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Database Design for Customer Retention and Loyalty Administration Information System

Nia Rahma Kurnianda
Faculty of Computer Science, Universitas Mercu Buana, Jakarta, Indonesia
nia.rahma@mercubuana.ac.id

Abstract — In an administrative information system, of course a database will be the main pillar in supporting system operations. However in designing a database for a system there are several stages that become the basis for determining the scope of the database to support optimally and efficiently. in this study, The author tries to explain the steps taken in carrying out database design that is suitable for the business needs of PT XYZ and uses design steps such as ERD, LRS, Normalization, Code design, database specification design in order to support PT XYZ's activities in running customer retention and loyalty administrative operations.

Keywords — Database Design, Administration IS, Customer Retention and Loyalty, Normalization, Code Design.

I. INTRODUCTION

The ability of an information system cannot be separated from the influence of efficiency and optimization of a database. In maintaining the quality of an information system, a database must be carefully designed to fit the needs and business functions of an organization. However, to design an optimal database requires several stage to be taken. Building a database is the first step in making an application. Success in building a database will make the program easier to read, easy to develop and easy to follow the development of software. The following are the components contained in the database, namely: Tables, Fields, Records, Primary Key, Foreign Key and Index[1].

This study aims to explain how to design an appropriate database by using stages such as elaborating ERD, LRS, Normalization, Database Specifications and Code Design in a case study of PT XYZ's customer retention and loyalty information system needs.

Then to make it easier for readers to follow the flow of this research, we represent the results of this study into 5 parts, namely **I. Introduction**, reviewing the background, problems, objectives and systematic of writing. **II. Fundamental Theories**, reviewing the related theories used in this study, **III. Methods**, which describes the methods used in the study, **IV. Discussion**, which is describing the database design conducted and V**. Conclusions**, describes the conclusions obtained after the implementation of the research

II. FUNDAMENTAL THEORIES

A. Entity Relational Diagram

It is one of the conceptual data modeling that is most often used in the process of developing a relational type database. The E-R model is a detail that is a logical representation of data in an organization or a particular business area. The E-R model consists of several basic components, as follows:[2]

1. Entity
   An entity is something or object in the real world that can be distinguished from something or another object. For example, every student in a university is an entity. Each faculty in a university is also an entity. It can be said that entities can be conceptual / abstract or real present in the real world
2. Attribute
   Attributes are descriptive properties owned by each member of the entity set. As an example of a student entity, the attributes possessed are nim, student name, address and others
3. Relationship
   Relationship between relations is the relationship between a set of entities with another set of entities. For example, the student entity has a certain relationship with the subject entity (students take courses). In the depiction of the E-R model, relations are the glue that connects an entity with other entities
4. Mapping Cardinality
   Relationship cardinality shows the maximum number of entities that can relate to other entities. From a number of possible numbers of relationships between entities, the cardinality of the relation refers to the maximum relationship that occurs from one set of entities to another set of entities, and vice versa.

B. Logical Record Structure

A system model is described with a diagram-ER will follow the pattern or certain modeling rules in relation with conversion to LRS, then that change happens is to follow the following rules this: Each entity will be changed into a box, A relation attribute is united in a box with entity if the relationship occurs in ER-1: M diagrams (relations unite with cardinality M) or level of relationship 1: 1 (relation unite with the most cardinality requires reference), a relation is separated in a separate box (being an entity new) if the relationship level is M: M (many to many) and have a foreign key as a primary key taken from both entities previously interconnected[3]

C. Administration

includes recording activities, correspondence, bookkeeping and letter archiving as well as other matters intended to provide information and make it easier to get information back if needed.[4]

D. Customer Retention and Loyalty

1. CRM
   Customer Relationship Management (CRM) is currently one of the strategies used by companies to better know and understand their customers, so that companies can provide the best service and foster better long-term relationships with their customers[5] because ccustomers satisfactions are a very important factor and determine the success of an enterprise[6]. CRM is an approach that views customers as the core of their business and the success of a company depends on how they effectively manage their relationships[7]
2. Customer Retention
   customer retention is an activity aimed at being able to maintain continuous interaction with customers through ongoing relationships, marketing loyalty, database marketing, marketing permissions, and advancements[8]
3. Customer Loyalty
   Customer loyalty or consumer loyalty according to Amin Widjaja Tunggal[9] is customer attachment to a brand, shop, manufacturer, service provider, or other entity based on favorable attitudes and good responses, such as repurchase. Based on this definition, it can be concluded that there is an element of behavior and attitude in customer loyalty.
   Boulding[10] suggests that the occurrence of brand loyalty to consumers is caused by the influence of satisfaction and dissatisfaction with the brand which accumulates continuously in addition to the perception of product quality.

E. Information System

According to O'Brian, information systems are a regular combination of the people, hardware, software, communication networks, and data resources that collect, change, information within an organization[11]. So we can gain conclusion that there are several part to conduct some information System. So in this study, we focused about data resources stored based on DBMS to support the performace of the Information System.

III.METHODS

A. Data Needs Analysis Method

For analysis, author used object-oriented analysis based[12]. What been analysis is the work form, work document, existing work flow and many others

B. Design Method

For design method, still we used object-oriented based. There are several parts in the segmen of our design work:

1. Entity Relationship Diagram Design.
   We used analysis result to design entity relationship diagram. Mostly the data needs were gained from observation and document review. So we strive to make the Entity from the data that we gained. And the relationship between the entity and the cardinality is the result from our observation from work flow and work procedure
2. How to transform from ERD to LRS
   Based on the cardinality relationship, we strive to split the ERD into table like candidates, we limit each table like candidates with a box with dotted lines with different colors to make it easier to see what table will be contained into this study.
3. Logical Record Structure
   After we all se the table like candidates, next one is to make Logical record structure which describes the full table shape
4. Normalization
   In this part, we find some data in the tables need to be normalize. Because it will be used all over again into another part. So we can comply into object-oriented rule: reuse
5. Table spesification and code design

IV.DISCUSSION

A. Entity Relationship Diagram (ERD)

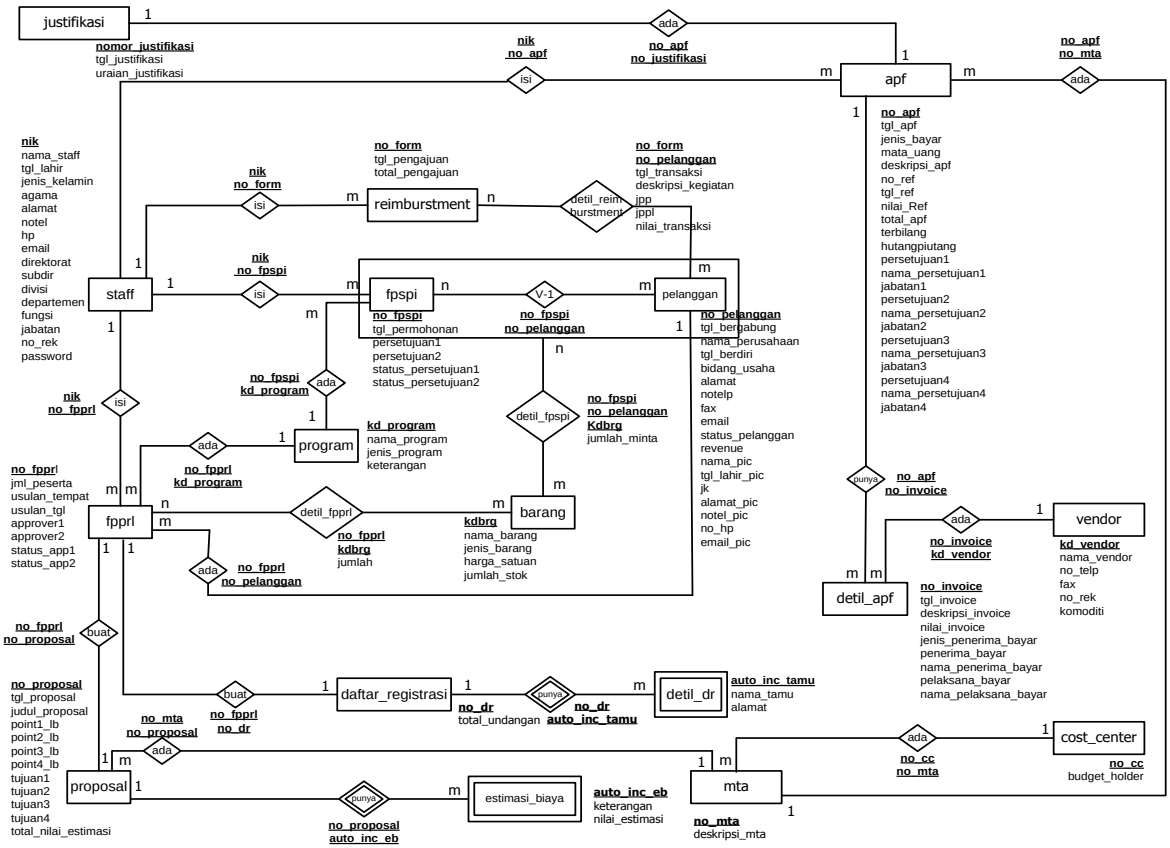

Fig 1. Entity Relationship Diagram

B. How to transform ERD to Logical Record Structure (LRS)

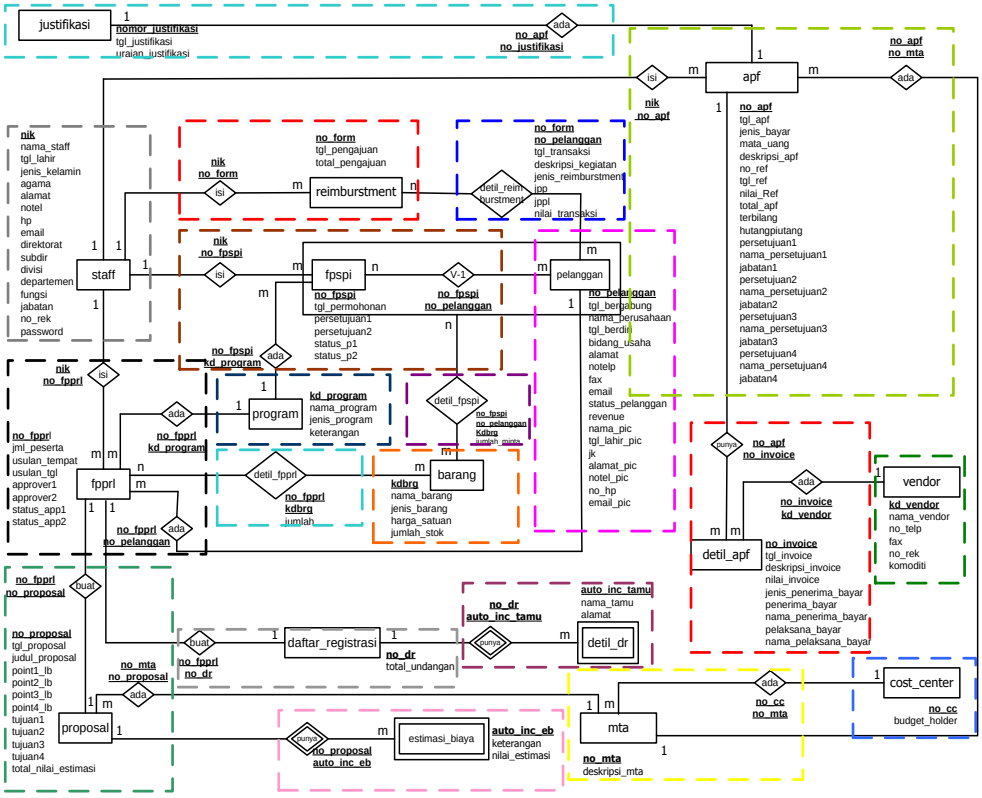

Fig 2. Transformation ERD to LRS

C. Logical Record Structure

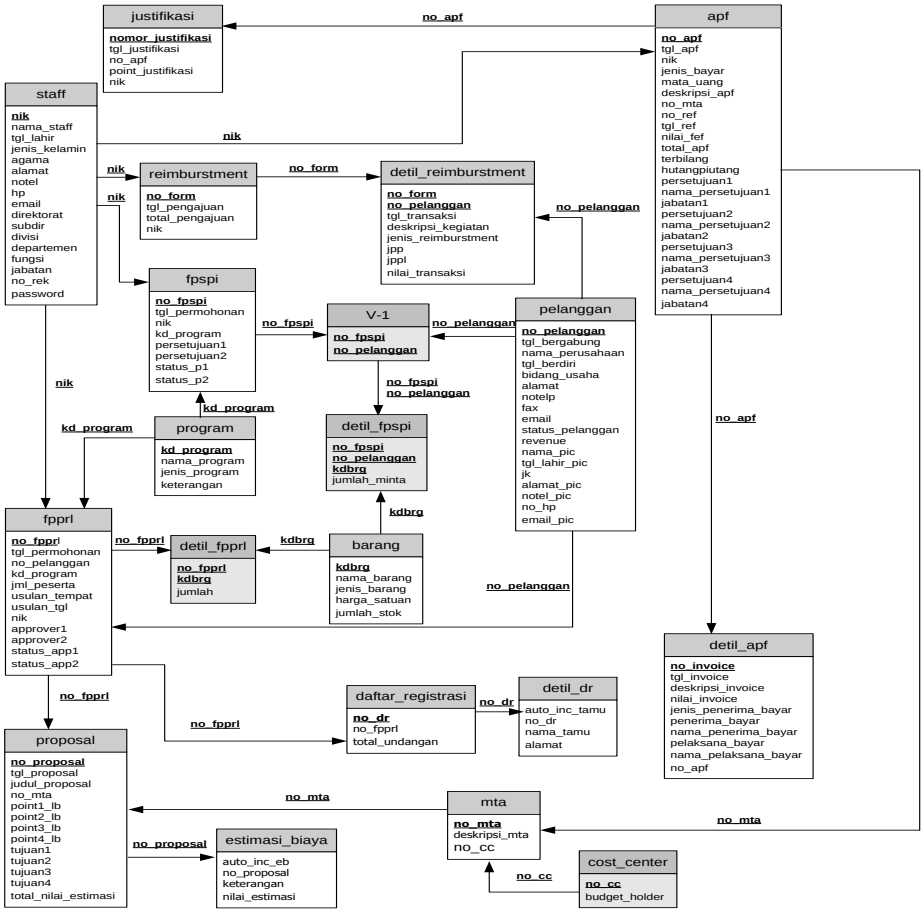

Fig 3. Logical Record Structure

D. Database Normalization

Normalization is carried out in order to avoid the possibility of anomalies that arise when using the database. Following is the normalization carried out against the tables that are expected to be used to support the design of the customer retention and loyalty group sales administration information system at PT XYZ. In this paper, we only present 3 normalized tables from a total of 20 tables that we made for example to normalization process

1. Item Table

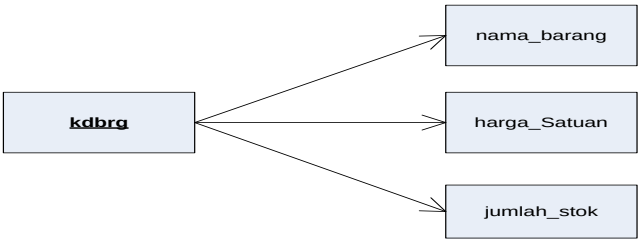

Fig 4. Normalization with only primary key

In Fig. 4 we see:

a. The relations above are 1NF, because there is no repeating group that repeats some similar attributes
b. The relation above is 2NF, because it has 1NF and there is no partial dependency. And the non key attribute, namely nama_barang, harga_satuan, number of stock on the item table depends entirely on the key attribute, which is kdbrg
c. he relation above has 3NF, because it has 2NF and there is no transitive dependency because the non key attribute, namely nama_barang, harga_satuan, the number of stock in the item table does not depend on other non key attributes.

2. Retention and loyalty program request form detail

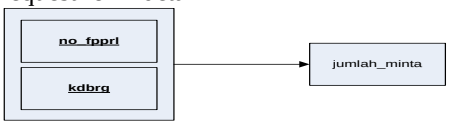

Fig 5. Normalization with composite key

In Fig. 5 we see:

a. The relations above are 1NF, because there is no repeating group that repeats some similar attributes.
b. The relation above is 2NF, because it has 1NF and there is no partial dependency. And the non key attribute, that is, the number _ request in the detail_fpprl table depends entirely on the key attribute, namely no_fpprl and kdbrg
c. The relation above has 3NF, because it has 2NF and there is no transitive dependency because the non key attribute, namely the number_minta in the detail_fpprl table does not depend on other non key attributes.

3. Souvenir form request detail

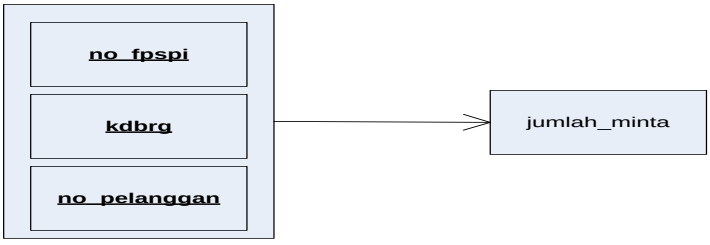

Fig 6. Normalization with agregation composite key

In Fig. 5 we see:

a. The relations above are 1NF, because there is no repeating group that repeats some similar attributes
b. The relation above is 2NF, because it has 1NF and there is no partial dependency. And the non key attribute, that is, the number_minta in the detail_minta table depends entirely on the key attribute, namely no_fpspi, kdbrg and customer number
c. The relation above has 3NF, because it has 2NF and there is no transitive dependency because the non key attribute, that is the number of request does not depend on other non key attributes.

E. Database Spesification and Code Design

In this paper, we only present 2 spesification tables with code design from a total of 20 tables that we made for example to spesification process

1. Item Table Spesification

Table Name : Barang
Media : Hard disk
Content : Item data for Promotional Item, Marketing Kit and Souvenir
Organization : Index Sequential
Primary Key : kdbrg
Record Length : 41 *byte*
Total record : 85*record*
Structure :

TABLE I
TABLE: BARANG

No	Field Name	Type	Length	Decimal	Note
1.	kdbrg	*Character*	6	-	Item Code, Primary Key
2.	nama_barang	*Character*	20	-	Item Name
3.	jenis_barang	*Character*	2	-	Item Type "S / MK / PI" {S: Souvenir, MK: Marketing Kit, PI: Promotional Item}
4.	harga_satuan	*Numeric*	10	2	Unit Price per Item Item {9.999.999.999,99}
5.	jumlah_stok	*Numeric*	3	0	Number of Stock Items in the Warehouse

Code Design for kdbrg:

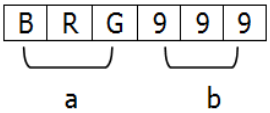

Fig 7. Kdbrg Code Design

In fig 7, we can break the code as for the primary key into:

a. the first three digits indicate the code for the item
b. the next three digits indicate the serial number of the item

2. Retention and Loyalty Program Request

Table Name : fpprl
Media : Hard disk
Content : Data on Application Form for Retention or Loyalty Program
Organization : Index Sequential
Primary Key : no_fpprl
Record Length : 106 byte
Total Record : 600 record
Structure :

TABLE II
TABLE: FPPRL

No	Field Name	Type	Length	Decimal	Note
1.	no_fpprl	*Character*	5	-	Contains the Retention / Loyalty Program Application Form Number, Primary Key
2.	tgl_permohonan	*Date*	-	-	Contains Date of Request {Format : yyyy-MM-dd}
3.	no_pelanggan	*Character*	6	-	Contains Customer Number Reference from the Customer Table. Foreign Key
4.	kd_program	*Character*	6	-	Contains Program Code References from the Program Table, Foreign Key
5.	jumlah_peserta	*Numeric*	3	0	Contains Number of Participants {999}
6.	usulan_tempat	*Character*	20	-	Contains a Proposed Place for Retention / Loyalty Program
7.	usulan_tgl	*Date*	-	-	Contains the Proposed Date for the Retention / Loyalty Program {Format : yyyy-MM-dd}
8.	nik	*Character*	8	-	Contains the Applicant's reference from the staff table, Foreign Key
9.	approver1	*Character*	8	-	Contains a Level 1 Approval from the Staff Table
10.	approver2	*Character*	8	-	Contains Level 2 Approval from the Staff Table
11.	status_app1	*Character*	14	-	Contains Approval Level 1 Status "Approved / Disapproved"
12.	status_app2	*Character*	14	-	Contains Level 2 Approval Status "Approved / Disapproved"

Code Design for no_fpprl:

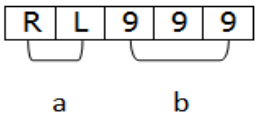

Fig 8. no_fpprl code design

In fig 8, we can break the code as for the primary key into:

a. The first two digits indicate the form code
b. The next three digits indicate the form sequence number

F. Data Storage Capacity Estimation Needs

1. Table of Needs for Database Deposits Within Five Years

TABLE III
DATABASE STORAGE NEEDS

No.	File/Table Name	Record Length (RL)	Record Total (RT)	Total in Byte (RLxRT)
1	Pelanggan	429	1.108	475.332
2	Barang	41	85	3.485
3	Staff	467	325	151.775
4	Vendor	156	195	30.420
5	program	94	27	2.538
6	fpprl	106	600	63.600
7	detil_fpprl	15	1.800	27.000
8	reimburstment	27	1.080	29.160
9	detil_reimburstment	91	5.400	491.400
10	fpspi	67	1.080	72.360
11	detil_fpspi	21	10.800	226.800
12	proposal	898	1.800	1.616.400
13	estimasi_biaya	82	10.800	885.600
14	apf	780	1.200	936.000
15	detil_apf	180	60.000	10.800.000
16	daftar_registrasi	14	600	8.400
17	detil_dr	86	120.000	10.320.000
18	justifikasi	190	240	45.600
19	cost_center	7	19	133
20	mta	64	190	12.160
			Total :	26.198.163

2. Table of Estimation of Data Deposits Needs Within Five Years

TABLE IV
DATA DEPOSITS STORAGE NEEDS

No.	Needs	Total
1	Windows 7 OS	21.474.836.480
2	Visual Studio 2005	2.147.483.648
3	MySql Server	322.183.168
4	Database	26.198.163
	Total :	23.970.701.459

V. CONCLUTION

A. The database we design is optimal for customer retention and loyalty on PT XYZ. It following some steps to build based on analysis result.

B. It support the application of information system and contain some components in database: tables, fields, primary key with carefully design with code design, records which function has been normalized that will support object-oriented program, foreign key and index.

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