DETERMINATION OF MATERIALS PRODUCT APPROACH TO CUSTOMER RELATIONSHIP MANAGEMENT (CRM) IN CV. MULTI Rizkia ABADI

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ABSTRACT

CV. Rizkia Multi Abadi is a company engaged in the service, suppliers, raw material trading fiberglass like sandpaper, resin, meth, catalysts, Stirin and others, as well as producing products made from raw materials fiberglass such as car accessories, motorcycle accessories, gypsum or list, and water reservoirs. Lack of knowledge of employees about the quality of the raw material makes it difficult to determine recommendations director of quality raw materials in accordance with the quality that customers want. The number of products sold also raises new issues, such as the accumulation of poor product sold and resulted in a lot of products that are beginning to fail.

Based on the issues raised in the CV. Rizkia Multi Abadi, solver solution is how to build an information system to deal with the problem on raw material and product recommendation method used to determine the recommendation of raw material ie naïve Bayes methods, while to determine product recommendations using the nearest neighbor method. Naïve Bayes classification is the simplest method by using the existing opportunities, where it is assumed that every variable X is free (independence). Nearest neighbor method is a method to perform the classification of objects based on the learning data that were located closest to the object.

Based on the results of black box testing and beta testing has been done, it can be concluded that the system functionality inisudah passed the test and was able to help the director CV. Rizkia Multi Abadi in determining recommendations raw material and product recommendations to customers to solve existing problems.

Kata Kunci : *Fiberglass, Naïve Bayes, Nearest-Neighbor*, Rekomendasi Bahan Baku, Rekomendasi Produk

1. INTRODUCTION

CV. Rizkia Multi Abadi is a company engaged in the service, suppliers, raw material trading fiberglass as catalyst, erosil, silicone, resin, Stirin, and others, as well as producing products made from raw materials fiberglass and others such as car accessories, motorcycle accessories, gypsum or list, bathtub, sink, closet squatting. The company is located in Gg. Rawa Salak RT. 03 RW. 12 Village Sriwidari District of Mountain Quail city of Sukabumi, West Java Indonesia. Within the company there are five parts including directors, deputy directors, employees of the store, the administration and production parts.

When a customer will purchase raw materials to the store they always leave a question related to the quality of the raw materials exist, but the store employees are not informed about matters relating to the quality of the raw material so that the store employees should ask prior to production, while the location of the store with the production department located sufficiently much so that the store employees ask the quality of raw materials via sms or phone. Then some customers also complain to the store employees that the raw materials they buy are not in accordance with what they want because the store employees do not know the quality of the raw materials that customers want. So that the raw materials that customers buy frequently left. After a discussion with the director CV. Rizkia Multi Abadi deduced to determine the three criteria of quality raw materials are high quality, medium quality and low quality to help customers facilitate the selection of raw materials. Calculation of raw material quality criteria if sandpaper seen from the density of aluminum is on the surface, resin views from speed drying, meth views of thickness, etc. and on the quality of raw materials to customers seen from the criteria of quality products that customers want customers also can get discounts by 10% in terms of transaction data of their raw materials. Giving discounts on raw materials supplied when customers already have a deal of at least 2 times. Based on the interview with the director of CV. Rizkia Multi Abadi, Mr. Renaldi Rizkia Son that the director is still difficult to determine recommended quality raw materials that customers want because of limited knowledge of the store employees to the quality of raw materials, also needs to be a system of information to enable directors to determine recommendations raw materials with quality

customer want and giving discounts of raw materials to customers.

Based on the interview with the director of CV. Rizkia Multi Abadi that the director of the difficulties in determining and granting discounts on products according to customer needs because of CV. Rizkia Multi Abadi provide products to sell based on the type of products each with types and prices vary. Once the recommendation is given to the customer, then the customer will get a discount of 10% of the recommended products and the views from their transaction data. Product discount will be given when the customer has done at least 2 transactions in CV. Rizkia Multi Abadi.

Based on the description of the problems that exist today in the CV. Rizkia Multi Abadi, it takes a determination system development on raw materials with the approach of Customer Relationship Management (CRM) in the CV. Rizkia Multi Abadi.

1.1 Formulation of the problem

Based on the above background exposure can be formulated the problem include:

1. The Director difficulty deciding on appropriate raw materials with the quality that customers want and giving discounts to customers.
2. Director trouble to recommend products and giving discounts to customers.
3. Customers difficulty selecting suitable raw material quality they want.

Customers difficulty to choose products according to the criteria they want.

1.2 Purpose and objectives

Based on the problems studied, the purpose of this thesis is to build an application Customer Relationship Management (CRM) in the CV. Rizkia Multi Abadi which aims to:

1. Assist the director determines recommendation raw materials with the desired quality customers and give discounts to customers.
2. Assist the director in determining the appropriate product recommendations to customers and provide discounts to customers.
3. 3Helping customers get information on raw materials with desired quality recording and get a discount on the recommendation of raw materials.
4. Helping customers get information on the products they want and get a discount on the product recommendations.

2. CONTENTS OF RESEARCH

2.1 *Customer Relationship Management*

Manajemen hubungan pelanggan atau *customer relationship management* (selanjutnya disingkat CRM) merupakan konsep yang berbeda-beda menurut pandangan berbagai pihak. Bahkan, arti kepanjangan CRM itu sudah bervariasi dan diperdebatkan sejak lama. Bagi sebagian orang, CRM adalah singkatan dari customer relationship marketing. Sementara itu, kelompok lain yang berkeyakinan bahwa tidak semua pelanggan menghendaki hubungan dengan supplier, menghapus kata ‘hubungan’, dan memilih istilah yang lebih singkat, yaitu ‘manajemen pelanggan’ alias ‘customer management’. Ada pula pihak-pihak yang lebih menyukai istilah ‘relationship marketing’. Apa pun istilahnya yang jelas CRM adalah praktik berbisnis yang terfokus atau berorientasi pada pelanggan. Istilah CRM sendiri baru populer digunakan dalam beberapa tahun terakhir. Bagi kalangan perusahaan yang bergerak di bidang teknologi informasi (IT), istilah CRM digunakan untuk mendeskripsikan berbagai aplikasi perangkat lunak yang digunakan untuk mengotomarisasi fungsi-fungsi pemasaran, penjualan, dan pelayanan[3].

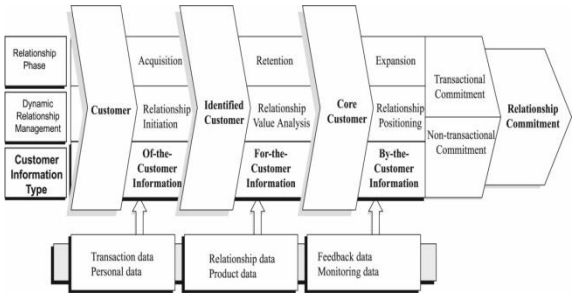


Figure 1 ***Framework Dynamic CRM***

2.2 *Naïve Bayes*

Naïve Bayes is a simple probabilistic-based prediction technique which is based on the application of Bayes' theorem [9].

1. The assumption of independence (independence) is strong (naive).
2. The model used is the "model of independent features".

Naïve Bayes classification is the simplest method by using the existing opportunities, where it is assumed that every variable X is free (independence). Because the assumptions are not mutually dependent variable, then the following equation :

$$P(X|Y = y) = \prod_{i=1}^{1} P(Xi|Y = y) \quad (2.2)$$

The data used can be categorical (discrete) or continuous. However, in this final project will use continuous data. Therefore For continuous data can be completed using the following steps.

First set of data sets to be used for the calculation melakuka Naïve Bayes.

Calculate the average (mean) of each feature in the training dataset with the equation (2.3).

$$\mu = \frac{\sum x_i}{n} \quad (2.3)$$

where:

μ = mean

n = the number of data
Σxi = the number of data values

Then calculate the variance of the training dataset as in equation (2.4).

$$\sigma^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \mu)^2 \quad (2.4)$$

where:
$\sigma 2$= varians
μ = mean
xi = the number of data
n= the number of data values
Testing :

Calculate the probability (Prior) for each class that is by counting the amount of data each class divided by the total number of overall data.

Next calculate the probability density using equation (2.4). Expressing the relative probability density function. Data with mean μ and standard deviation σ, the probability density function is:

$$\varphi_{\mu\sigma}(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \quad (2.5)$$

Dimana :
x = data input
π = 3,14
σ= standar deviasi
μ = mean

Having obtained the probability density values, then calculate the evidence of each class using equation (2.6).

Evidence=prior x likehood (2.6)

Having obtained the probability density values, then calculate the posterior of each class using equation (2.7). $Posterior = \frac{P(Ci) x P(X1 \ldots\ldots\ldots\ldots Xn|Ci)}{P(X1 \ldots\ldots\ldots\ldots Xn|Ci}$ (2.7)

atau bisa ditulis

Posterior = $\frac{prior\ x\ likehood}{evidnce}$ (2.8)

If the value of each class poeterior obtained, the posterior greatest value is the appropriate grade.

2.3 *K-Nearest Neighbor*

K-nearest neighbor algorithm is a method to perform the classification of objects based on the learning data that were located closest to the object. Learning data projected into many dimensional space, where each dimension represents the features of the data. The room is divided into sections based on the learning data classification. K value is best for this algorithm depends on the data, in general, the value k may reduce the effect of noise on the classification, but make restrictions antarasetiap classification becomes more blurred. There are many ways to measure the distance between the proximity of the new data with the old data (training data), including euclidean distance and distance manhattan (city block distance), the most commonly used is the euclidean distance (Bramer, 2007), namely: [4]

To perform a variable weighting is done with paired comparison method, the variable weights determined by normalizing eigenvectors, which is associated with the maximum eigen value of a matrix before comparing the ratio to be determined scale value or important influence between the variables, as shown in Table 1.

Table 1 Skala Untuk Perbandingan Pasangan

values	Defenition
1	equally Important
2	Equally important to
3	Quite important
4	Quite important to high interest
5	high importance
6	High to very high importance
7	Very high importance
8	Interests are very high to extremely high
9	Extremely high interests

To perform the weighting value of the variable which has some similarities to use the following functions (Larose, 2005).

Different (ai,bi) { 0 jika ai = bi dan 1 jika ai ≠ bi }

Where ai and bi is the value category. If the value of the variable between two records compared to the same then the value of the distance is 0, if the value of the variable and the similarities or closeness then given a weight of 0.5, otherwise if the value of the different variables they will be given a weight of 1 means not at all similar. Suppose the state variable with a value of married and married, then the value of its proximity to 0, if married and widowed, the value of proximity between 0.5, whereas if the value of married and unmarried, the value of its proximity is 1. To compute the similarity of the case, used the formula (Kusrini and Ludhfi , 2009)

$$similarity\ (T,S) = \frac{\sum_{i=0}^{n} f(Ti,Si)xWi}{Wi}$$

Keterangan :
T : new cases
S : The case is in storage
n : The number of attributes in each case
i : Atribut Individu beetwen 1 s/d n

f : Function similarity atribut i beetwen case T and case S
w : The weights given to attribute to i
Proximity usually is at a value of 0 s / d 1. A value of 0 means that the two issues is absolutely not similar, on the contrary if one so similar to the absolute

2.4 Analysis Framework

In the process of CRM information systems development requires a framework as a reference so CRM features can be built properly. The framework will be built is the framework of Dynamic CRM explaining the series of stages in the development of CRM. The CRM Framework used in this study can be seen in Figure 2.

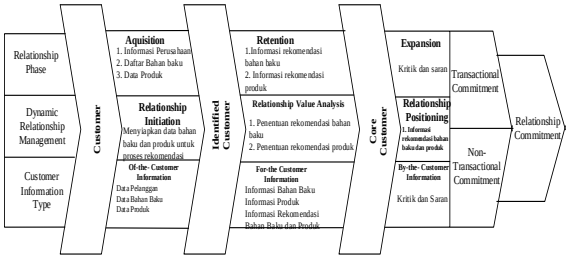


Figure 2. Implementation Framework of Dynamic CRM

The stages in the implementation of Dynamic Framework in Figure 1 are as follows:

1.4.1 Relationship Initiation

Contains stages consisting of Acquisition, Retention and Expansion. The explanation on the stages - these stages:

1. Acquisition Phase

Phase Acquistion is a business strategy to give a good impression to potential customers, so interested in conducting transactions with CV. Rizkia Multi Abadi. Acquistion phase analysis can be seen in Table 1.

Table 2. Analysis Acquisition Phase

System Running	Evaluation	Solution
The absence of a brochure or information means running	The absence of a brochure or information tool that runs on the CV. Rizkia Multi Abadi	Building information systems in the CV. Rizkia Multi Abadi to help customers find information companies

2. Retention Phase

Retention stage is a stage that is used to improve customer relations with CV. Rizkia Multi Abadi. Retention phase analysis can be seen in Table 2.

Table 3. **Analysis Retention Phase**

System Running	Evaluation	Solution
To provide better service to customers, such as: cutting the price, giving the product. Provide innovative products to customers. Approach with customers	do not have the facilities to facilitate a store employee in determining the product recommendations and the quality of raw materials, so customers often ask directly to a store employee-related information on the quality of products and raw materials.	Building a web-based CRM that can provide information about existing promotions in Mochi Talent Jaya. Voting feature to perform the determination of new products according to customer wishes.

3. Expansion Phase

Expansion stage is the stage that is used to maintain customer loyalty to the company. The analysis phase of expansion can be seen in Table 3.

Table 4. **Analysis Expansion Phase**

System Running	Evaluation	Solution
-	the service does not have to accept criticism and suggestions from customers. So that the company can not get a fill of customers and attention to customer satisfaction and desires.	making features to accommodate customer's criticism and suggestions to the company. The facilities were raised included in this expansion process, namely: the service is a means of criticisms and suggestions about the desire of customers to CV. Rizkia Multi Abadi, for services CV. Rizkia Multi Abadi as expected by the customer.

1.1.1. Dynamic Relationship Management

The stages of the Dynamic Relationship Management in the implementation of Framework Of Dynamic CRM is as follows:

1. Relationship Initiation
   This stage is the stage of the initiation of the relationship with the customer, that is by CV. Rizkia Multi Abadi preparing customer data.

2. Relationship Value Analisys
There are two stages in this stage, the analysis determining the quality of raw materials and produ analysis recommendations. The explanation is as follows:

a. Raw Material Quality Determination Analysis

In any system required a method naïve Bayes classifier as a reference so CRM features can be built quickly and precisely. naïve Bayes classifier is a method to classify raw materials based on quality to enable store employees recommend the raw materials to customers.

Before entering the calculation, Naïve Bayes classifier requires a data set to be used as training data, the following data sets of raw materials in the CV. Rizkia Multi Abadi. The data set is taken from a number of raw materials. The raw material will be used as the dataset is the raw material used to make fiberglass Determination seen from the quality of raw materials is based on interviews with the production department. The steps for determining the quality of raw materials:

1. Determine the data set

Tabel 5 Data Set Amplas

Class Amplas	Density of Alumunium
High Quality	60 and 120
Medium Quality	200 and 280
Low Quality	500 and 600

2. Calculate the average value

μ Aluminum density Sandpaper High Quality = $\frac{60+120}{2} = 90$

μ Aluminum density Sandpaper Medium Quality = $\frac{200+280}{2} = 240$

μ Aluminum density Sandpaper Low Quality = $\frac{500+600}{2} = 550$

3. Calculate the value of the variance

σ^2 Aluminum density Sandpaper High Quality = $\frac{1}{2-1}$.$(60-90)^2+(120-90)^2 = 1800$

σ^2 Aluminum density Sandpaper Medium Quality = $\frac{1}{2-1}$.$(200-240)^2+(280-240)^2 = 3200$

σ^2 Aluminum density Sandpaper Low Quality = $\frac{1}{2-1}$.$(500-550)^2+(600-550)^2 = 5000$

4. Data Testing

Having obtained the mean and variance of the training data in the training stage, we then can do testing on test data that can be seen in table 3.4, step step is as follows.

Table 6 Data Uji

Kelas	Kerapatan Alumunium
Amplas Kualitas ?	120

To find out, including what grade raw material. Then the step of testing the naïve Bayes algorithm to be done, the stages are :

5. Looking for each class prior to the training data.

Prior Sandpaper High Quality = 2/6 = 0.33333333333

Prior Sandpaper Medium Quality = 2/6 = 0.33333333333

Prior Sandpaper Low Quality = 2/6 = 0.33333333333

6. Finding the data probability density testing
High Quality Class

φ(Density|High Quality) = $\frac{1}{\sqrt{2\pi\ 1800}}\ e^{-\frac{(120-90)^2}{2\times 1800}}$
= 0,0074350279

Medium Quality Class

φ(Density|Medium Quality) = $\frac{1}{\sqrt{2\pi\ 3200}}\ e^{-\frac{(120-240)^2}{2\times 3200}}$
= 0,00074350279

Low Quality Class

φ(Density|Low Quality) = $\frac{1}{\sqrt{2\pi\ 5000}}\ e^{-\frac{(120-550)^2}{2\times 5000}}$
= 0,000000000052653858753

7. Calculate the posterior of each class
Evidence
= (0,33333333333 . 0,0074350279) +
(0,33333333333 . 0, 00074350279) +
(0,33333333333 . 0, 000000000052653858753))
= 0,00272617691

Posterior (Sandpaper High Quality)
= (P(Hogh Quality).(P(Density|High Quality) / Evidence
= 0, 0074350279/ 0, 00272617691
= 2.7272721393

Posterior (Sandpaper Medium Quality)
= (P(Medium Quality).(P(Density|Medium Quality) / Evidence
= 0, 00074350279/ 0, 00272617691= 0,27272727139

Posterior (Sandpaper Low Quality)
= (P(Low Quality).(P(Density|LowQuality) / Evidence
= 0, 000000000052653858753/ 0, 00272617691= 0,00000001931

From the previous calculation as calculated posterior each class, find the value of the largest posterior, where the value of the largest posterior is the most suitable class for data testing

b. Analisis Rekomendasi Produk

1. Menyajikan data produk

The first presents the product data contained in the CV. Rizkia Multi Abadi

2. Weighting and Finding Value Similarity

Table 7 Pembobotan Atribut Data Produk

Atribute	Value
Types of products	0,5
Type	0,8
Cost	0,6

3. Select Results Recommendations

Based on calculations closeness, it can be seen the value similaritynya. Then have the greatest similarity value to be used as a product recommendation. Recommended products also get a discount of 10%. Data product recommendations can be seen in table 3.8.

Table 8 Recommendation Product

No	Jenis Produk	Tipe/Merek	Harga	Diskon	Total
1	LYS GYPSUM	Motif Biji Beton	Rp 14.000	Rp 1.400	Rp 12.600

1. *Relationship Positioning*

Customer Information Type consists of 3 parts :

1. *Of - the – Customer Information*

Information on customer data and customer transaction data in the CV. Rizkia Multi Abadi. Facilities that will be raised is the customer information and customer transaction information. This information will be channeled using the website.

2. *For - the – Customer Information*

Information on raw materials, products, prices, discounts that are applicable, and other corporate information that is considered important by customers. This information will be channeled using the website.

3. *By - the – Customer Information*

Information on the feedback received from customers. The complaint is a place for customers to deliver existing problems experienced by customers. This feature will be channeled using the website.

2.1. Analisis Basis Data

The database or database is a collection of files that have the link between the file with another file so as to form an integrated whole. Analysis of this data base using the Entity Relationship Diagram (ERD). Analysis of the data base can be seen in Figure 3.

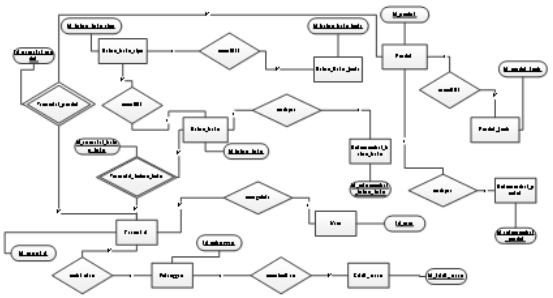


Figure 3 Entity Relationship Diagram

2.2. Testing Systems

Tests are used to test the new system is a black box testing methods. Black box testing focused on testing the functional requirements of information systems. The tests to be carried out is a way of testing systems built black box and beta. Tests using test data based on data provided from some of the data that has been given.

2.2.1. Scenario Testing

Black box testing focuses on functional to the terms software built. Black box testing performed on each section to the possibility of errors occur.

2.2.2. Conclusion Testing Black box

Based on the results of testing with test cases that have been done to the conclusion that the process has not been as expected. Filtering process error message that appears in the form is not quite optimal. Functional system can not be considered to meet the expected demand.

3. Closing

1.1. Conclusion

Based on the description and discussion of the analysis of testing has been done, it can be a conclusion to the customer relationship management CV. Rizkia Multi Abadi as follows :

1. Determination on product materials with customer relationship management approach to CV. Rizkia Multi timeless enough to help the Director, in determining the raw materials and products that will be recommended to customers according to customer requirements.
2. With the feature on raw materials and products on the system easier for customers to get information raw materials and products that fit their needs.

1.2. Suggestion

Based on the results that have been achieved in building the customer relationship management in the CV. Rizkia Multi Abadi, things are expected in the future can be developed more widely, among others :

1. Information on raw materials and products can be developed into more specific, for example, provide information description of each of the raw materials and products to customers or potential customers can be better informed of raw materials and products clearly.
2. Display of raw materials and product information can be made more attractive in order to appeal to more companies in the eyes of customers.
3. The company information can be developed further, such positive comments, customer testimonials and pictures relating to the company information in order to be an attraction for customers or prospective customers.

BIBLIOGRAPHY

[1] A. p. Eko k Budiarjo, "KESAMAAN ANTARA FRONT-CRM DENGAN DYNAMIC-CRM SEBAGAI CUSTOMER RELATIONSHIP MANAGEMENT (CRM) FRAMEWORK," *Seminar Sistem Informasi Indonesia (SESINDO2008) – ITS, Surabaya 17 Desember 2008* , 2008.

[2] Buttle, Francis. 2004. *CUSTOMER RELATIONSHIP MANAGEMENT.* Oxford: ELSEVIER LTD.

[3] E. Prasetyo, "Pengenalan Pola Naive Bayes," UPN, 2012.

[4] Park, Chung-Hoon, Young-Gul Kim. 2003. "A Framework of Dynamic CRM: Linking Marketing with Information Strategy, Business Process Management Journal," Vol. 9, No. 5, pp.652-671.

[5] Sumarlin, "Implementasi Algoritma K-Nearest ghbor Sebagai Pendukung Keputusan Klasifikasi erima Beasiswa PPA dan BBM," STIKOM lindo Kupang, 2013.