00 * 0.50 = 0.00	0.00 * 0.30 = 0.000

After getting the TF-IDF value, the next step is to calculate the similarity.

Table 3. Similarity Calculation Results

Product	Cosine Similarity
American Winter Grape Candy Magic	1.0000
Paradewa Grape Athena	0.0900
Cair Grape	0.0900
Grape Berry Blast	0.0900
American Winter Magic Lychee Float	0.0450

The table above shows the results of TF, IDF, and TF-IDF calculations for each product based on the keywords "wine" and "cold". American winter grape candy magic has a higher cons level than other liquid products, this is because the level of similarity of words from the description of American grape candy magic is higher, so this product is more relevant to user preferences.

3.1.1 System Implementation

In Figure 3. It is a use case, there are 2 actors, namely the Owner and the User. The use case scenario is the flow of the use case process from the actor and system side [16]. Indirectly, this case diagram is used to describe the system that shows the interest between the actors in this system [17]. The owner is the person in charge of MoreVapor Gading who can access the administration page by entering the username and password that have been created, while the User himself is the person who accesses the liquid recommendation system website at Morevapor who can see the liquid products available at that place and can access the recommendation page to get recommendations for sweet and fresh Liquids that match the user's preferences.

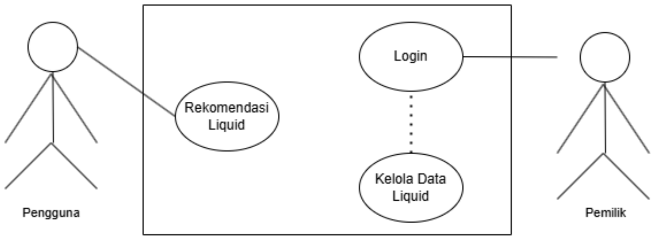

Figure 3. Use case Diagram

Table 4. Actor Identification

No	Actor	Explanation
1	Owner	Access the data management page with login requirements with username and password & Input camping equipment data
2	Users	Access the recommendations page

The Inter-Table Relationship Design view is the result of table design, which contains the users and products tables (Figure 4).

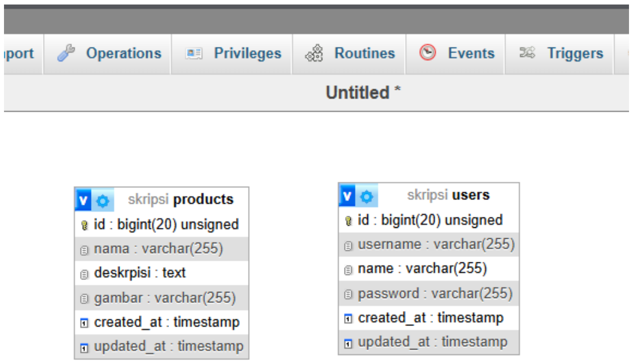

Figure 4. Table Relationship View

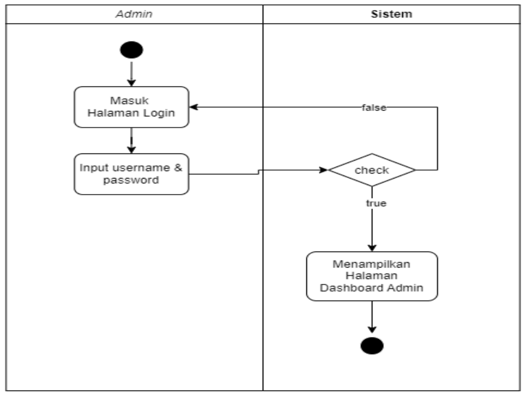

Figure 5. Activity diagram of Login Owner

Activity Diagram is a visual representation of the system's workflow to understand the processes that occur in this application. This diagram is in accordance with the flowchart because both are models that describe the transition of some activities to others [18]. The difference is that the flowchart is used as a description of the system's workflow, while the activity diagram is used to represent activities that can be done by actors. In Figure 4 is the owner's activity diagram when logging in, if the unique name & password are correct, it will be returned to the Dashboard page. Then Figure 5. Is the owner's activity diagram when he wants to manage data and the system also returns according to the admin input. And in Figure 6 is the user's activity diagram when he is going to make a recommendation, the system also returns according to what the user inputs. The Activity Diagram chart for admin login is used to describe the admin login process modeling to the system (Figure 5). The activity dashboard diagram chart is used to illustrate the admin login process modeling for access to create, read, update, and delete liquid data (Figure 6). The activity diagram chart is used to describe the modeling of the user recommendation process to obtain complete data on the liquid being searched for according to the user's perspective (Figure 7).

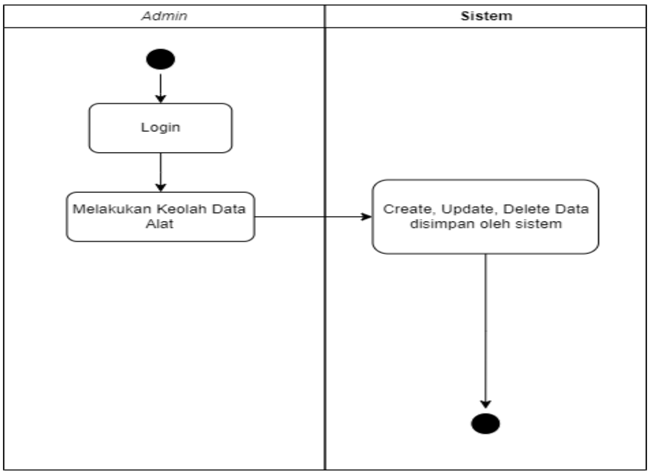

Figure 6. The owner manages the data with the Activity diagram.

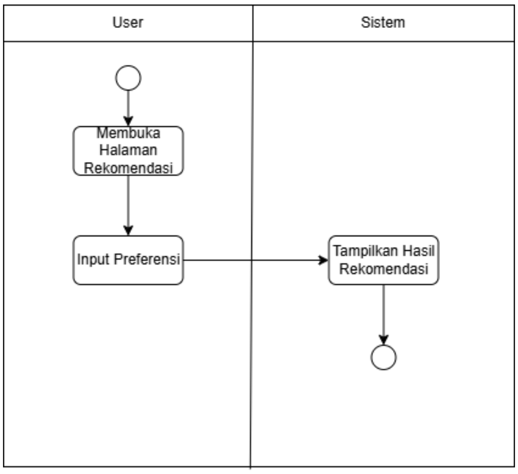

Figure 7. User recommends the Activity diagram

The display results that have been created to make it easier to read the dataset in the database and then perform calculations more quickly and practically and according to user preferences which are references from manual calculations, here are some displays. On the main page is the initial display of the Morevapor Gading website, which contains the general profile and address of the store, then there are 2 navigations, namely Recommendations and Login.

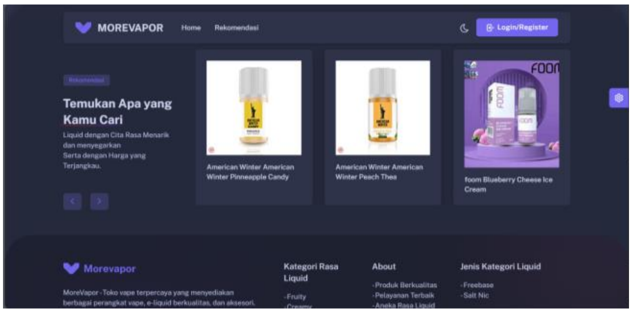

Figure 8. Home Page

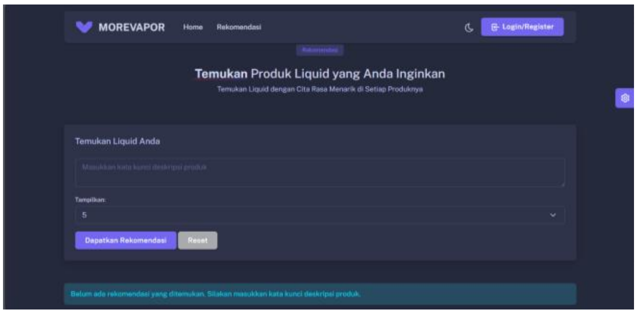

Figure 9. Recommendations Page

The Recommendation Page contains an input form for users to choose based on several things such as flavor category, type of liquid, brand of liquid and a brief description of the liquid. After the user inputs their preferences, the user clicks the get recommendations button and will get the recommendation results that match their preferences. On the Login Page (Admin) is access for admins to enter the admin dashboard page to manage data.

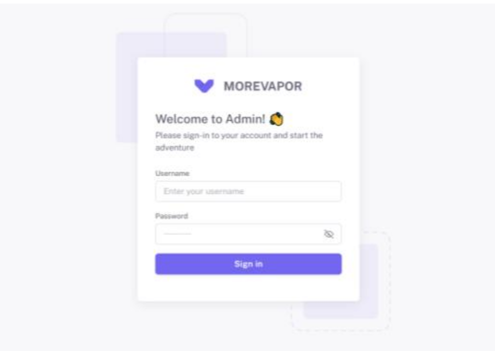

Figure 10. Login Page

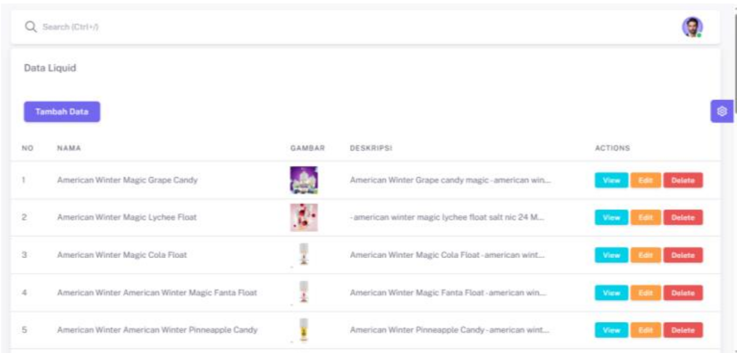

Figure 11. Dashboard page

On the Dashboard page is a preview for admins who can manage data such as creating, editing, and deleting data.

3.1.2 System Testing

Black Box Testing is a system test that aims to find functional errors in the system being developed [19]. This test is very important to do because it ensures whether the quality of the software or system being built can run well or not. In this test, data is taken randomly with the aim of getting the expected results. [20] For example, if data cannot be added to the database when trying to add it, then it is considered an error. Conversely, if the data is successfully added to the database, then it is considered correct.

Table 5. System Test Results

Function	Condition	Output	Status
Login	Unique name and password are correct	login successful	Valid
	Unique name and password are incorrect	login failed	Valid
Add Liquid data	Fill in all forms (name, picture, and description)	Add data successful	Valid
Changing Liquid data	Fill in all or one of the formats (name, image, and description) that have been added.	Change data successful	Valid
Deleting Liquid data	Delete one of the data that has been added	Data deletion successful	Valid
Entering recommendations	Enter all requirements correctly	Recommendation result successful	Valid

Black box testing has successfully verified that the vape liquid selection recommendation system works well. Every function tested, from login to recommendation, provides valid results and is in accordance with expectations.

3.2 Discussion

A recommendation system using the CBF method based on TF-IDF for recommendation for nicotine vapor liquid selection can help users find the most suitable product for their needs by analyzing the descriptions associated with the products stored in the database. We did this with 25 liquid data, processing them in the preprocessing phase. One of the most important steps in Natural Language Processing (NLP) is data preprocessing. Stopword removal is important because it helps in reducing the dimensionality of the features and also focuses the analysis on words that have significant semantic meaning. The results of this process are shown in Table 1, which shows that words such as "taste", "sensation", and "cold" become more significant by removing stopwords. This follows the principle that words that are frequently found in common usage (e.g., "and", "or", "the") usually convey a smaller number of indications and are thus ultimately less useful for text mining contexts. A common method for assigning weights to words in a document is the TF-IDF calculation, which is done in this study, on the frequency of occurrence of words in the document (Term Frequency) and on the frequency of occurrence of words in the entire document collection (Inverse Document Frequency). The output of the TF-IDF calculation for the words wine and cold in several products is represented in Table 2 below. A larger TF-IDF value means that the word is more likely to describe the product. If you take two examples, the names "American Winter Grape Candy Magic" and "Paradewa Grape Athena" will have identical TF-IDF values for the word "wine" (value = 0.10), which means that this word has the same signature for the name of one item or for another item. Similarly, the TF-IDF for word analysis for cold only occurs in products that discuss the sensation of cold, which means this is a good way to differentiate products through relevant features.

Cosine similarity measures the degree of match between what the user wants and the content of a product. The results of the cosine similarity calculation based on user preferences (searching for a liquid with a cold grape flavor) are shown in Table 3. The first row is selected (out of 146205 values), which means it shows the item with the highest relevance for the product "American Winter Grape Candy Magic" (similarity value 1.0000). Examples of significant similarity values (0.0900) among other products that indicate the system is able to identify relevant products based on features extracted from product descriptions include "Paradewa Grape Athena", "Cair Grape", "Grape Berry Blast". On the other hand, "American Winter Magic Lychee Float" is less similar (value 0.0450), because grapes are not in its description, although it contains the word cold. This means that the system prioritizes certain keywords in user preference requirements.

As shown in Figure 3, the system design consists of two main actors, namely the Owner and the User. The Owner implements the steps through the administration page to manage liquid data, while the User uses it through the recommendation page to get recommendations through the User.""" Table 4 summarizes the responsibilities of each actor. The relationship creation design between each table (Figure 4) describes how the tables are used as in the database structure such as the user table and the product table. The activity diagram (Figures 5, 6, & 7) illustrates the system workflow and user-system interactions, following the guidelines for User-Centered Design. The black box testing technique (shown in Table 5) confirmed the functional adequacy of the system. All these findings provide confirmation that all functions will work properly, and also in accordance with the specifications or requirements of the study. This confirms that all functional requirements for the system have been met, allowing the system to go into production. The proposed system was then successfully used by implementing the CBF method combined with the TF-IDF approach inducing a vape liquid recommendation system. The findings show that the system can generate relevant product recommendations based on user preferences obtained from product descriptions.

4. Related Work

Research on recommendation systems has grown rapidly, with various approaches and applications. One commonly used approach is Content-Based Filtering (CBF), which recommends items based on the analysis of item features that users have liked in the past. This approach has been applied in various domains, including video game recommendations [2], books [3][9], skincare [7], exclusive pens [8], software [19], and food crops [18]. In its implementation, CBF often utilizes the Term Frequency-Inverse Document Frequency (TF-IDF) technique to extract important features from item descriptions. TF-IDF assigns weights to words based on their frequency of occurrence in documents and in the entire document collection, so that the most relevant and discriminatory words can be identified [8][9]. In addition, research has also shown that recommendation systems can be implemented in various platforms, including e-commerce [6], allowing users to find products that match their preferences.

Several studies have highlighted related aspects, such as predicting vape liquid sales using the linear regression method [1], and analyzing customer loyalty to e-liquids [4]. Other studies also discuss the implementation of e-commerce for vape product sales using the Content Management System (CMS) and Business Model Canvas [6]. However, studies that specifically discuss the vape liquid recommendation system with the CBF and TF-IDF approaches are still limited. Therefore, this study attempts to fill this gap by developing a vape liquid recommendation system using the CBF and TF-IDF methods, which are expected to help users choose liquids that suit their preferences.

In addition, related research also covers aspects of information system development, such as the use of the System Development Life Cycle (SDLC) method in developing a vape product sales website [12], designing a vocational school information system using the waterfall method [14], and designing a purchasing information system [16]. System modeling is also a concern, with the use of Unified Modeling Language (UML) for modeling the Customer Relationship Management (CRM) system [17]. The aspect of system testing is also an important part of information system development, with the use of black box testing and white box testing to test the documentation and information network system [20]. In addition, the study also highlights the importance of sentiment analysis in customer reviews [15], and factors that influence organizational commitment [5]. Finally, research on the design of a miniature automatic liquid filling machine based on the Internet of Things (IoT) is also relevant in the context of technology used in the vape industry [13]. Based on previous research, the Content-Based Filtering approach with TF-IDF has been successfully applied in various domains. This study contributes by applying this approach to the liquid vape domain, which has unique characteristics in product descriptions and user preferences and integrating them into a functionally tested recommendation system.

5. Conclusion

By using the CBF method with the TF-IDF approach, the recommendation system developed has successfully recommended liquids that match the user's wishes or preferences based on the product description. The use of the Waterfall method in the system development process ensures that every stage from needs analysis to maintenance is carried out properly. The results of this study are expected to increase customer satisfaction and loyalty by providing accurate and personalized liquid recommendations, as well as helping the MoreVapor Gading store optimize sales. The implementation of this system also provides valuable insights into further development in the vaping retail industry. In this conclusion, it can also be added for further development, the recommendation system that has been built is expected to be a model for other stores or industries that want to implement a similar system. They can consider adding additional features such as real-time customer behavior analysis or integration with e-commerce platforms to expand market reach.

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