Indibiz Product Recommendation System Using *Knowledge Base* Method

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ABSTRACT

Many companies in the electronics field are competing fiercely in the business sector. Companies are required to continue to innovate and must also provide the best service to customers in order to remain relevant and able to compete in the market. One of them is PT Telekomunikasi Indonesia Klaten branch or also known as PT Telkom Indonesia Klaten branch which sells Indibiz internet products. Indibiz products are internet products designed for Small and Medium Enterprises. The variety of internet products available makes customers face difficulties in choosing internet products. Because of these problems, it is important to develop a recommendation system that can help customers choose internet products. The researcher's goal is to design a recommendation system using the Knowledge Base method for internet product selection. Researchers use the Knowledge Base Recommendation method which has the advantage of being able to set a priority scale according to customer needs. Researchers also carry out a system development method using Rapid Application Development (RAD) which consists of 3 stages, namely business modeling, data modeling, and process modeling. In this modeling, internet product selection includes 4 search attributes, namely internet type, price, facilities, and internet speed. Based on the results of calculating the similarity value with 42 sample data, the system can provide recommendations for internet products that match customer needs based on attributes. Internet products with the highest similarity value of 0.769 will be displayed in the recommendation system. With this system design, it can make it easier for customers to determine the selection of internet products needed.

I. Introduction

In this rapidly growing digital era, competition is getting tougher in the business world. Companies are required to continue to innovate and must also provide the best service to customers in order to remain relevant and competitive in the market. In facing the needs of commerce in the digital era, many stores choose to expand their services by running online sales transactions[1]. One aspect that companies focus on is improving customer experience through recommendation systems.

A recommender system is a software tool and technique for suggesting *items* that can benefit users[2]. Recommender systems attempt to provide product recommendations that users will choose by taking into account past preferences, purchase history, and demographic information[3]. Recommendation systems have been widely used in *e-commerce* on a website. The concept of recommendation systems has been found in several *marketplace* applications that exist in everyday

life, such as Amazon, eBay, Shopee, and Bukalapak[4]. One alternative that allows marketers to offer products based on customer interests in *real-time* is the recommendation system.

One of the largest telecommunications companies in Indonesia is PT Telekomunikasi Indonesia. PT Telkom is also not immune from fierce business competition. Indibiz is the latest product issued by PT Telekomunikasi Indonesia or often referred to as PT Telkom Indonesia. This Indibiz product is a product specifically to meet the internet needs of Small and Medium Enterprises (SMEs). However, the sales system at the Klaten branch of the Telekomunikasi Indonesia company is still by visiting customers to houses so that it is less effective and requires a lot of time.

From the description above, the author of this study designed a web Indibiz product recommendation system using the *knowledge base* method. *Knowledge* base is a method that utilizes the *personalization rule* on the *knowledge* base. *Personalization rule* is a rule designed on a knowledge base using a certain priority scale [5]. The knowledge-based recommendation method has the advantage of setting user priorities by paying attention to user needs for products by calculating the similarity value between customer needs and product attributes [6]. This system is made to make it easier for customers to find out information about products and be able to order the desired product.

II. Method

The research method requires data collection through observation and documentation. The next stage is the system development process using the *Rapid Application Development (RAD)* method. This method involves 3 stages of modeling, namely business modeling, data modeling, and process modeling[7].

A. Business Modeling

At this stage, a business function model was created in an effort to understand the information that needed to be compiled. In addition, researchers collected data and observed system requirements using workflow diagrams.

B. Data Modeling

The data modeling stage involves the formation of a data model in accordance with the business model structure and the determination of its attributes. In the data modeling stage, researchers create a data model based on existing product data and attributes that have been collected using the *Knowledge Base Recommendation* method.

C. Process Modeling

The process modeling stage is used to implement business functions that are connected to the data definition. Researchers use the Unified Modeling Language or (UML).

III. Results and Discussion

A. Business Modeling

Based on the analysis, there are 2 types of access rights, namely admin and buyer.
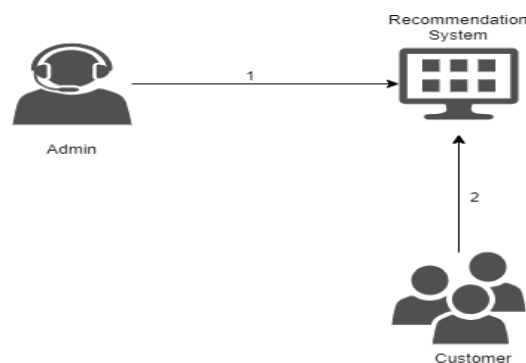

Fig. 1. Workflow Diagram

Description:

1. Admin is given access rights to manage data. Admins can add, subtract, edit descriptions and delete product data.

2. Customers are given access rights to search for products by entering criteria that have been prepared according to predetermined needs, after which the system will display results based on the suggestions given.

B. Data Modeling

The data utilized is internet product data owned by PT Telkom. In modeling this data, researchers used 42 examples of product data that had 5 attributes. Information about internet products can be found in the following table.

Table 1. Internet Products

No.	Types of Internet	Attributes				
		Brand	Speed	Facilities	Price	Speed Ratio
1	HSI Basic	1S	50	Internet Only	387.000	1 : 2
2	HSI Basic	2S B2B	50	Internet + Voice	427.000	1 : 2
3	HSI Basic	2S	50	Internet TV	587.000	1 : 2
4	HSI Basic	3S	50	Internet + Voice + TV	612.000	1 : 2
5	HSI Basic	1S	100	Internet Only	557.000	1 : 2
6	HSI Basic	2S B2B	100	Internet + Voice	597.000	1 : 2
7	HSI Basic	2S	100	Internet TV	757.000	1 : 2
8	HSI Basic	3S	100	Internet + Voice + TV	782.000	1 : 2
9	HSI Basic	1S	200	Internet Only	877.000	1 : 2
10	HSI Basic	2S B2B	200	Internet + Voice	917.000	1 : 2
11	HSI Basic	2S	200	Internet TV	1.077.000	1 : 2
12	HSI Basic	3S	200	Internet + Voice + TV	1.102.000	1 : 2
13	HSI Basic Bundling	Netmonk	50	Services for Network Monitoring	413.000	1 : 2
14	HSI Basic Bundling	OCA	50	Service for Hotels	419.000	1 : 2

N o.	Types of Internet	Attributes				
		Brand	**Speed**	**Facilities**	**Price**	**Speed Ratio**
15	HSI Basic Bundling	Pijar	50	Services for Schools	970.000	1 : 2
16	HSI Basic Bundling	Netmonk	100	Services for Network Monitoring	583.000	1 : 2
17	HSI Basic Bundling	OCA	100	Service for Hotels	661.000	1 : 2
18	HSI Basic Bundling	Pijar	100	Services for Schools	1.140.000	1 : 2
19	HSI Basic Bundling	Netmonk	200	Services for Network Monitoring	903.000	1 : 2
20	HSI Basic Bundling	OCA	200	Service for Hotels	981.000	1 : 2
21	HSI Basic Bundling	Pijar	200	Services for Schools	1.460.000	1 : 2
22	Business HSI	1S	50	Internet Only	439.000	1 : 1
23	Business HSI	2S B2B	50	Internet + Voice	479.000	1 : 1
24	Business HSI	2S	50	Internet TV	639.000	1 : 1
25	Business HSI	3S	50	Internet + Voice + TV	664.000	1 : 1
26	Business HSI	1S	100	Internet Only	669.000	1 : 1
27	Business HSI	2S B2B	100	Internet + Voice	709.000	1 : 1
28	Business HSI	2S	100	Internet TV	869.000	1 : 1
29	Business HSI	3S	100	Internet + Voice + TV	894.000	1 : 1
30	Business HSI	1S	200	Internet Only	1.049.000	1 : 1
31	Business HSI	2S B2B	200	Internet + Voice	1.089.000	1 : 1
32	Business HSI	2S	200	Internet TV	1.249.000	1 : 1

N o.	Types of Internet	Attributes				
		Brand	Speed	Facilities	Price	Speed Ratio
33	Busines s HSI	3S	200	Internet + Voice + TV	1.274.000	1 : 1
34	HSI Business Bundling	Netmonk	50	Services for Network Monitoring	465.000	1 : 1
35	HSI Business Bundling	OCA	50	Service for Hotels	543.000	1 : 1
36	HSI Business Bundling	Pijar	50	Services for Schools	1.022.000	1 : 1
37	HSI Business Bundling	Netmonk	100	Services for Network Monitoring	695.000	1 : 1
38	HSI Business Bundling	OCA	100	Service for Hotels	773.000	1 : 1
39	HSI Business Bundling	Pijar	100	Services for Schools	1.252.000	1 : 1
40	HSI Business Bundling	Netmonk	200	Services for Network Monitoring	1.075.000	1 : 1
41	HSI Business Bundling	OCA	200	Service for Hotels	1.153.000	1 : 1
42	HSI Business Bundling	Pijar	200	Services for Schools	1.632.000	1 : 1

In modeling the *knowledge base,* the technique used in the design is *case-based.* The *case-based* technique involves calculating the similarity value between user preferences and product data using the *similarity* method[8]. The following is the formula for calculating the similarity value in the *knowledge base:*

$$Sim\,(user, item) = \sum(W * S) \tag{1}$$

Description :

$Sim\,(user, item)$ = *Similarity* Value

W = Attribute Weight

S   = Comparison Value

In this study, there are 5 attributes used, namely brand, speed, facilities, price, and speed ratio. Each has the same weight, which has a value of 20% or 0.2.

Based on the table above, if customers will search for internet products with the following criteria:

   a.   Brand = 1S

   b.   Speed = 50

   c.   Facility = Internet Only

   d.   Price = 400,000

To determine internet product recommendations, a *knowledge base* model is used by considering the following criteria:

1.   If the customer chooses the internet *only* facility*,* then from 42 internet product data will be filtered based on the facilities desired by the customer. The result is 6 internet products. Here is the data that has been filtered:

Table 2. Internet Only Facility Products

No.	Types of Internet	Attributes				
		Brand	Speed	Facilities	Price	Speed Ratio
1	HSI Basic	1S	50	Internet Only	387.000	1 : 2
2	HSI Basic	1S	100	Internet Only	557.000	1 : 2
3	HSI Basic	1S	200	Internet Only	877.000	1 : 2
4	Business HSI	1S	50	Internet Only	439.000	1 : 1
5	Business HSI	1S	100	Internet Only	669.000	1 : 1
6	Business HSI	1S	200	Internet Only	1.049.000	1 : 1

2.   Of the 6 facility products that have been filtered, similarity calculations will be carried out using the knowledge-based recommender method by considering brand, speed, and price as needed. The highest price of internet products sold is 1,632,000. The following are the steps to calculate the similarity value:

Product 1

When compared between customer preferences, there is a price difference of 13,000 which is cheaper, in terms of brand, speed and facilities according to customer needs. Below is the result of calculating the similarity value:

$Sim(user, product1) = (0.2*1) + (0.2*(1-13,000/1,632,000)) + (0.2*1) + (0.2*1) + (0.2*0) = 0.2 + 0.198 + 0.2 + 0.2 + 0 = 0.798$

Product 2

When compared between customer preferences, there is a price difference of 157,000 which is more expensive, in terms of brands and facilities in accordance with customer needs, in terms of speed not in accordance with customer needs. Below is the result of the calculation of the similarity value:

$Sim(user, product2) = (0.2*1) + (0.2*0) + (0.2*1) + (0.2*(1-157,000/1,632,000)) + (0.2*0) = 0.2 + 0 + 0.2 + 0.181 + 0 = 0.581$

Product 3

When compared between customer preferences, there is a price difference of 487,000 which is more expensive, in terms of brands and facilities in accordance with customer needs, in terms of speed not in accordance with customer needs. Below is the result of the calculation of the similarity value:

Sim(user,product2) = (0.2*1) + (0.2*0) + (0.2*1) + (0.2*(1-487,000/1,632,000)) + (0.2*0) = 0.2 + 0 + 0.2 + 0.140 + 0 = 0.540

Product 4

When compared between customer preferences, there is a price difference of 39,000 which is more expensive, in terms of brand, speed and facilities according to customer needs. Below is the result of calculating the similarity value:

product2) = (0,2*1) + (0,2*1) + (0,2*1) + (0,2*(1-39.000/1.632.000)) + (0,2*0) = 0,2 + 0,2 + 0,2 + 0,195 + 0 = 0,795

Product 5

When compared between customer preferences, there is a price difference of 269,000 which is more expensive, in terms of brands and facilities in accordance with customer needs, in terms of speed not in accordance with customer needs. Below is the result of the calculation of the similarity value:

Sim(user,product2) = (0.2*1) + (0.2*0) + (0.2*1) + (0.2*(1-269,000/1,632,000)) + (0.2*0) = 0.2 + 0 + 0.2 + 0.167 + 0 = 0.567

Product 6

When compared between customer preferences, there is a price difference of 649,000 which is more expensive, in terms of brands and facilities in accordance with customer needs, in terms of speed not in accordance with customer needs. Below is the result of the calculation of the similarity value:

Sim(user,product2) = (0.2*1) + (0.2*0) + (0.2*1) + (0.2*(1-649,000/1,632,000)) + (0.2*0) = 0.2 + 0 + 0.2 + 0.120 + 0 + 0.520

3. From the calculation with the *knowledge-based* method, it is found that product 1 has the highest similarity value according to customer needs, which is **0.789.**

C. Process Modeling

The design process has been designed using the Unified Modeling Language or commonly referred to as UML. The use of UML is used to identify how systems are interconnected in *subitems* and other systems outside the system[9]. One type of UML diagram that will be used is the use case diagram[10]. Use case diagrams are used to describe scenarios carried out by actors and concluded in a system[11]. In modeling this process there are 2 actors, namely admin and customer. Admins can manage product data and delete product data. While customers can view products, search for products and see product recommendation results. Use case diagram can be seen in figure 2.
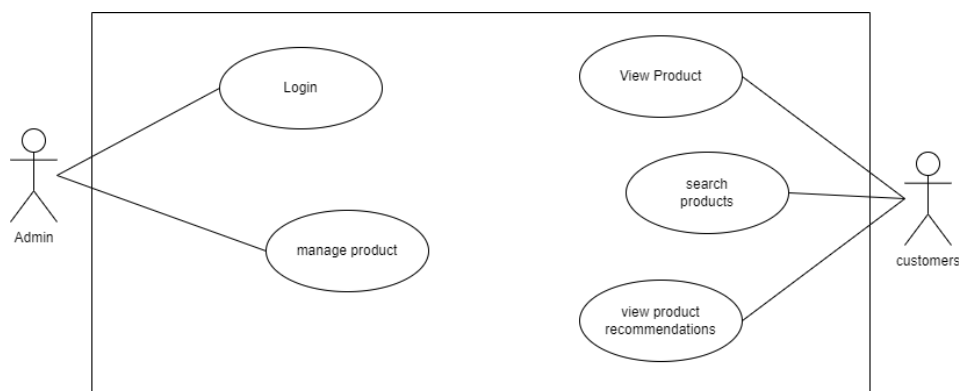

Fig. 2. Use Case Diagram

Based on the process modeling depicted in the figure above, the interface of the internet product recommendation system in terms of customer access rights is as follows:

1. Product design

On the internet product page, the display is used to display all internet packages offered. The interface design of the product page can be seen in the following figure.
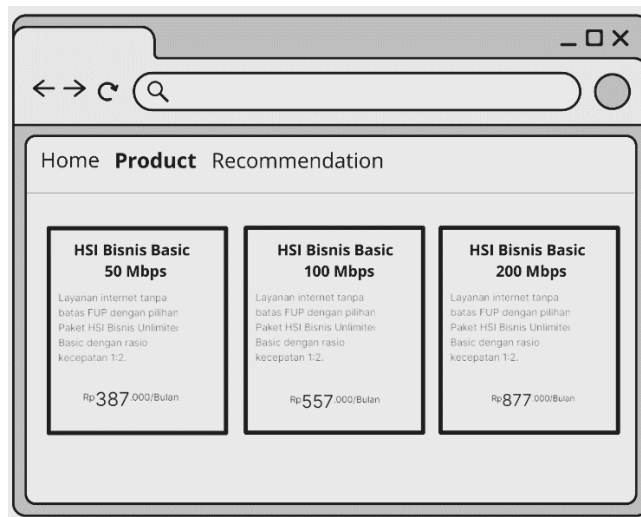
Fig. 3. Product Page Design

2. Product search design

On the product search page, users can search for products that customers want. The design of the product search page can be seen in the following figure.
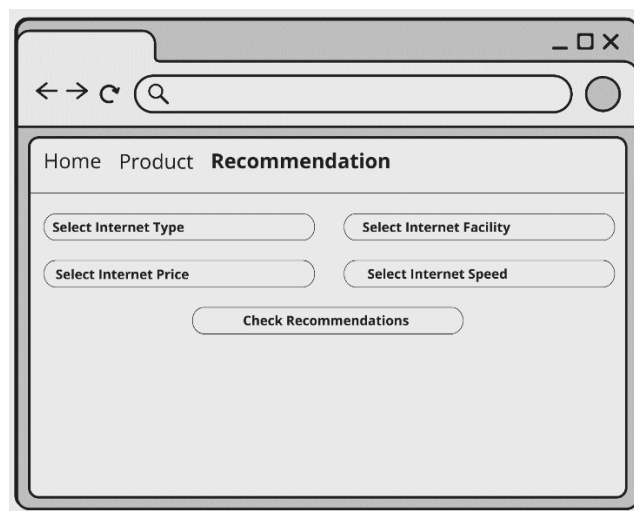

Fig. 4. Product Search Design

3. Design of recommendation results

On the recommendation results page, the display is used to display internet products that have been searched by customers. The design of the recommendation results page can be seen in the following figure.
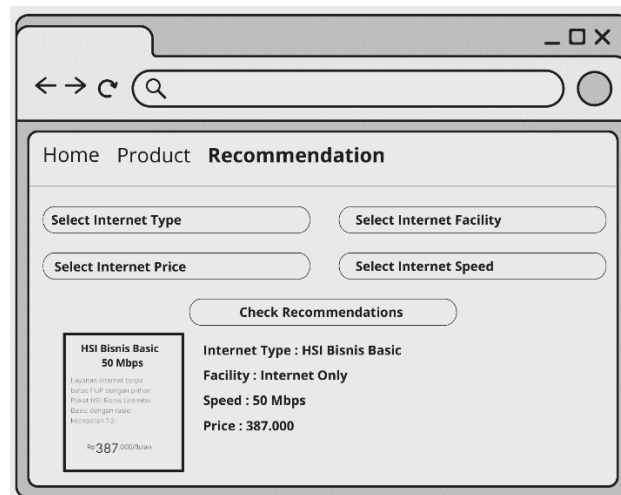
Fig. 5. Recommendation Design

The results of the process modeling that has been designed by researchers are use case diagrams, product interface design, product search interface design, and recommendation result interface design.

IV. Conclusion

From the discussion that has been described, it can be concluded that modeling using the Knowledge Base Recommendation method for internet product selection recommendation systems sets 4 search attributes, namely internet type, price, facilities, and internet speed. Based on the results of modeling with a sample of 42 data, the system is able to provide recommendations for internet products that suit customer needs. Internet products with the highest similarity rate of 0.769 will be displayed in the system. The results of the knowledge base recommendation modeling can be used as a guide for the development of an internet package selection recommendation system.

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