DETERMINATION OF RECOMMENDATIONS PRODUCTS USED THE CUSTOMER RELATIONSHIP MANAGEMENT IN CV. PUTRA SANGGAR TEKNOLOGI INDONESIA

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ABSTRACT

CV. Putra Sanggar Teknologi Indonesia (PUSTEKINDO) is a company specialized services in the manufacture of new and improved part - part industrial machinery, service vacuum pump, construction machinery, tank, pipe installation and others. The problems that occurred, the customer always buy products with the same material for a product that is a product that has an excellent material, consequently supplies piled higher and warehouses. Customers also stated affordability unsatisfactory products, customers expect no recommendations similar product cheaper that can be selected.

This is what makes the determination on the need for a system with a customer relationship management approach that is able to give product recommendations. The development objective of this recommendation system to help determine marketing and product recommendations to help customers get a similar product recommendations. The methods used for product recommendation is Analytical Hierarchy Process to three criteria: the price, the material and the amount of sales. The results of this method is the second product with the largest global TPV be recommended.

Based on the results of research and testing can be concluded that a system built to help marketing to determine product recommendations and memabantu customers in getting a similar product recommendations.

Keywords : Analytical Hierarchy Process , reccomendation, Customer Relationship Management.

1. INTRODUCTION

CV. Putra Sanggar Teknologi Indonesia (PUSTEKINDO) is a company located on raya soreang street - banjaran number 62, village ciluncat district cangkuang Bandung, West Java. Cv. Putra Sanggar Teknologi Indonesia serving making new and improved part - part machine, industry service vacuum pump, construction of machines a, tank, installation pipes and other. From the beginning CV. Putra Sanggar Teknologi Indonesia has 117 customers consisting of large companies, a small company, and individuals.

Based on interviews with mr Kurnia and based on transaction from January to August, 2016 more than 50% customers always buy products with the same material for a product that is a product that has excellent material , whereas companies have similar products with different materials and prices - different. For manufacturing machines for small and medium-sized machinery companies do supply a lot of materials, consequently supplies piled higher and warehouses.Furthermore , based on the results of questionnaires that have been granted to 30 customers, 59% of customers who never make transactions do not know the detail differences product - a product that is in the CV. Putra Sanggar Teknologi Indonesia Technology Indonesia. Customers also expect no alternative cheaper products that can be selected , while the results of the questionnaire 60% of customers also gave unsatisfactory assessment of the affordability of the products they buy in the CV. Putra Sanggar Teknologi Indonesia. All this time the company has similar products with different materials and prices - different but information about the product is not up to the customer. Meanwhile, 56% of customers also said the company's efforts to introduce products that the company offers is quite satisfactory and 44% said it was not satisfactory. Because of these problems consequently declining purchasing power of the customers towards the product and potential customers switch to another company.

Based on the existing problems then the company will provide a similar product recommendations but have material prices and varying the rate of sales less. But the problem for one type of product the company has several products that are similar to materials and prices vary, while the company only

plans to recommend two products, because the number of products that many.

For the determination of the two products will be recommended, the company suggests the assessment of the 3 aspects of the materials used, the product price and the number of products sold within a period of 6 months.

Customer Relationship Management is a type of management that discusses the handling of the relationship between the companies. Customer Relationship Management is a strategy to acquire, consolidate, analyze data, to then be used to interact with the customer, thus creating a comprehensive view of the customer and a better relationship with the customer [1]. Therefore , by exposure of the facts and issues above , required the construction of the determination of product recommendations with customer relationship management approach to CV. Putra Sanggar Teknologi Indonesia to help solve problems that occur.

2. THE CONTENT OF RESEARCH

2.1 The cornerstone of the theory

2.1.1 Understanding *Customer Relationship Management* (CRM)

Customer Relationship Management (CRM) is practice of selling a focused or customer-oriented. The term used to describe a variety of CRM software applications used to create automatic functions of marketing, sales, and service [2].

2.1.2 Stages in Customer Relationship Management

According to Kalakota and Robinson [3] There are three stages in Customer Relationship Management, namely:

1. Acquire
   New customers acquired by providing ease of access to information, new innovations, and interesting services
2. Enhance
   The company tried to establish relationships with customers through the giving good service towards its customers (customer service).
3. Retain
   Retain customers that give advantages, offering what is needed by specific customers is not required by the market, because customers value the product or service to the customer is the value of proactive that best suits his needs.

2.1.3 *Dynamic Framework Customer Relationship Management*

Dynamic CRM-describing a set of phases to do an organization in achieving customer management corresponding to the main business of the company. This framework can be considered a pattern or model of reference an organization in improving the maturity of they customer.

In the framework there are several phases, among others [5] :

1. *Relationship Phase*

At this stage of this phase relationship is further divided into three stages, between is as follows:

a. Acquisition

The stage is used to attract potential new customers in order to be interested in using the services offered by the company.

b. Retention

The stage is used to improve the relationship with the customer.

c. Expansion

Are used to retain customers in order to continuously use the services offered by the company.

2. *Dynamic Relationship Positioning*

Dynamic Relationship is divided again into three Positioning stages, among which are the following:

a. Relationship Initiation

At this stage of the initiation of the relationship with the customer, the organization conducts logging against customers, typically with membership registration . After record customers, organizations can infer information about the offer is right for the customer (for the customer) . After a certain period the customer is satisfied with what the Organization has to offer, then the relationship with the customer can escalate into core customer. At this stage the organization can continue to the next phase, namely the CRM . On this phase occurs a two-way interaction between customers and organizations. Customers will be told what is needed specifically (by the customer). Things like this opens up the opportunity for the Organization to offer new products or services to customers, improve business processes and to satisfy the core customer.

b. Relationship Value Analysis

In this phase of the relation between customers psychologically with the organization. This usually happens through a process of segmentation that continued with the granting of discounts to customers when making a purchase in large quantities, indirectly increasing customer loyalty.

c. Relationship Positioning

At this phase in the implementation of the strategy of building a mutually beneficial relationship, the Organization maximizes the right customers will automatically increase the value of customers. In addition to fair organisation should also evaluate the relationship with customers from the viewpoint of benefit obtained. If such a relationship continues between the customer and the Organization will form a strong commitment either transactional or

nontransactional and the relationship developed to the stage of a relationship.

3. *Customer Information Type*

This phase is the type of information berorintasi on customers. On the domain have a difference in focus orientation towards the customer. This domain contains three types of information that is of-the-customer information, for-the-customer information and by-the-customer information.

2.1.4 Recommendation System

Recommendation system (web) is a personalization tool that provides the user a list of information items that comply with the wishes of the respective user. System recommendations conclude user preferences by analyzing the availability of user data, information about the user and the environment [13].

2.1.5 Analytical Hierarchy Process(AHP)

AHP (Analytic Hierarchy Process) is a general theory about the measurements that are used to find the scale ratio, both of the paired comparison of discrete or continuous.

AHP has stages, namely:

1. Defining the problem and determine a solution is desirable, then compose the hierarchy structure dawali with General purpose, followed by the criteria and alternatives choice who want ranked

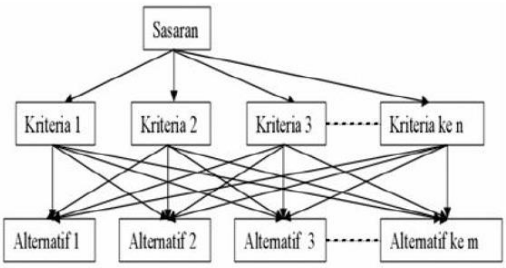


Figure 1 Hierarchical structure of AHP

2. Make a comparative matrix pairs that describe contributions or the relative influence of each element against the objectives or criteria that are a notch above.

Table 1 Paired Comparison Matrix

K	A1	A2	A3
A1	1	A12	A13
A2	Aij	1	A23
A3	Aij	Aij	1

Calculation formula for filling columns with Aij is the equation

$$Aij = \frac{1}{Aij} \quad (1)$$

3. Extended comparison of pairs. The column is filled with the results of the comparison of each element will be a number from 1 to 9 which shows the comparison of the importance of an element. Assessment scales comparison can be seen in table 2.

Table 2 Scale Of Assessment Of Comparative

Level	Definition	Description
1	Equally Important	Both elements have the same influence.
3	Rather more important that one over the other	Pengalaman dan penilaian sangat memihak satu elemen dibandingkan pasangannya.
5	Quite Important	Experience and the decision shows the Favorites on one activity over anot her.
7	It Is Very Important	Pengalaman dan keputusan menunjukkan kesukaan yang kuat atas satu aktifitas lebih dari yang lain.
9	Absolutely more important	An absolute element is preferred compared to his partner at the highest level of confidence.
2,4,6,8	The middle value betwe en two adjacent decisio n value	If a compromise is needed.

4. Normalize the data by dividing the value of each element in the matrix that is paired with a total value of each column..

$$\text{The value of the new element} = \frac{\text{The quantity of each elemn the initial matrix}}{\text{The number of columns of the old}} \quad (2)$$

5. Calculates the eigen vector from each paired comparison matrix. Nilaieigen vector is the weight of each element. This step is to synthesize the options in the penetuan priority elements on the lowest level of the hierarchy until the achievement of the objectives.

$$\text{Bobot Prioritas} = \frac{\text{number of rows}}{\text{number criteria}} \quad (3)$$

6. Consistency counts to find out how good consistency. Calculate the consistency by multiplying each value in the first column with priority relative the first element, the value of the second column with the relative priority of the second element, and so on (weight vector sum), then each line is added and the result is divided by the relative priorities are concerned. The results for the combined to get the right value for λmaks.

7. Test the consistency of the hierarchy. If it does not comply with CR assessment then 0.100 < have to be repeated again.
8. Measurement of the consistency of a matrix itself is based upon the maximum eigenvalues with the following formula:

$$CI = \frac{\gamma max - n}{n-1} \quad (4)$$

CI = *(consistency indeks*)
λ*max* = The value
of thelargest eigenvalues of matrix berordo n
n = The order of matrix
If the CI is zero, then the matrix of pair wise the comparation is consistent. This inconsistency limits determined by using a Consistent Ratio (CR), i.e. the comparison index consistency with Random indexes , can be formulated as follows:

$$CR = \frac{CI}{CR} \quad (5)$$

CR = The Ratio Of Consistency
RI = Random Index

Table 3 Random Value Index

N	1	2	3	4	5	6	7
R1	0,00	0,00	0,58	0,90	1,12	1,24	1,32

Table 4 Random Value Index (Advanced

8	9	10	11	12	13	14	15
1,41	1,45	1,49	1,51	1,48	1,56	1,57	1,59

When the matrix of pair-wise comparation with the CR values smaller than 0.100 then the inconsistency of opinion of the decision maker can be accepted, if not then the assessment need to be repeated [12].

2.2 RESULTS AND DISCUSSION

2.2.3 The analysis of CRM system in CV Sanggar Teknologi Indosia use Dynamic CRM .

As for the CRM Framework that corresponds to the system to be built at CV. Putra Sanggar Teknologi Indonesia is a Framework of Dynamic CRM that describes a series of stages in the development of CRM can be seen in Figure 3.11

1. Relationship Phase

Relationship Phase made in CV. Putra Sanggar Teknologi Indonesia has 3 stages: Acquisition, Retention and Expansion.

1. Tahap *Acquisition*

Stages of acquisition is business strategy by giving a good impression to potential customers, so that potential customers are interested in doing deals with CV. Putra Sanggar Teknologi Indonesia Workshop of how to build a website. The facility will be built on the stage of the Acquisition, i.e. company info, product information, and promotional information

2. Tahap *Retention*

Stage of retention is a process where the CV. Putra Sanggar Teknologi Indonesia build a good relationship with customers in order to retain customers. In building a good relationship with the customers the facility to be built at the retention, i.e. granting product recommendations.

3. Tahap *Expansion*

Expansion stages are used to improve customer loyalty CV Putra Sanggar Teknologi Indonesia. Customer loyalty can be increased if the customer is given a personalized service that can benefit. The facility will be built on a stage expansion, i.e., criticism and suggestions.

2. *Dynamic Relationship Management*

Dynamic Relationship Management conducted in CV. Putra Sanggar Teknologi Indonesia has 3 phases: Initiation of Relationship, Relationship, Relationship Analysis, Positioning Value.

1. **Stage Relationship Initiation**

Stages of relationship initiation i.e. stage where presentation and logging that is used to process customer transactions data i.e. recommendations in January – August 2016,), customer data, product data, questionnaire data per category.

2. **Relationship Value Analysis**

Phase relationship of value analysis i.e. stages which carried out the process of product recommendations. In the process of product recommendations using the AHP method. Based on the data of transactions January Marketing has determined the 3 criteria of materials, prices, number of products sold (past 6 months).

Tabel 5 Classification of materials

Less Good	Enough	Good Enough	Good	Very Good
Alumunium	*Stainless*	Iron	(Mixture of Black Steel and iron)	Black steel

Tabel 6 Grouping of price components

Cheap	Is being	Expensive
< =150000	151000 – 300000	> 300000

Tabel 7 Grouping the number of sold products

Little	Middle	Many
< 5	5 – 10	> 10

The following steps-steps that exist at this stage of the relationship value analysis

1) Defining the problem

The problem for marketing is determining the product recommendations and assist the customer in getting the information product recommendations. For that marketing gives advice based on the criteria price, material, number of products sold.

2) Create a hierarchical structure

This is a hierarchical structure product selection can be seen in Figure 2 below.

The Criteria Price

A1 = Expensive

A2 = Is being

A3 = Cheap

The Criteria Materials

B1 = Very Good

B2 = Good

B3 = Good enough

B4 = Enough

B5 = Less Good

The Criteria Total Of Number

C1 = Many

C2 = Is being

C3 = little

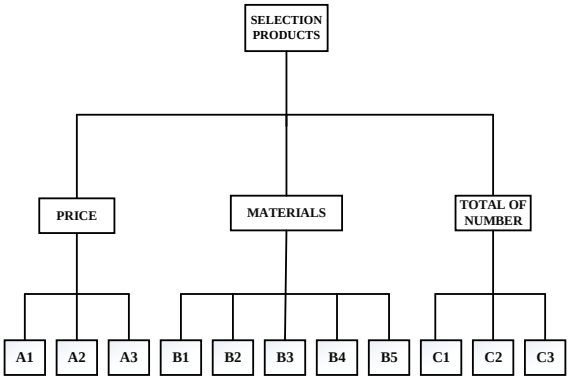


Figure 2 structure of the Hierarchy Problem

3) Make A Comparative Matrix Pairs

Tabel 8 Matrix Numbers Comparison

CRITERIA	PRICE	MATERIALS	TOTAL NUMBER
PRICE	1	3	5
MATERIALS	1/3	1	3
TOTAL NUMBER	1/5	1/2	1

Table 9 Matrix comparison criteria

CRITERIA	PRICE	MATERIALS	TOTAL NUMBER
PRICE	1	3	5
MATERIALS	0,33	1	3
TOTAL NUMBER	0,20	0,33	1

3. Add Up Each Column On A Comparison Matrix

Table 10 With the number of columns of the matrix

CRITERIA	PRICE	MATERIALS	TOTAL NUMBER
PRICE	1	3	5
MATERIALS	0,33	1	3
TOTAL NUMBER	0,20	0,33	1
∑	1,53	4,33	9

For example : 1 + 0,33 + 0,20 = 1,53

4) Add Up Each Row In The Matrix Pairs

Table 11 Paired with the number of matrix rows

CRITERIA	PRICE	MATERIALS	TOTAL OF NUMBER	∑ ROW
HARGA	0,65	0,69	0,56	1,90
MATERIALS	0,22	0,23	0,33	0,78
TOTAL OF NUMBER	0,13	0,08	0,11	0,32

The value of the price column in the rows of 0.65 material obtained from the results of the Division column price divided by line pricing ∑ a column, for example 1/1.53 = 0.65, likewise with other numbers.

5) Calculate The TPV (*Total Priority Value*)

Tabel 12 Weighting of criteria

CRITERIA	TPV
PRICE	0,63
MATERIALS	0,26
TOTAL OF NUMBER	0,11

The numbers in the column line TPV 0.63 price obtained from LINE/jumlah ∑ price criteria, for example 1.90/3 = 0.63.
As well as other figures obtained in the same way.

6) **Calculate Test Consistency**

Calculating the eigenvalues (γmax)

Eigen value is the result of the calculation of the relative weights are normalized from the example on the table 13

Tabel 13 Nilai eigen

CRITERIA	TPV	∑ COLUMN	γ MAX
PRICE	0,63	1,53	0,97
MATERIALS	0,26	4,33	1,13
TOTAL OF NUMBER	0,11	9	0,96
		∑	3,06

Consistency index

$$CI = \frac{3.06 - 3}{3 - 1}$$

$$CI = \frac{0,06}{2}$$

$$= 0,02$$

Based on the formula (5)

$$CR = \frac{0,02}{0,58}$$

$$CR = 0,04$$

Based on the ratio of the value of consistency, obtained the value matrix criteria 0.06 (0.06 < 0.1). This showed that the consistency is very good and acceptable, where the value of the consistency of the ratio is said to be consistent if CR < 0.1.

Example the case of a recommendation by the method of AHP

The weighting is the last stage in the calculation of the value of the method of Analytical Hierarchy Process (AHP). Calculation of the weighting value is the result of the calculation of the total priority value criteria, total priority value subkriteria. For more details can be seen in table 14.

Tabel 14 The Results Matrix Of The TPV, TPV Subkriteria Criteria

Criteria	TPV Criteria	Subcriteria	TPV Subkriteria
Price	0,63	Expensive	0,11
		Is being	0,26
		Cheap	0,63
Materials	0,26	Very Good	0,41
		Good	0,28
		Good Enough	0,16
		Good	0,1
		Less Good	0,05
Total Of Number	0,11	A little	0,63
		Is being	0,26
		Many	0,11

Based on the table above, then the product data will be multiplied with the TPV criteria and subkriteria that correspond to each of the criteria and subkriteria of the product. Products that are made for example the case is as follows:

Tabel 15 Examples of product data

Product	Materials	Price	Total of Number
Lengan Besi	Iron	125000	1
Lengan Besi 2	Stainless	110000	0
Lengan Besi 1	Black Steel	155000	0
Lengan Besi 3	Mix	135000	0

Here is the description from table 15 example of product data

Iron is an iron arm on a product, the product is price 125000 to iron sleeves, and 1 is the amount of product iron arm within 6 months. The original data obtained later changed into subkriteria so that each produces the following data:

The results of the grouping range

Tabel 16 The Results Of The Grouping Range

Product	Materials	Price	Total Of Number
Lengan Besi	Good Enough	Cheap	a little
Lengan Besi 2	Enough	Cheap	a little
Lengan Besi 1	Very Good	Middle	a little
Lengan Besi 3	Good	Cheap	a little

After the grouping of products, obtained will then be calculated based on the following calculations:

Assessment = TPV subkriteria x TPV Criteria

Table 17 The Results Of The Assessment Of The Product

Product	Materials	Price	Total Of Number
Lengan Besi	0,15 x 0,16	0,22 x 0,63	0,08 x0,63
Lengan Besi 2	0,15 x 0,10	0,22 x 0,63	0,08 x0,63
Lengan Besi 1	0,15 x 0,41	0,22 x 0,26	0,08 x0,63
Lengan Besi 3	0,15 x 0,28	0,22 x 0,63	0,08 x0,63

Table 3.13 shows the process of calculation of the TPV, TPV x subkriteria criteria for the result can be seen in table 6

Tabel 18 Global Priority

Produk	Materials	Price	Total of Number	Result
Lengan Besi 3	0,042	0,1386	0,0504	0,231
Lengan Besi	0,024	0,1386	0,0504	0,213
Lengan Besi 2	0,015	0,1386	0,0504	0,204
Lengan Besi 1	0,0615	0,0572	0,0504	0,169

Table 3.13 shows the process of calculation of the TPV, TPV x subkriteria criteria for the result can be seen in table 6

Example Cases

A customer named Mr. Andi intends to buy iron arm. It takes a query and find the products that have a similarity of names with products that are inputed namely iron arm that is on the table 19

Tabel 19 Similar products will be recommended

Produk	Bahan	Harga	Jumlah
Lengan Besi	Besi	125000	1
Lengan Besi 2	Stainless	110000	0
Lengan Besi 1	Baja Hitam	155000	0
Lengan Besi 3	Campuran	135000	0

After getting the results of the product to be recommended, further system checking and grouped in accordance with the product and take the value of the TPV criteria and TPV subkriteria that has been calculated before calculating the system after that AHP and get the global priority and greater than mengurutkanya, then take the 2 products to two largest global priority which made recommendations

Table 20 Results Of Recommendations

Produk	Materials	Price	Total Of Number
Lengan Besi 3	Mix	135000	0
Lengan Besi	Iron	125000	1

This result was obtained from two iron arm products has the largest global priority. Calculation based on AHP recommendations that best fit that is recommended for the customers is Lengan Besi 3 and Lengan Besi.

3).Stage Relationship Positioning

At this stage will do the delivery results of recommendations to customers, whereby the grant recommendations will be by email. As for the architecture of the email that will be used in the process of information delivery to the customer will be illustrated in Figure 20 below

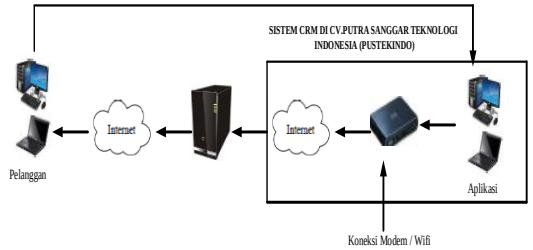


Figure 3 Email CRM System architecture in CV. Pustekindo

The illustration above depicts the process of information delivery product promotions via email. Based on a sample of cases that have been performed on stage before, penindaklanjutan against the customer named Mr. Andi is send an email with the following email content

Tabel 21 Email content

Email Content
Produk yang anda inputkan adalah lengan besi yang merupakan produk dari jenis mesin pemotong kertas. Produk yang direkomendasikan untuk anda adalah: Lengan Besi 3 ..... Lengan Besi ..... Datang ke *workshop* kami (jam 08.00 – 16.00) CV. Pustekindo di jalan Raya Soreang Banjaran Bandung dan kunjungi *website* kami di www.pustekindo.co.id . Dapatkan penambahan garansi 1 tahun untuk salah satu produk di atas hanya untuk 3 pembeli pertama pada hari ini dan minimal telah melakukan 2 kali transaksi di bulan ini dengan menunjukan bukti faktur pembelian. Email ini hanya berlaku selama 24 jam. Terima Kasih

4).Customer Information Type

On the Customer Information Type there are

1. information about customers

Information about customer data and customer transaction data in CV. Putra Sanggar Teknologi Indonesia namely customer information and transaction customer info.

2. Information for customers

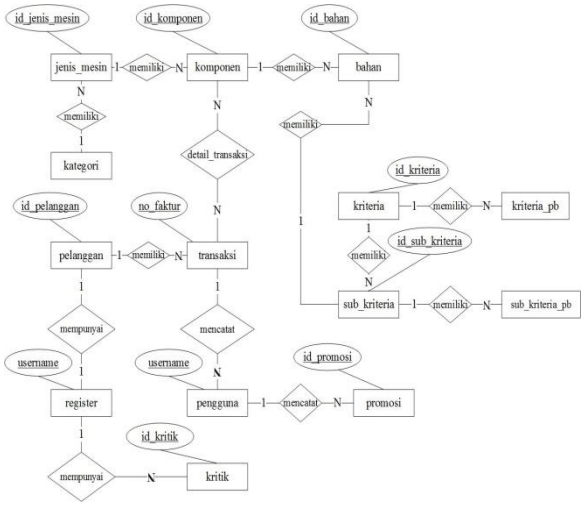
Information about company information, products, prices, service firms considered important by the customer information and product recommendations. This information will be transmitted using the website and email.

3. Customer Information

Information about the criticism and suggestions from customers

2.2.4 Analysis Database

ERD is the relationship between entities that are used in the system to describe the relationships between entities or the data structure and relationships between files. The E-R diagram is proposed for the system to be constructed are as follows:



Fugure 4 ***Entity Relational Diagram (ERD)***

2.2.5 Context diagram

Context diagram is a diagram of the highest level of the DFD that describe relationships in the system by its users. There are 4 users that play a role in this system, namely admin, marketing directors, customers and potential customers where every actor has the right Info and different data which can be seen in Figure 5.

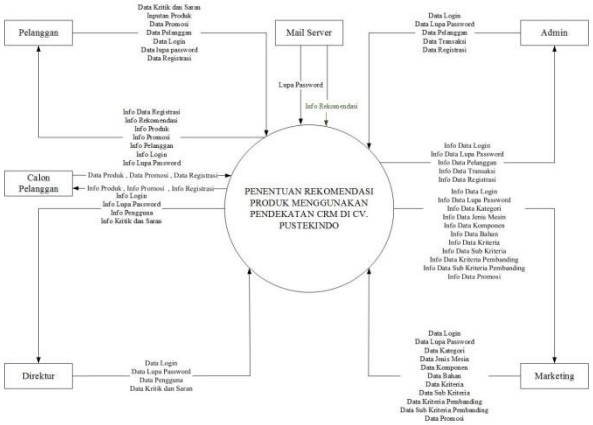


Figure 5 Context Diagram

2.2.6 DFD Level 1

DFD Level 1 the following explains that the system users can access the system information by selecting a menu that is available in the system as the Director, admin, marketing, customers. and potential customers.

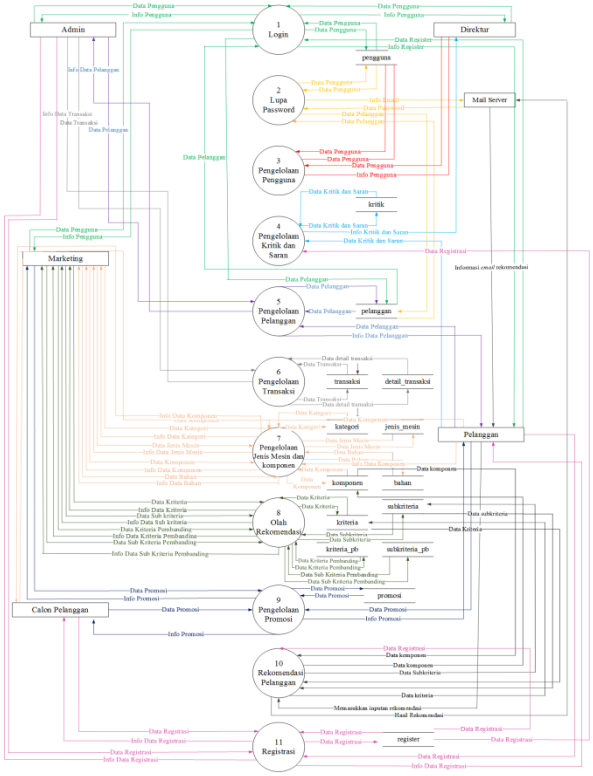


Figure 6 DFD Level 1

2.2.7 Scheme Relation

Describes the connectedness of tables in the system in detail or clear, then use table relationships. Table relationships are described in Figure 7

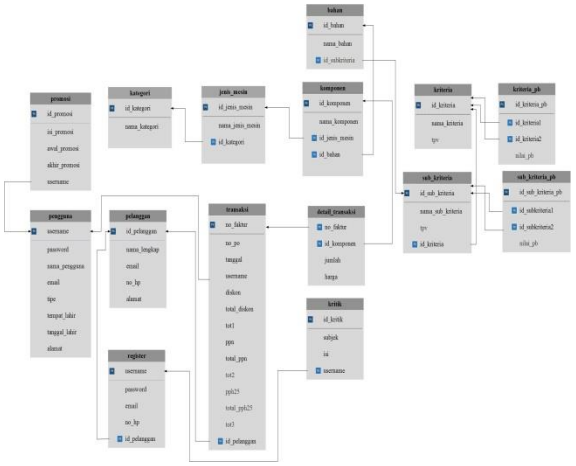


Figure 7 Scheme Relation

3 COVER

3.1 Conclusion

Based on the results obtained in the writing of this final task, then a conclusion can be drawn as follows:

Determination system product recommendations using the approach of customer relationship management in CV. Putra Sanggar Teknologi INDONESIA this may help in determining the marketing product recommendations and assist customers in getting product recommendations

3.2 Advice

As for suggestions for product recommendations determination system using the approach of customer relationship management in CV Putra Sanggar Teknologi Indonesia are as follows

1. Determination of product recommendations using the system approach to the custome relationship management in CV. Putra Sanggar Teknologi Indonesia this need for development, such as the following can make transactions at once.
2. Determination system product recommendations using the approach of customerrelationship management CV Putra Sanggar Teknologi Indonesia this need for data backup facility.

SAY THANKS

The first praise we render to God Almighty, because upon his grace and blessings we can complete this thesis with the title "The DETERMINATION of PRODUCT RECOMMENDATIONS USING the APPROACH of CUSTOMER RELATIONSHIP MANAGEMENT in CV. PUTRA SANGGAR TEKNOLOGI INDONESIA" which is one of the conditions for the final exam in order to achieve a Bachelor of computer engineering informatics courses at the University of Indonesia's computer. All the discussion presented in the writing of this thesis is the result of a maximum of usahayang of the author to present the best results.

The author realized that the drafting of the thesis is still insufficient, since it's criticisms and suggestions build is a form of attention that will be of benefit to authors. The writing of this thesis will not be completed without the support of those who are so big and mean. For that there is no word spoken strategies other than thank you to Mother Gentisya Tri Mardiani, s. Kom, Kom as a supervisor who has a lot of mentor authors in writing this thesis, report to the parents and younger brother and sister are also writers who author very dear thanks for the moral support and materilnya, as well as to Mr. Anwar Musadad and Mr. Redi as Director and Deputy Director of CV. Putra Sanggar Teknologi Indonesia who had allowed the writers to do research in led , and has been providing input and direction of the work of this thesis.

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