DEVELOPMENT OF INFORMATION SYSTEMS CUSTOMER RELATIONSHIP MANAGEMENT (CRM) AT PT. ANGGA SARANA MEDIA

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ABSTRACT

PT. Angga Sarana Media (ASM) is an advertising company based in Bandung. PT Angga Sarana Media as a business company which has been in advertising world for years, must consider how to improve long term growth and company profitability. PT. Angga Sarana Media still has a problem with giving a right kind of services to customers, and also has a difficult in determining a recommendation of list services that will be offered to customers. Based on these issues at PT. Angga Sarana Media, then it needs an information systems development of Customer Relationship Management (CRM) at PT. Angga Sarana Media. The Information development of CRM was purposed to ease in adjusting the right types of service to customers and to determine a recommendation of list services that will be offered to customers based on transaction.

CRM (Customer Relationship Management) is a methodology, strategy, software, and web application which adequate to help a company to manage a relation with customers. CRM concept widely used as a reference in information industry as an internet capability methodology that helps company to manage a relation with customers. The types of CRM that was built in this company is Analytical CRM. The method that was used in customer segmentation was RFM (Recency, Frequency, Monetary) method.

Based on the test results it can be concluded that this system could helped a company to adjust the right types of service to customers and to determine a recommendation of list services that will be offered to customers.

Keywords: information systems, customer relationship management, analytical, segmentation, RFM.

1. INTRODUCTION

PT. Angga Sarana Media (ASM) is a company engaged in advertising services. The company was established since 2005, based in Bandung and has several branches including in Jakarta and Bekasi. PT. ASM offers advertising services, namely services of making banners, billboards, neon, banners, banners, and branding. Until 2015, PT. ASM has 119 customers comprised of large corporate customers and small companies. Each year, the increase in service advertising businesses is increasing, so the business competition in the field is increasing as well. PT. ASM as a business that has long been in the field of advertising need to think about how to keep the business in the business to make a profit on the rise.

Based on the interview to Mr. Caka Tommy as the Manager of PT. ASM, stating the amount of customer data up to July 2015 amounted to ± 119 customer data. From the amount of customer data, the company did not understand the characteristics of existing customers based on transaction data. As a result, the company provides the same services to its customers without knowing any customer who has a great potential to use the company's services. The absence of the segmentation process in determining customer categories to determine differences in the behavior of each customer, so that managers have difficulty in adjusting the provision of the right kind of services to customers.

Besides the observation of PT. ASM , based on data transactions during August 2014 - July 2015 , as much as ± 50 % or 59 customers out of 119 customers of PT . Angga Sarana Media acquired only once in that period. Party managers do not know what the list of services most used by customers , consequently on the list of services to customers is not yet set. Because the company wants its customers to conduct transactions back , so managers have difficulty determining on the list of services to be offered to customers .

PT . Angga Sarana Media (PT . ASM) need a means to build and strengthen long-term relationships with customers for the company's success . 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 the gain (profit) , income (revenue) and counters satisfaction (customer satisfaction) . Customer Relationship Management (CRM) is a combination of three interrelated aspects , namely : Customer Relationship and Management.

Based on the issues raised above problems , the problems that occur in the PT . Angga Sarana Media is how to build the information system customer relationship management (CRM) in PT . Angga Sarana Media to support the smooth relationship between company and customer.

While the objectives to be achieved in this research is:

1. Make it easy for managers to adjust the provision of the right kind of services to customers.
2. Facilitate managers in deciding on the list of services to be offered to customers based on transactions.

2. CONTENTS RESEARCH

2.1 Theoretical basis

The theoretical basis on this thesis will explain the theories relating to Customer Relationship Management System application in PT . Angga Sarana Media. Theory basis discussed in the final work is about : the system, the definition of customer relationship management, crm stages, types crm, crm and objectives.

2.1.1 Systems

The system is a network of some procedures that are interconnected gathered together doing an activity to accomplish a particular goal [1].

System elements are interconnected to form one entity or organization [2].

Based on the above opinion the authors conclude that the system is a network of procedures that are interconnected and mutually kertergantungan in forming a single unit or organization to accomplish a particular goal . The system contains components that form sub- systems / parts of the system that has the properties of a system to perform a function and affect the overall process .

2.1.2 Information

Information is data that is processed into a form that is more useful and more meaningful for those who receive [1].

Information is data that have a series of temporary nature , depending on the time , was able to give a shock or surprise on who receives it. Information can also be regarded as data that has been processed, which has a value of actions or decisions[3].

Based on the above opinion the authors conclude that the information is data that has been processed and then processed into a more useful form is used to make decisions.

2.1.3 Information Systems

The information system is a system within an organization reconcile the needs of daily transaction processing , support the operation , managerial and strategic activities of a organisasasi , and provide certain outside parties with the reports - reports required [1].

The information system is a system that provides network SPD (data processing system), which is equipped with the communication channels used in the system data organization [3].

Based on the two opinions above authors concluded that the information system is a system that contains a set of processing are managerial and strategic activities of a organisasasi that help in providing information for the recipient needs.

2.1.4 Customer Relationship Management

Definition 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 [4]:

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).

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).

The definition of CRM if 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 in the future (in terms of business).

The purpose of CRM systems is to improve customer service, increase customer satisfaction, and ensure customer retention by aligning the way of doing business with the integration of technology. In addition, the primary goal of CRM is to identify, anticipate, retain, understand the needs of customers both current customers and the potential to become customers by collecting information about customers, sales and the effectiveness of marketing and market trends, so that CRM can be managed well is organizations need to know exactly what

information they want and obtain customers, and what will be done with the information known.

The principle of customer relationship management (CRM) including empowering relationships that have been formed to maximize revenue, empowering knowledge about the customer to provide the best service, formed a sales process that can be done repeatedly, and build customer loyalty. When companies implement CRM strategy means improved service to customers and create interactions that are consistent, reliable and easily accessible in every interaction between the customer and the company.

Targets to be achieved from the CRM system is the optimization of profits, and this can be achieved by understanding that not all customers are created equal each other. Only companies that understand this and understand how each customer's desire to interact with the company, will be able to achieve customer loyalty and progress of a profitable business.

2.1.5 Type of CRM

Type of Customer Relationship Management (CRM) is operational CRM, analytical CRM and collaborative CRM [5], namely:

1. Operational CRM

The CRM component plays a role in the interaction with customers. Operational CRM includes an integrated automation process of the entire business processes, such as marketing automation, and service. One application that is included in the category of CRM Operational CRM is in the form of a web application. Through the web, a company can provide service to customers.

2. Analytical CRM

Analytical CRM is known as the back office of the company. The CRM component plays a role in understanding customer needs. Analytical CRM role in carrying out the analysis of customers and markets, such as the analysis of market trends and requirements analysis and customer behavior. Data used in analytical CRM is data derived from operational CRM.

3. Collaborative CRM

CRM collaboration components including e-mail, personalized publishing, ecommunities, and the like which are designed for interaction between the customer and the company. Its main objective is to provide added value and expand customer loyalty to other customers who are still not at the level of customer loyalty. Collaborative CRM also includes an understanding or awareness that loyal customers can be a magnet for other customers.

2.1.6 *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 that described Dalan "Framework of Dynamic- CRM". Illustrated that phase of CRM within a framework in the form of a series of processes Acquisition-Retention-Expansion [5. CRM as an integrated framework based on the types of customer information are arranged in stages in accordance with the development of the customer relationship, the framework of Dynamic CRM can be seen in figure 1.

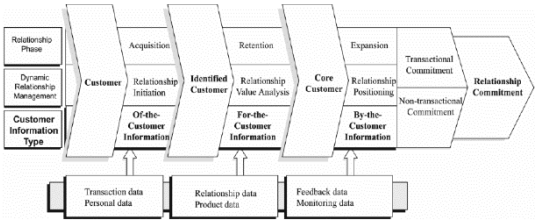


Figure 1. Dynamic CRM Framework

In the framework of the above illustrated that there are three types of customer information (Customer Information). Among others:

1. Of - the – Customer Information (information about customers) Information regarding personal data and customer transaction data. The information in this category often known as database marketing and marketing targets
2. For - the – Customer Information (information for customers) Information regarding products, services, and company information deemed important by customers. This information could be channeled through a variety of communications media in the form of direct mail, auto-attendant system, and the internet site.
3. By - the – Customer Information (informasi oleh pelanggan) Nontransaksional feedback information from customers which include complaints, proposals, claims, customer needs and others. This information is usually manifested in the form of an expanded customer data because this information is membantudalam customer interaction. In addition, because it contains complaints, needs and suggestions, this type of information can be applied to develop products.

Broadly speaking, Dynamic CRM actually describes a series of phases that must be made of an organization in achieving customer management in accordance with the company's main business. This framework can be considered a reference pattern or model of an organization in improving their customer management maturity. Within this framework there are several phases, among others :

1. Relationship Initiation

   At the initiation stage of a relationship with the customer, the organization collected data to customers, usually with a membership

registration. Once the customer record, organizations can deduce information about supply what 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 could increase to core customer. At this stage the organization can continue the next phase, namely CRM. In this phase, two-way interaction between the customer and the organization. Customers will tell what is needed specifically (by-the-customer). Things like this opens the opportunity for organizations to offer new products or services to customers, improve core business processes and satisfy customer.

2. Relationship Value Analysis
   CRM in order to be effective, should any customer relationship is analyzed from the standpoint of either the customer or organization. There are two dimensions in determining the value of each customer relationship value from the standpoint and from the standpoint of customer rights organization. In this phase occurs psychological relationship between the customer and the organization. This usually happens by giving discounts to customers when making a purchase in bulk, indirectly increasing customer loyalty. Customer value is a collection of favorable relationship benefit economically and psychologically.
3. Relationship Positioning
   Build a mutually beneficial relationship is very important to maintain a long-term relationship between the customer and the organization. In the application of the strategy of building mutually beneficial relationships, organizations maximize customer rights will automatically increase customer value. In addition to remain fair organization should also evaluate the customer relationship from the standpoint of benefit gained. If this continues the relationship like between the customer and the organization will be formed a strong commitment both transactional and nontransactional and the relationship progressed to the stage of relationship commitment.

2.1.7 RFM (Recency, Frequency dan Monetary)

RFM is the process of analyzing customer behavior . It is commonly used in database marketing and direct marketing . RFM stands for Recency , Frequency , Monetary . Using information about customer behavior in the past that are easily tracked and available . The purpose of RFM is to predict future customer behavior (direct decisions better segmentation).

RFM method consists of three dimensions [4]:

1. Recency

Recency is a measure of customer value by looking at customer behavior with regard to the purchase of the latest accomplishments. The most important information that should not be missed with respect to recency is the last purchase date is the barometer measuring recency.

2. Frequency

Frequency is a measure of customer value by looking at customer behavior with regard to the activities of transactions made by consumers during the period. A period that is the span of time specified, for example in 2 years what is the average transaction conducted by customers.

3. Monetary

Monetary is a measure of customer value by looking at customer behavior with regard to average transactions conducted by customers in one transaction.

2.2. Problem Analysis

Analysis of the problem is an assumption of the issues that will be described in these procedures on the data processing program information system development Customer Relationship Management in PT . Angga Sarana Media . From the research conducted found several problems which consists of :

1. Managers have difficulty in adjusting the provision of the right kind of services to customers because companies still lack an understanding of the characteristics of existing customers based on transaction data . The absence of the segmentation process in determining customer categories to determine differences in the behavior of each customer.

2. Manager difficulty deciding on a list of services to be offered to customers because the manager did not know what the list of services most used by customers , consequently on the list of services to customers is not yet set.

2.2.1 Customer Segmentation Analysis

In the analysis of customer segmentation , steps will be carried out using RFM method is made in the form of grooves that are described in Figure 2. Here's an explanation of the stages of customer segmentation analysis using RFM.

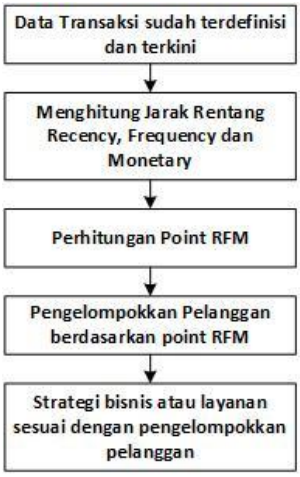


Figure 2. Customer Segmentation Analysis

1. Data Transactions have been defined and up to date.

RFM customers are using this method , data on customer transactions should be defined in advance and up to date . The transaction data which will be used as reference material in the delivery point.
Transaction data obtained from customer transactions in August 2014 - July 2015. The data will be processed can be seen in Table 1.

Table 1. Table Customer Transaction

Nama Pelanggan	Transaksi Terakhir	Jumlah Frekuensi	Jumlah Monetary
PT. Mandom Indonesia	07/03/2015	3	Rp 20.500.000
PT. Indosat	14/07/2015	8	Rp 51.800.000
Yogya Group	26/08/2014	1	Rp 2.000.000
PT. Mayora Indah	11/02/2015	3	Rp 16.600.000
PT. Holcim Indonesia	16/12/2014	1	Rp 4.800.000

2. Calculate the distance ranges of recency , frequency and monetary

In the process of calculating the distance range of recency , frequency , and monetary , previously done first calculate the value of each of the three indicators (recency , frequency and monetary) .
a. recency
Calculate recency may be obtained by using equation (1) . The specified date is the date of the latest transaction is July 14, 2015 .
Then to get the range of recency can use statistical calculation formula n odd quartile see equation (2) .

Recency = latest transaction date - the date of the last transaction (1)

$$Qi = \frac{i(n+1)}{4} \quad (2)$$

Information :
Qi = kuartil ke-i
n = banyak data

The amount of customer data that is 119 data. Calculated as follows :

Q1 = (1 (119 + 1)) / 4 = 30 ◊ all the data is data with recency 30 to 56 days
Q2 = (2 (119 + 1)) / 4 = 60 ◊ the data to 60 is data by recency 125 days
Q3 = (3 (119 + 1)) / 4 = 90 ◊ data is all the data recency 90 is 210 days

Based on the calculations above , we can determine the distance range recency namely :
1. Recency ≤ 56 days then included customers with a 4 point scale
2. Recency ≤ 57 days ≤ 125 days then included customers with a 3-point scale
3. Recency ≤ ≤ 126 days 210 days then included customers with scale point 2
4. Recency ≥ 211 days then included customers with scale point 1

b. frequency
Similarly, recency , to get a frequency range can use statistical calculation formula n odd quartile see equation (2) . Calculated as follows :
Q1 = (1 (119 + 1)) / 4 = 30 ◊ data is all the data with frequency 30 is 1 times
Q2 = (2 (119 + 1)) / 4 = 60 ◊ the data to 60 is the data with frequency 2 times
Q3 = (3 (119 + 1)) / 4 = 90 ◊ data is all the data with a frequency of 90 is 3 times

Based on the calculations above , we can determine the distance range of frequency are:
Frequency = 1 time then including customers with scale point 1
Frequency = 2 times then including customers with scale point 2
Frequency = 3 times then including customers with 3 point scale
Frequency of > 3 times then including customers with 4 point scale

c. Monetary
Similarly, the recency and frequency , calculate the distance range of monetary using the formula n odd quartile see equation (2) . Calculated as follows :

Q1 = (1 (119 + 1)) / 4 = 30 ◊ all the data is data with monetary 30 2,000,000
Q2 = (2 (119 + 1)) / 4 = 60 ◊ the data to 60 is the data with monetary 4,800,000
Q3 = (3 (119 + 1)) / 4 = 90 ◊ data is all the data with monetary 90 is 19,000,000

Based on the calculations above , can be determined within the range of monetary namely :
≤ 2,000,000 Monetary then including customers with scale point 1
2000001 < Monetary ≤ 4,800,000 then including customers with scale point 2
4800001 < Monetary ≤ 19 million customers with the included 3 point scale
Monetary > 19,000,000 then including customers with 4 point scale

3. Calculation Point RFM

RFM has a range of calculations before, can be made RFM point scale . The point scale is obtained between 1-4 points because there are four categories of customer groups. The following point scale RFM can be seen in Table 2.

Table 2. Scale Point RFM

Atribut	Skala Point			
	4 point	3 point	2 point	1 point
Recency (R)	≤ 56 hari	57 – 125 hari	126 – 210 hari	≥ 210 hari
Frequency (F)	> 3 kali	3 kali	2 kali	1 kali
Monetary (M)	M > 19000000	4800001 < M ≤ 190000000	2000001 < M ≤ 4800000	M ≤ 2000000

Based on Table 2. it can be seen that the total points obtained by summing attributes (R + F + M) . If the minimum point of each attribute is 1, the minimum point total (R + F + M) 3. Meanwhile, if the customer is the maximum point of each attribute is 4 , then the maximum point total (R + F + M) customer is 12 . the next stage is the awarding points based on the RFM transaction data contained in Table 1. This provision refers to the point RFM Table 2. granting point RFM can be seen in Table 3.

Table 3. Giving Point RFM

Nama Pelanggan	RFM						Total Point (R+F+M)
	R	Point	F	Point	M	Point	
PT. Mandom Indonesia Tbk	129	2	3	3	Rp 20.500.000	4	9
PT. Indosat Tbk	0	4	8	4	Rp 51.800.000	4	12
Yogya Group	322	1	1	1	Rp 2.000.000	1	3
PT. Mayora Indah Tbk	153	2	3	3	Rp 16.600.000	3	8
PT. Holcim Indonesia	210	2	1	1	Rp 4.800.000	2	5

4. Grouping customers based point RFM

Based on the results of RFM analysis has been done , the next step is grouping customers based point RFM . Point range and the number of categories of customers assumed by a discussion with the manager . Before grouping customers must be determined beforehand pointnya range , the range of points obtained will be used as reference material for the stage grouping .

Based on Table 2. obtained the highest point total is 12 , while the lowest point total is 3. Since grouping is divided into 4 groups of categories of customers , then the distance determination perkategori point range , namely :

$$\frac{12}{4} = 3$$

Results obtained division number 3 , this figure is used as the value for the distance from point range perkategori. As for determining the point perkategori ranges are as follows :
1. Most Valuable Customer that is taken from the highest point total is 12 points . Because of the distance range is 3 , then made a point range of 10-12.

2. Most growable Customer that is taken from the highest point total is reduced lowest point total is 12-3 = 9 points. Because of the distance range is 3 , then made a point range 7-9.

3. Migrator is taken from the second-highest total point total is reduced lowest point ie 9-3 = 6 points . Because of the distance range is 3 , then made a point range 4-6.

4. Below Zeros are taken from the lowest point total of 3 points .

At the customer grouping , there are 4 categories of customer groups , while the pre-determined point range can be seen in Table 4 .

Table 4. Range Point Category Customer

Kategori Pelanggan	Rentang Point
Most Valuable Customer	10-12
Most Growable Customer	7-9
Migrator	4-6
Below Zeros	3

From the results point above can perform grouping customers based on the ratings given in accordance with the provisions of RFM is most valuable customer , most growable customer , zeros and migratory below in Table 4. The results of the customer groupings can be seen in Table 5.

Table 5. Results Grouping Customers

Nama Pelanggan	Total Point	Kategori Pelanggan
PT. Mandom Indonesia Tbk	9	*Most Growable Customer*
PT. Indosat Tbk	12	*Most Valuable Customer*
Yogya Group	3	*Below Zeros*
PT. Mayora Indah Tbk	8	*Most Growable Customer*
PT. Holcim Indonesia	5	*Migrator*

5. The business strategy or service according to customer groups category

After segmenting customer data PT . Angga Media means using RFM analysis , it will be applied to business strategy or the services that are tailored to specific customer categories . The strategy will be

applied to the categories of customers can be seen in Table 6.

Based on Table 5 and Table 6 , can be determined from the service implementation segmentation results can be seen in Table 7 .

Table 7. Implementation Service of segmentation results

Nama Pelanggan	Kategori Pelanggan	Jenis Layanan
PT. Mandom Indonesia Tbk	*Most Growable Customer*	Mendapatkan potongan 5% sebanyak 2 kali transaksi selama 2 bulan dengan minimal transaksi Rp. 5.000.000
PT. Indosat Tbk	*Most Valuable Customer*	Mendapatkan potongan 10% sebanyak 2 kali transaksi selama 2 bulan dengan minimal transaksi Rp. 10.000.000
Yogya Group	*Below Zeros*	Pemberitahuan untuk meningkatkan transaksi
PT. Mayora Indah Tbk	*Most Growable Customer*	Mendapatkan potongan 5% sebanyak 2 kali transaksi selama 2 bulan dengan minimal transaksi Rp. 5.000.000
PT. Holcim Indonesia	*Migrator*	Pemberitahuan untuk meningkatkan transaksi

After the delivery of this type of service to customers has been determined , the next step is PT . Angga Media means leave a message by email . The contents of this email message refers to Table 6. As for the message that will be given can be seen in Table 8 .

Table 8. Provision of email messages based on customer groups

No	Kategori Pelanggan	Isi Pesan Email
1	*Most Valuable Customer*	Mitra PT. ASM (Nama Pelanggan) yth, Sekarang (Nama Pelanggan) bisa mendapat potongan harga dari kami. Nikmati potongan harga sebesar 5% sebanyak 2 kali transaksi selama 2 bulan dengan minimal transaksi Rp. 10.000.000. More info : www.crm-anggasaranamedia.com Terimakasih, Salam Hangat
2	*Most Growable Customer*	Mitra PT. ASM (Nama Pelanggan) yth, Sekarang (Nama Pelanggan) bisa mendapat potongan harga dari kami. Nikmati potongan harga sebesar 5% sebanyak 2 kali transaksi selama 2 bulan dengan minimal transaksi Rp. 5.000.000. More info : www.crm-anggasaranamedia.com Terimakasih, Salam Hangat
3	*Below Zeros*	Mitra PT. ASM (Nama Pelanggan) yth, Terimakasih atas kepercayaan anda terhadap produk kami. Tingkatkan terus transaksi anda terhadap PT. Angga Sarana Media dan dapatkan potongan harga yang menarik jika anda telah bertransaksi dengan jumlah transaksi tertentu. More info : www.crm-anggasaranamedia.com Terimakasih, Salam Hangat
4	*Migrator*	Mitra PT. ASM (Nama Pelanggan) yth, Terimakasih atas kepercayaan anda terhadap produk kami. Tingkatkan terus transaksi anda terhadap PT. Angga Sarana Media dan dapatkan potongan harga yang menarik jika anda telah bertransaksi dengan jumlah transaksi tertentu. More info : www.crm-anggasaranamedia.com Terimakasih, Salam Hangat

2.2.2 Recommendation Service Analysis

In the analysis recommendations are taken from the list of services and transaction data retrieved a list of services that are most widely used by each customer . Determination on the list of services are taken once a year . The results from the recommendation list of services which are often ordered by the customer are the banners .

These banners will be offered to customers of PT . Angga Sarana Media with other promotions or discounts in accordance with the provisions of the company during the period of a year.

2.3 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 Figure 3.

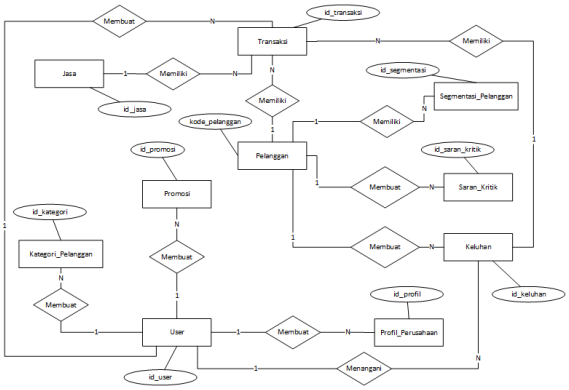


Figure 3. *Entity Relationship Diagram* information systems of *customer relationship management* at PT. Angga Sarana Media

2.4 Context Diagram

Context diagram 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 Bandung PT. Angga Sarana Media can be seen in Figure 4.

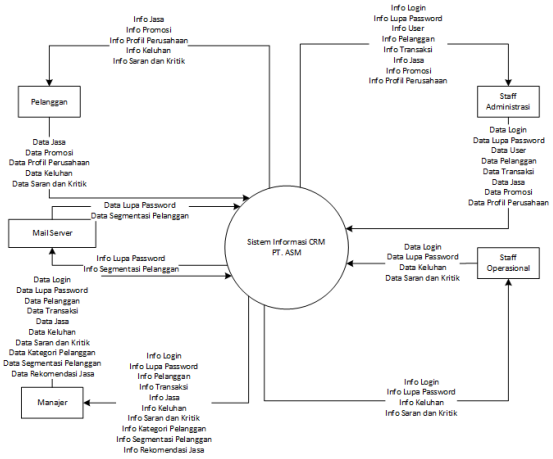


Figure 4. Diagram of the context of the customer relationship management system in PT. Angga Sarana Media

2.5 *Data Flow Diagram (DFD)*

DFD is often used to describe an existing system or a new system that will be developed logically without considering the physical environment in which 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 clear. DFD is a representation of a system that describes parts - parts that exist. From this it can be seen DFD source of the information contained in the system. Data flow diagrams show how to decipher the data flow processes that occur in the system to process more detail. In the context diagram as shown in Figure 4. can be broken down into several DFD.

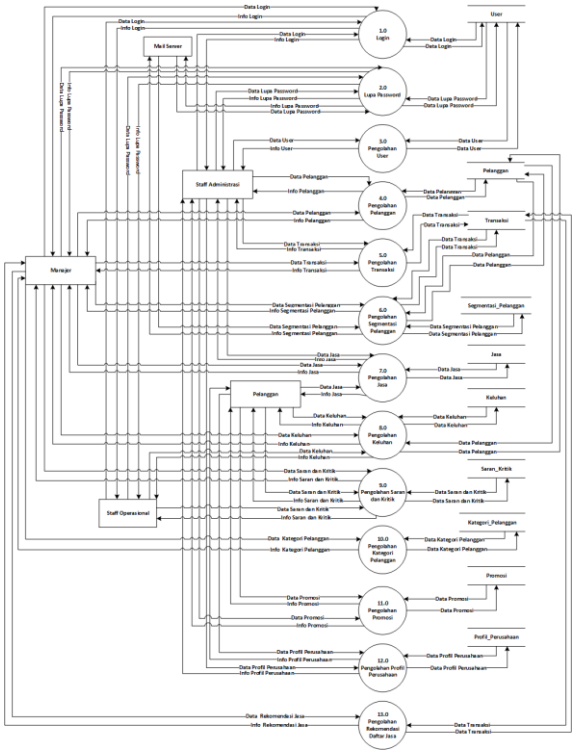


Figure 5. DFD Level 1 CRM PT. Angga Sarana Media

2.6 Table Relationships

Table relationships describe the relationship between the data, meaning the data and limitations. The process of relationships 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 Figure 6.

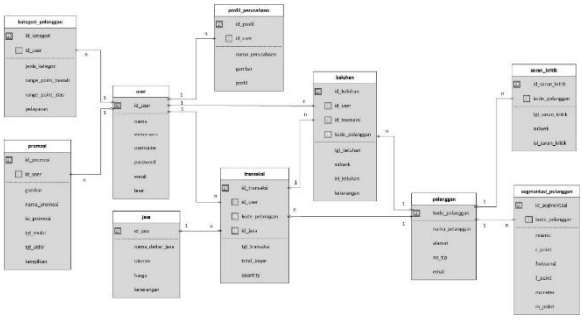


Figure 6. Table Relationships CRM PT. Angga Sarana Media

2.7 Designing Interfaces

Interface design created to describe the look of the program that will be used by the user to interact with the system to be built. The design of the user interface is based on both input and output to be generated when the application is implemented. Here is a sample login interface design that can be seen in Figure 7.

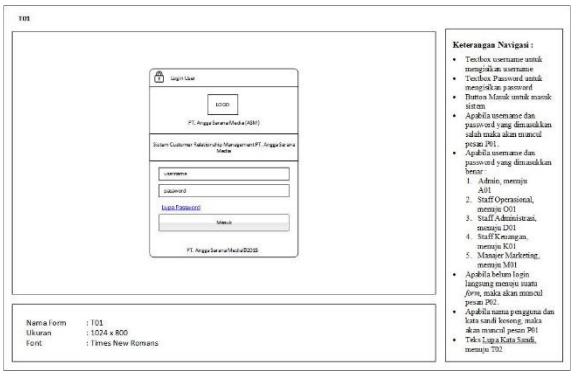


Figure 7. Interface Design T01 Login

2.8 Designing Semantic Network

Semantic network design is a representation of the design interface that shows where each interface is connected. Here is an example design of a semantic network staff administration in PT. Angga Sarana Media can be seen in Figure 8.

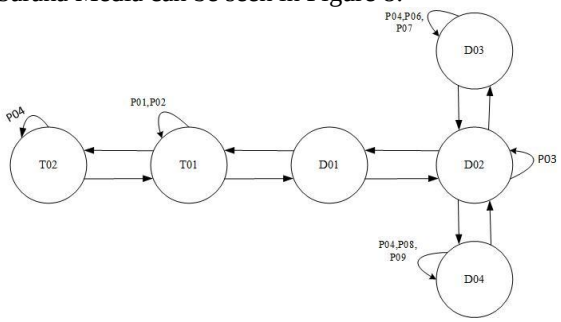


Figure 8. Designing User Semantic Network Staff Administration

2.9 Testing Systems

Testing of the system is the cornerstone that aims to find errors or shortcomings in the supply chain system under test. Testing intended to determine the supply chain system has met performance made in accordance with the design objectives.

Tests are used to test the new system is a black box testing methods. Black box testing focuses on testing the functional requirements of information systems.

Plan testing to be performed is to test the system built by Black Box and beta. Testing of the construction supply chain system in PT. Angga Sarana Media using test data based on data provided from some of the data that has been given.

1. Black Box Testing

Black box testing focuses on functional requirements of software built.

Testing is done by testing each process to the possibility of errors occurring.

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 messages appear in the form of a maximum enough. Functional system can already be considered to meet the expected demand

2. Beta Testing

Beta testing is testing that is directly within the truth. Users undertake an assessment of the software using interviews. From the interviews, it can be deduced whether the software is built in accordance with the purpose or not.

Interviews conducted for the users of the system consisting of the operational part of the fund manager. This research was carried out in Bandung PT. Angga Sarana Media in order to determine the extent to which the system is built to be a solution and settlement of problems that have been described previously.

Based beta testing has been done before, it can be concluded that the system in terms of functionality already meet the needs of business managers based on the purpose of research, but there is still need for adaptation in using 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 the software design 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 previously.

3.1 Conclusion

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

1. The information system built CRM can help managers , but in adjusting the proper provision of its services to customers based on the customer category was not achieved due to functionally incompatible with the purposes of research.

2. The information system built CRM can help managers , but in deciding on the list of services to be offered to customers based on the transaction can not be reached due to functionally incompatible with the purposes of research.

3.2 Suggestion

Suggestions for the development of supply chain systems are some suggestions that can be done, among others:

1. Further development is expected not only through the delivery of promotional e-mail , can be numerically hp, line , fuel , or other social medi .

2.The method for calculating customer segmentation can be developed using a method other than RFM , for example, using methods such as Sharp RFM , LRFM and CLV where results of calculations can be more detailed.

3. Make pages display more attractive to customers because the display for customer use is still modest

BIBLIOGRAPHY

[1] Jogiyanto, Analisis dan Desain Sistem Informasi, Yogyakarta: Andi, 2005.

[2] Z. Amsyah, Manajemen Sistem Informasi, Jakarta: Gramedia Pustaka Utama, 2005.

[3] Witarto, Memahami Sistem Informasi, Bandung: Informatika, 2004.

[4] T. Kristanto dan R. Arief, “Analisa Data Mining Metode Fuzzy Untuk Customer Relationship Management Pada Perusahaan Tour & Travel,” *Seminar Nasional Sistem Informasi Indonesia*, 2013.

[5] O. Dyantina, M. Afrina dan A. Ibrahim, “Penerapan Customer Relationship Management (CRM) Berbasis Web (Studi Kasus Pada Sistem Informasi Pemasaran di Toko YEN-YEN),” *Jurnal Sistem Informasi*, vol. 4, pp. 516-529, 2012.

[6] E. K. Budiardjo dan A. Prasetyo, “Kesamaan antara Front-CRM dengan Dynamic-CRM Sebagai Customer Relationship Management (CRM) Framework,” *Seminar Sistem Informasi Indonesia*, 2008.