CUSTOMER INFORMATION SYSTEM DEVELOPMENT RELATIONSHIP MANAGEMENT (CRM) IN PD. AXA

Mahesa Mulyana

Teknik Informatika – Universitas Komputer Indonesia
Jl. Dipatiukur 112-114 Bandung
E-mail : djenarz@gmail.com

ABSTRACT

PD. AXA is a company engaged in the sale of stationary namely paper and stationery - stationery based in Bandung. PD. AXA as a business that has long been in the field of stationary needs to think about how to improve the long-term growth and profitability. PD. AXA still has a problem in terms of retaining customers as well as provide a fitting tribute to the customer. Pursuant to the problems that exist at present in PD. AXA, the need for an information system development Customer Relationship Management (CRM) in PD. AXA. The development objective information CRM makes it easy to adjust the appropriate award to customers based on the customer transaction.

CRM (Customer Relationship Management) is a methodology, strategy, software (software) and web applications that can help a company to manage relationships with customers. The concept of CRM is widely used as a reference in the information industry as a methodology of Internet capabilities that help companies manage customer relationships. CRM types are constructed using the Analytical CRM. The methods used in determining the award to customers using Association Rule.

Keywords: information systems, customer relationship management, analytical, Association Rule

1. INTRODUCTION

PD. Axa is one company that is engaged in the sale of goods, particularly in terms of sales of stationery (ATK) located on Jl. Jend. Sudirman No.55B, Bandung. The sales can be done much (Wholesale) or retail. Customers in PD. Axa comprises establishments, shops - stores, and individuals. Customers are considered important because it is only by having a business customer can continue to run while on one side of the PD. Axa has not had any strategy in terms of maintaining customer impact on corporate profits.

Based on interviews with the mother as the head of the administration Rosiyanti PD. Axa, explained that the development of the number of subscribers in PD. Axa is not too significant, and can be proven with registered customers in mid June 2015 as many as 81 companies and individuals, and customers registered in December 2015 as many as 85 customers and individuals, from the fact that said by the head of the PD. Axa can be concluded that the PD. Axa was very slow in doing marketing strategy for the withdrawal of new customers, especially in terms of promotion of the company.

Besides the observation of PD. Axa is based on the transaction data for the month of November 2015 until the end of December 2016 can be used as a reference for the conduct of a strategy to retain customers for the period of 2 months is already a lot of customers PD. Axa conducting transactions. In these transactions there are already some customers are suitable to be given an award, therefore PD. Axa requires an appropriate way to reward customers so that the customers can make transactions as much as possible, therefore giving discounts to customers according to the recommendations of the company based on customer transactions is the choice of the right strategy.

Based on the above statement can be concluded the problems faced by the PD. Axa today is the lack of promotion, customer management and strategy to retain customer to re-do the transaction, because the PD. Axa has not done any follow-up processes such as the provision of goods based on customer transactions which result in PD. Axa lose the opportunity to benefit from the same customer, and can allow the cessation of purchases of goods in PD. Axa, so the effect on the stability of the company profit.

By applying the concept of CRM (Customer Relationship Management), companies can identify potential customers to conduct transactions back. And the purpose of the recommendations is to determine the goods consumer behavior and implement appropriate marketing strategies, so as to bring benefits to the company. Market Basket Analysis method is a method to know the habits of consumers into buying a product simultaneously.

This is the focus and the reference in the customer management process, known as Customer Relationship Management (CRM). Customer Relationship Management (CRM) is a business strategy that consists of software and services

designed to increase profit (Profit), Revenue (Revenue) and customer satisfaction (customer satisfaction). Customer Relationship Management (CRM), Is a blend of three related aspects, namely: Customer Relationship and Management.

Based on the problems that exist at the present time in the PD. Axa, the need for an information system that provides additional information to the customer and recommend a list of goods method approach, Customer Relationship Management (CRM). While the objectives to be achieved in this research is to help the head of the administration in deciding on the list of items that will be offered to customers based on customer transaction data.

2. RESEARCH

2.1 Theoritical Basis

The theoretical basis of this thesis will explain the theories relating to the application of Information Systems Customer Relationship Management (CRM) in PD.Axa.

2.1.1 Information Systems

The term comes from the Greek system is sistema. Judging from the origin of said system means a set of objects that work together to produce a unified method that combined and arranged in a way that serves to achieve the goal. A system can stand up of several sub-systems that are interconnected to form a unity so that the system of goals or objectives can be achieved. In general, the characteristics of the system aims, has limits, open, composed of subsystems and interrelated and interdependent, a determination is intact, conducting transformation, there is a mechanism of control and have the ability to set and adjust yourself [1].

Information is data that has been processed, data transformation, thus transformed into information. Information is data that has been retrieved, processed or otherwise used for informative purposes, argument, or as a basis for decision making. Information is the result of process data into useful forms less useful data. The quality of an information system depends on three things, that information must be accurate, timely and relevant [1].

2.1.2 Customer Relationship Management

Definition of CRM can be viewed from different sides of the sides with regard to technology, the communication and management, and the business side. The sense is as follows [2]:

1. CRM is "a strategy to optimize the lifetime value of the customer (customer lifetime value) in a way to know more about the customer information and interacting with customers intensively (in terms of technology).
2. CRM is defined as "an enterprise approach to understanding and influencing customer behavior through intensive communication in order to improve customer acquisition, customer retention, customer loyalty (in terms of communication and management).

CRM definition when viewed in terms of business can be defined as "a business strategy to understand, anticipate and manage the needs of potential customers in an organization at the present time and to be dating (on the side of the business).

2.1.3 Type of CRM

Type of Customer Relationship Management (CRM) is operational CRM, analytical CRM and collaborative CRM [3] :

1. Operational CRM
   Operational CRM deals with a company's business functions that include customer service, order management, invoice or billing, management and sales automation.
2. Analytical CRM
   An activity which includes store, move, process, interpret and report data customers or users, who then analyze what they need.
3. *Collaborative* CRM
   Collaborate CRM is the activity to combine all the necessary communication, coordination and collaboration between vendors and customers.

2.1.4 Framework of CRM

Architecture or framework of CRM is the customer's perspective and organizations in the implementation of CRM, CRM architecture is divided into two types namely [4] :

1. Front CRM
   Front-CRM is a framework (Framework) to establish a computer system for managing customer relationships (CRM) according to the internal perspective of the organization. The biggest challenge is how the concept of CRM can be implemented in a company. The problem is, the concept of CRM is not just a software installation per se, but more emphasis on the implementation of the philosophy and customer-centric culture as a whole.
   CRM Implementation should begin at the level of business strategy, which at this level overall organizational change is possible. Agenda changes is then directed to the work process, and supported by information technology. This process can not run otherwise. In fact, the majority of CRM implementation project first focused on the aspects of the technology rather than business strategy. This may be one factor contributing to the failure of CRM implementation.
   Front-CRM is intended to provide a framework for recognizing the business process anything that happens in every field of management related to CRM, especially in the aspect of marketing, sales, and service (departmental

plans). The framework is based on the activity of Strategic Planning, Marketing, Sales, and Services contained in the company. The fourth activity is a basic philosophy to implement CRM. To better understand what the essence in each department related to strategic planning and the concept of CRM.

2. Dynamic CRM
   Research on CRM framework conducted by Chung-Hoon Park and Young-Gul Kim, review the connection information and marketing strategies, and create a model described Dalan "Framework of Dynamic CRM". Described that phase of CRM within a framework in the form of a series of processes Acquisition-Retention-Expansion. As an integrated CRM framework based on the types of customer information is arranged in stratified according to the development of customer relations.

2.1.5 Association Rule

"According Jiawei Han and Micheline Kamber, Association rule is to look for patterns - patterns, associations, correlations, or causal structures among sets of items in the transaction database, relational databases and repositories, and more". "According to Taufiq Emha Kusrini and Lutfi, association rule is a data mining techniques to discover the rules of associative between a combination of items." Association rule has parameters, the support, confidence and correlation. Use of parameter support and confidence only to association data produced some rules in determining the method. However, we can improve the result by the correlation parameter [5].

In association rule, a group of items called itemset. Support is a measure that indicates the extent of the dominance of an itemset of the overall transaction. This size determines whether an itemset worth seeking his confidence (eg, of the total transactions that exist, the extent of the dominance of an item indicating that the item A and B items purchased together) .Support of itemset X is the percentage of transactions in D that contain X, usually written with supp (X). If support an itemset greater than or equal to the minimum support, the itemset can be described as a frequent itemset, which does not meet the so-called infrequent.

Confidence is a measure that indicates the relationship between duaitem (eg, calculating the possibility of how often the item B purchased by the customer if the customer purchases an item A). Confidence of a rule R (X => Y) is the proportion of all transactions that contain both X and Y containing X, commonly written as conf (R). An association rule with confidence equal to or greater than the minimum confidenceY can be regarded as valid association rule.

Association rules are usually expressed in the form:

{Bread, butter} -> {milk} (support = 40% confidence = 50%)

The rule means that 50% of transactions in the database that contains the item also includes bread and butter milk items. While 40% of all transactions in the database that contains three items. May also mean, when a consumer buys bread and butter has a 50% chance to also buy milk. This rule is significant because it represents 40% of the transaction records for this.

The basic method of association analysis is divided into two stages :

1. Analisis pola frekuensi tinggi

   This stage looking for a combination of items that meet the minimum requirements of the value of the support in the database. According to Larose who dikutif by Kusrini, we are free to determine the value of the minimum support (minsup) and minimum confidence (mincof) as needed (Kusrini; Lutfi, Taufiq Emha ;, 2009). For example, if you want to find data that has a strong association relationship, minsup and mincofnya be rated high. Conversely, if you want to see many variations of data without regard too strong or whether the association relationship between his items, the value can be filled minsup and mincofnya low.Values support an item obtained by the following formula.

$$Support(A) = \frac{Jumlahtransaksimengandung A}{Totaltransaksi}$$

Equation 1 explains that the support is obtained by dividing the number of transactions that contain item A (one item) with transaksi.Sementara sum total of all that, the value of the support of two items obtained from the formula 2 below:

$$Support(A,B) = P(\text{A}\cap\text{B})$$

Support Count is the number of the same itemsets appear bersaman in a transaction data in the shopping cart.

2. Pembentukan Aturan Asosiasi
   After all the high frequency pattern is found, then look for association rule that meets the minimum requirements for calculating the confidence with confidence A◊ associative rule B of support of high frequency pattern A and B. Values confidence of the rule A◊ B obtained by the following formula.

$$Confidence = P(B|A) = \frac{\sum Transaksimengandung AdanB}{Transaksimengandung A}$$

2.1.6 Parameter Colleration

Colleration is a parameter that determines the value of connectedness Parameter correlation searched using the formula elevator. Rated lift measure how important the rule that has been

formed based on the support and confidence. The occurrence of itemset A is independent of the occurrence of itemset B if P (A | B) = P (A) P (B), if not, itemset A and B dependent and correlated as events. Lift happened between A and B can be measured by calculating:

$$lift = (A, B) = \frac{P(A \cup B)}{P(A)P(B)}$$

With the following rules:
1. Lift (A, B) <1 then buy (B)
2. Lift (A, B)> 1 then buy (A, B)
A transaction is said to be valid if the lift has a value of more than 1, which means that the transaction item A and item B really - really purchased together.

2.1.7 Algoritma Apriori

Apriori is an algorithm that is well known in the search frequent itemset to get the association rules. As the name implies, this algorithm uses knowledge about the frequent itemset previously known to process more information. Apriori uses an iterative approach, also known as level-wise search where k-itemset used to find (k + 1) -itemset.
Step - step algorithm priori as follows:
1. Set k = 1 (refer to the itemset to-1).
2. Calculate all k-itemsets (itemset having k items).
3. Calculate the support of all the candidate itemset. Filter itemset is based on minimum support its value.
4. Combine all k-sized itemsets to generate candidate itemsets k + 1.
5. Set k = k + 1 (point itemset 2nd and so on).
6. Repeat steps 3-5 until no larger itemset can be formed.
7. Create a final set of itemset by creating a union of all k-itemsets.

To improve the efficiency review From k-itemset search, then used a method, what is called a priori properties, methods singer can be Reduced scope of the search so that the search time can be shortened. Definition of a priori properties is a condition where ALL parts From frequent itemset Which Also must NOT empty frequently, often Yang revoked here is ALL itemset meets the minimum support Yang Yang is determined by the user. Based Definition Yang mentioned, IF A itemsetI NOT meet the minimum support (min_sup) Being determined, then I DO NOT often, OR WITH denoted P (I) <min_sup. IF A point A is inserted into the first, then the findings itemset I U A NO can be Occurs More Than Term itemset I. By THEREFORE I U A NOT frequently Also, with the word lie P (I U A) <min_sup. Can be said to be simple to operate IF A itemset NOT meet the requirement, then ALL superset (itemset lay Yang formed WITH contains the itemset Element) from itemset tesrebut NOT likely to meet the requirements also.

Following further clarification on the property priori algorithm is used algorithm singer Yang hearts. The following explanation is a process comprising Steps From prayer Namely join and prune (Han, Jiawei; Kamber, Micheline, 2006):
1. Step join: to determine Lk, a set of candidate k-itemsets produced by menjoinkan Lk-1 with himself. This candidate set generated as Ck. For example I1 and I2 is itemset in Lk-1. For example I1 [k-2] refers to the second to the last item in I1. It should be stressed that this algorithm has a rule that the items in the transaction or itemset has been sorted in lexicographic order first. Furthermore join denoted by Lk-1 ∞ Lk-1 run, where members of the form Lk-1-itemset itemsets can be joined if the first (k-2) - items of Lk–1 same. So members of l 1 and l 2 of Lk-1 will be joined if (l1 [1] = I1 [1]) ^ (I1 [2] = I1 [2]) ^ ... ^ (I1 [k-2] = I2 [k-2]) ∧ (I1 [k-1] <I2 [k-1]). Condition (I1 [k-1] <I2 [k-1]) aims to ensure there are no duplicate itemset resulting from the join I1 and I2 are in a format I1 [1], I1 [2], ..., I1 [k-2], I1 [k-1], L2 [k-2].
2. Prune step: Ck is a superset of Lk where each member can be frequent or not, but all frequentk-itemsets included in Ck. The process of scanning the database is done to determine the number of occurrences of each candidate that is in Ck will determine Lk (for example, every candidate who has the support count is less than or equal to the minimum support specified called frequent, which means also eligible for entry into lk). There is a possibility Ck can contain a candidate with a very large number, so it can cause Ck calculation process becomes unwieldy. To reduce the number of candidate Ck, a priori property is used as berikut.Semua (k-1) are not frequent itemset 19 otherwise could not be a subset of a frequent k-itemset. Therefore, if there are (k-1) -subset of a candidate k-itemset is not included in Lk-1, then the candidate may not be frequent as well and therefore can be removed from Ck.

2.2. Problem Analysis

Analysis of the problem is an assumption of the issues that will be described in the procedures of data processing in information systems development program Customer Relationship Management (CRM) in PD. Axa. Analysis of the current system at this time is the difficulty of the administration in deciding on the list of items that will be offered to customers based on customer transaction data.

2.3 Framework of CRM Analysis

Analysis of CRM is used by Dynamic CRM Framework consists of Relationship Phase, Dynamic Relationship Management and Customer Information. Each stage has a respective facility.

A. *Relationship Phase*

Relationship Phase terdiri dari 3 tahapan, yaitu : *Acquisition, Retention* dan *Expansion*.

1) *Acquistion*

Acquistion is the stage of acquiring customers. At this stage the company conducts business strategy by giving a good impression to the customer so that the customer is interested to do business with the company. In PD. Axa some strategies are:

a. promotion

This facility is the means used to carry out promotional offer of services provided by companies such as rebates presented in the system.

b. Company information

This facility is used to simplify the way customers and prospective customers in knowing the positive information about the company so the company has more value in the eyes of customers. The Company provides website information by sending an email to the customer by email is already registered during charging customer data.

2) *Retention*

Retain is a process where the company establish a good relationship with the customer. At this stage of the business strategy undertaken by the company is the sale of products based on the recommendations derived from the behavior patterns of customers using market basket analysis. Market basket analysis method used to determine the pattern of customer transactions, which by knowing these patterns can know what products will be recommended to the customer. The results of these recommendations are used as a reference to the customer to be given other services, such as discounts or promotions on these products.

3) *Ekspansion*

Ekspansion is the stage where companies seek to maintain relationships with customers, in other words to get customers and then maintain a relationship with them. In this stage the company retain customers by always providing the best service company owned mainly on the reward system in the form of discounts to customers based on the results of product recommendations: a. Giving discounts to customers Companies find out what products can be used as a recommendation to pelannggan. Having in mind the product to be recommended, the company tells rewards to customers through the medium of email in the form of discounts or rebates based products such recommendations. Recommendations important in order to know what products are really needed by the customer so that the reward system can be precisely targeted. b. Complaint This facility contains about complaints by customers online and outcome of complaints will be processed by the company to do the handling, both in terms of goods or services. For example, if there is a customer leave a complaint about faulty goods or services of a company that is not good, then when the company will strive to directly address complaints and will confirm to the customer complaint and after that will confirm whether the customer complaint to the customer complaint has been handled or not. b. Suggestion This facility contains suggestions provided by customers online and the result of suggestions will be disposed of by the company to do repairs in the future.

B. *Dynamic Relationship Management*

Dynamic Relationship Management terdiri dari 3 bagian yaitu : *Relationship Initiation, Relationship Value Analys* dan *Relationship Positioning.*

1. Relationship Initiation, PD. AXA prepares the data for product recommendations to customers in the form of transaction data and customer data.
2. Relationship Value Analysis, in this phase is done the process of determining recommendations to customers of the available data, using market basket analysis
3. Relationship Positioning, providing services to customers such as the handling of complaints and criticisms and suggestions.

C. *Customer Information Type*

Customer Information Type terdiri dari 3 bagian, yaitu : *of – the – customer – information, for – the – customer information*, dan *by – the – customer - information.*

1. *Of the customer information*

   Is information about customer data and customer transaction data PD. Axa. Facilities that will be raised, namely customer information (name, address, telephone number, and email) and customer transaction information.

2. *For the customer information*

   This stage is the stage where companies build good relationships with customers. In this process the membership process will be conducted, and given the price cuts according to the types of customers that are grouped together. The next stage of the company is to do stage segmentation / grouping of potential customers, so the company can determine the type of services to be provided. Data were managed at this stage is data customer groups and product data.

3. B*y the customer information*

   Is information on complaints and suggestions from customers. complaints and suggestions is

a place for customers to deliver to the company regarding the customer's wishes.

After the third stage of the above is done, the company will receive two types of relationship provided by the customer is transactional and non-transactional commitment commitment. transactional relationship commitment is given to the company's customers in the form of transaction / purchase services offered by the company. non-transactional relationship commitment is given to the company's customers in the form of complaints and suggestions regarding the service and the work of the company. With the two types of relationships between the customer and the company will create Relationship Commitment is the main goal of the CRM concept is applied.

2.3.1 Association Rules Method Analysis

Method of Association Rules or also known as market basket analyis, used to discover the rules of associative between a combination of items or goods. Rules associative (association rules) can be used to find the combination of the item or items commonly purchased by the customer (Customer Behavior) algorithms using a priori. Results of the determination of the combination of the item or items used as a reference for the head of the administration in determining the recommendation list of items that will then be recommended to the customer.

Based on transaction data in November 2015 through December 2015 obtained fekuensi shopping transactions each customer that can be obtained during the two months. The next step is to determine the association rules that will be used to determine product recommendations to customers. The basic method of association rules is divided into two phases: the search for patterns of high frequency and the establishment of the association or the calculation of frequencies that have been obtained.

The first stage is the search for patterns of high-frequency, this stage look for patterns of eligible items from the minimum support value in the database. According Lorase, we are free to determine the value of minimum support and minimum confidence as needed. To see the many variations of the data obtained, then in this case the minimum value of the support that has been used is 100% of the approximately 600 samples of data items used in the amount of minimum 6 and its 60% confidence.

The algorithms used in this study is a priori algorithm. This algorithm uses knowledge about the frequent itemset previously known to process more information. Step-by-step process of a priori algorithm in this study are as follows:

The first step to do is scan the database D for a support-count of each item code. Where the support-count value is obtained by calculating the appearance of each item on the sales transaction data. From the calculation of support-count can know the number of items contained in the goods data of approximately 600 items.

The second step is to eliminate items that have a support-count is less than the minimum value predetermined support, in this case the minimum value predetermined support amounted 6. Where the items are less than 6 will be eliminated and items that have a support-count of more or equal to 6 will be used for next process. After a process of elimination of data that does not meet the minimum support, the number of items that meet the minimum support as many as 21 items. Here is the data support ≥ minimum support count.

The third step is finding frequent 2-itemsets or L2. To find the frequent 2-itemset is the L1 L1 join.

$$Support(A,B) = P(\text{A}\cap\text{B})$$

which produces 2-itemset candidates or C2

The next stage is once calculated and ditemkan support count of each candidate 2-itemset in C2, it can be seen that there are some that do not meet or less than the minimum support count. To determine the members of the L2, itemset-itemset in C2 that has the support count is smaller than the minimum support will be removed, so all that remains is itemset has support count ≥ minimum support.

After frequent itemset of the analysis is obtained, the next step is to find the value of frequent itemset certainty has been obtained. By using the formula of confidence that has been described in previous chapters. Implementation of confidence formula that has been described in previous chapters. Implementation of these formulas can be seen:

$$Confidence = P(B|A) = \frac{\sum Transaksimengandung A dan B}{Transaksimengandung A}$$

After the value of certainty is obtained, remove the certainty that the data value is less than the minimum value certainty. If the minimum is 60% certainty, then only a few strong candidates that can be used as a reference for the recommendation goods to customers in PD. Axa. The value of greater certainty than the minimum value, can be seen in Table 1.

Table 1. Table value certainty required

Itemset	Nilai Kepastian
{B038(Standar G Soft)},{B124(Binder Clip 105)}	6/7 = 85%
{B039(Standar AE 7)},{B068(Buku Kwitansi Besar SD)}	7/8 = 88%
{B078(Buku Folio 100 BO)},{B175(Isi Cutter Besar)}	6/10 = 60%
{B124(Binder Clip 105)},{B138(Papper Clip No 3 Joyko)}	8/8 = 100%
{B308(Singpen 1 Warna)},{B315(Stabilo Boss)}	6/9 = 67%
{B315(Stabilo Boss)},{B573(D/L)}	6/7 = 85%
{B574(Lakban Coklat)},{B580(Lakban Bening)}	6/6 = 100%

1. If the last transaction the customer to buy goods at the item code B038 (Standard AE 7), the company will recommend items with code B124 (Binder Clip 105) with 85% certainty.

2. If the last transaction the customer to buy goods at the item code B039 (Standard AE 7), the company will recommend items with code B068 (Great Receipt Books SD) with 88% certainty
3. If the last transaction the customer to buy goods at the item code B078 (Book Folio 100 BO), the company will recommend items with code B175 (Content Cutter Large) with a certainty of 60%
4. If the last transaction the customer to buy goods at the item code B124 (Binder Clip 105), the company will recommend items with code B138 (Papper Clip No. 3 Joyko) with 100% certainty
5. If the last transaction the customer to buy goods at the item code B308 (Singpen 1 Colour), then the company will recommend items with code B315 (Stabilo Boss) with 67% certainty
6. If the last transaction the customer to buy goods at the item code B315 (Stabilo Boss), then the company will recommend items with code B573 (D / L) with a 85% certainty
7. If the last transaction the customer to buy goods at the item code B574 (Tape Brown), the company will recommend items with code B580 (Lakban Bening) with 100% certainty

The following table recommendations on the results of the transaction PD. Axa :

Table 2. Recommendations of the transaction PD.Axa

No	Transaksi	Rekomendasi Barang
1	B038(Standar G Soft)	B124(Binder Clip 105)
2	B039(Standar AE 7)	B068(Buku Kwitansi Besar SD
3	B078(Buku Folio 100 BO	B175(Isi Cutter Besar
4	B124(Binder Clip 105)	B138(Papper Clip No 3 Joyko
5	B308(Singpen 1 Warna)	B315(Stabilo Boss)
6	B315(Stabilo Boss)	B573(D/L)
7	B574(Lakban Coklat)	B580(Lakban Bening)

From the above it can be proved that the transaction PD. Axa within a period of two months, there are several recommendations based on frequently purchased items by all subscribers.

2.3.2 Menentukan pelanggan yang berhak mendapatkan rekomendasi barang

Having known the goods which will be used as a recommendation, the company determine which customers are entitled to the goodsrecommendations based on 5 customers with the highest transaction.

Table 3. Customers with the results of many transactions

Nama Pelanggan	Frekuensi
PT. LEN Persero	21
GameMaster	11
Bank Indonesia	7
PT. Indofood Sukses Makmur	6
CV. Cipta Anugrah Jaya	4

The provision of goods was determined based on suitability for the customer's last purchase, for example: PT. LEN make purchases with the code B039 (Standard AE 7) so PT. LEN get a recommendation of goods with the code B068 (Great Receipt Books SD) with a 15% discount.

2.3.3 Pengiriman Email sesuai rekomendasi

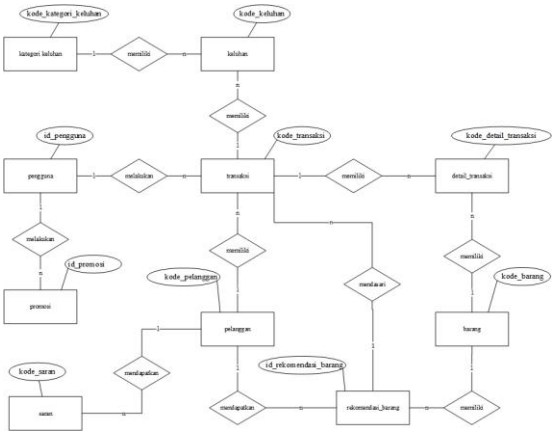
Once known which goods will be recommended. The company uses the data the recommendations for use as a reference in granting promotions to customers. The means used to notify subscribers use the email facility. Fill in the email referred to in Table 4.

Table 4. Contents of the message Email

Kategori Pelanggan	Isi Pesan Email
Pelanggan yang berhak mendapatkan rekomendasi barang	**PT. Len Industri (Persero)** yth, Selamat pelangggan Yth. Anda mendapakan promosi khusus berupa potongan harga produk Buku Kwitansi Besar SD sebanyak 15%, berlaku hingga tanggal 2 februari 2016 Terimakasih, Salam PD. Axa

2.4 Database Analysis

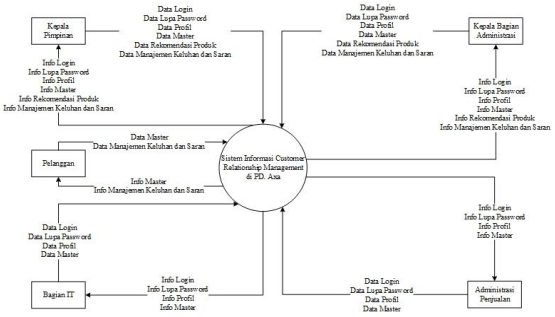
From the analysis, there is data to be used in the development process of this application. Then from the data obtained, built a database design and design of other features. To design a database used Entity Relational Diagram (ERD) as shown in Gambar 1.



Gambar 1. *Entity relationship diagram* sistem customer relationship management at PD. Axa

2.5 Context Diagram

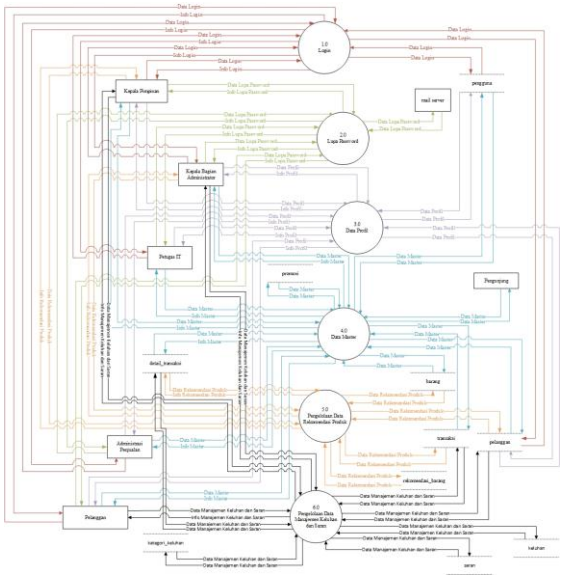
Diagram context is a tool for structural analysts, this approach tries to describe the system in general or overall. Diagram context of development of information systems customer relationship management in PD. Axa can be seen in Gambar 2.



Gambar 2. Context Diagram sistem customer relationship management at PD. Axa

2.6 *Data Flow Diagram (DFD)*

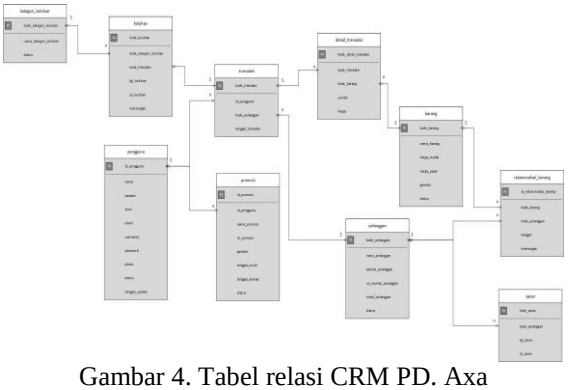
DFD is often used to describe an existing system or the new system will be developed logically without considering the physical environment where the data flow or the physical environment in which the data will be stored. DFD can describe the flow of data within the system with structured and clearly. DFD is a representation of a system that describes parts - parts that exist. From this DFD can be known sources of the information contained on the system. Data flow diagrams show how to decipher the data flow processes that occur in the system to process more detail. In such a context diagram Gambar 2 can be broken down into several DFD.



Gambar 3. DFD Level 1 CRM PD. Axa

2.7 Table Relationships

Table relationships describe the relationship between the data, meaning data and limits. The process of relations between attributes is a combination between the attributes that have the same primary key, so that these attributes into a single unit that is connected by the key fields. Table relationships are described in Gambar 4.



Gambar 4. Tabel relasi CRM PD. Axa

2.8 Interface Design

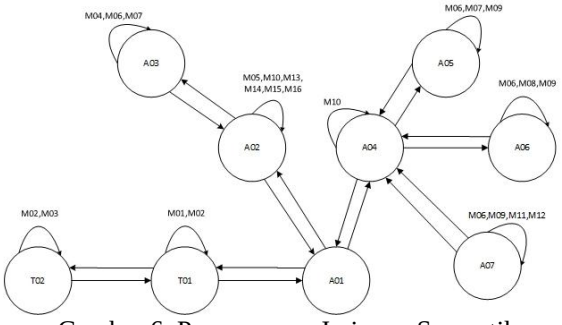
Interface design created to describe the look of the program that will be used by the user. The design is based on the interface display both input and output that will be generated when the application is implemented. Here is a sample login interface design that can be seen in Gambar 5.



Gambar 5. T01 Perancangan Antarmuka *Login*

2.9 Semantic Network Design

The design of the semantic network representation of the design interface that shows where each interface is connected. Following the design of semantic network admin users on PD. Axa can be seen in Gambar 6.



Gambar 6. Perancangan Jaringan Semantik Pengguna admin

2.9 Testing System

Testing of the system is the cornerstone that aims to find errors or deficiencies in the CRM system under test. Testing intended to determine the CRM system that is made in compliance with the

performance in accordance with the design objectives.

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. Test plan will do is to test the system built by Black Box and bet.

1. Testing *Black Box*

Black box testing focuses on functional requirements of software built. Testing is done by testing each process for possible mistakes. Based on test results with sample test cases that have been done on this CRM information systems to the conclusion that the process has been as expected. Filtering process error message that appears in the form of sufficient maximum. Functional system can already be considered to meet the expected demand.

2. Testing Beta

Beta testing is a test that is directly the actual environment. Users make an assessment of the software using interviews. From the results of these interviews, it can be concluded whether the software has been built in accordance with the purpose or not. Interviews conducted for the users of the system consisting of the manager fund operations section. This research was conducted in PD. Axa in order to determine the extent to which the system is built to be a solution and settlement of issues that have been described previously.

Based on the beta testing has been done before, it can be concluded that the system in terms of functionality already meets the needs of business managers based on the purpose of research, but there is still need for adaptation in the use sms and responds to complaints. In appearance as a whole has been quite good.

3. CLOSING

In this section, describes the conclusions which contains the results obtained after the analysis, design, and implementation of software design that was built and has been developed as well as suggestions that will provide important records and possible improvements that need to be done for software development previous.

3.1 Conclusion

Based on the results obtained in this thesis, it can be concluded as follows:

1. The information system built to help the head of the administration in determining the planning needs of recommendations to facilitate the management of goods and also facilitate the collection of goods.
2. The information system built to facilitate the administration section chief in the transaction process, the determination of promotion going on and also allows the head of the leadership in monitoring the transactions that take place in PD. Axa.

3.2 Suggestion

Suggestions for the development of the information system CRM PD. Axa are some suggestions that can be done, among others:

1. The addition of e-commerce system built to allow customers can directly buy products without having to interact directly with the company. And if it is implemented, customers can deal more quickly than usual.
2. Integration with financial systems that are already running with the existing budget data management in the information system that has been built.

BIBLIOGRAPHY

[1] T. Sutabri, Manajemen Sistem Informasi, Jakarta: Gramedia Pustaka Utama, 2005.

[2] K. T and A. R, "Analisa Data Mining Metode Fuzzy Untuk Customer Relationship Management Pada Perusahaan Tour & Travel," *Seminar Nasional Sistem Informasi Indonesia*, 2013.

[3] D. O, A. M and I. A, "Penerapan Customer Relationship Management (CRM) Berbasis Web (Studi Kasus Pada Sistem Informasi Pemasaran di Toko YEN-YEN)," *Jurnal Sistem Informasi*, pp. vol. 4, pp. 516-529, 2012.

[4] B. and P. , "Kesamaan antara Front-CRM dengan Dynamic-CRM Sebagai Customer Relationship Management (CRM) Framework," *Seminar Sistem Informasi Indonesia*, 2008.

[5] J. Han and M. Kamber, Data Mining : Concept and Techniques Second Edition, Morgan Kaufmann Publishers, 2006.