INTEGRATION OF DATABASE INTO BUSINESS PROCESS TO SUPPORT IMPLEMENTATION OF CUSTOMER RELATIONSHIP MANAGEMENT: CASE STUDY IN PT TDI

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Abstract: Information now is an important element to every growing industry in the world. In order to keep up with other competitors, endless improvements in optimizing overall efficiency are needed. There still exist barriers that separate departments in PT. XYZ and cause limitation to the information sharing in the system. Open-Source Manufacturing Execution System (MES) presents as an IT-based application that offers wide variety of customization to eliminate stovepipes by sharing information between departments. Benchmarking is used to choose the best Open-Source MES Application; and Dynamic System Development Method (DSDM) is adopted as this work guideline. As a result, recommendations of the chosen Open-Source MES Application are represented.

Keywords: Manufacturing Execution System (MES); Open Source; Dynamic System Development Method (DSDM); Benchmarking; Configuration

INTRODUCTION

Database is now an important thing to support any kinds of day-to-day activity for a company. This condition makes database as one of the most powerful, enduring technologies in information system environment [1]. Until now database concept keeps moving forward and innovates to give positive contribution for industry. Database is a collection of organized data which can store information in various forms, such as text, figures, documents, images and video [2]. A major aim of database system is to support data to users without certain details of technical of how data is stored or modified.

Before the database technology was developed, file based system was an early support system to computerize the manual process systematically. Some systems and their programs required data from only one or a few file. Generally, files were created to support a single application. There was no sharing of files or data among applications. This system works well as long as the number of transaction stored is small or the activity only has to store and retrieve the data. Nowadays daily activities grow exponentially, user needs more and more information of course for the file based system inadequate to fulfill this need.

Data are processed in several stages and often in several places. These data should be of superior quality, meaning they should be complete, accurate, complete, timely, consistent, accessible, and relevant [3].

There are frequently problems and difficulties, if the company still uses file based approach, such as how to integrate data, security policy, recovery process, and many other aspects to consider. According to this situation, database can be the strategy for data governance in the company.

In database environment, users interact with database using an application program that integrates with database software often called Database Management System (DBMS). Definition of DBMS is a software system that enables users to create, define, maintain and control access to database [4]. A DBMS provides a lot of features, such as: structure defined, modification activities, security system, integrity, concurrency control, recovery control and user accessible catalog. An application program is used as an intermediary between user and database. It can be built as online application/web based or desktop application. This application program may be coded in programming language or in higher level language.

The starting point for the design of database must be referring to an abstract view of data and information requirements of the company. An abstract view of data can be represented by data model to show user what is the component from database in order to comply with operational system. Data model represents real world objects that describe the company itself. It should provide the basic concepts and notation that will allow analyst and user to communicate each other understandable [4]. The data model in relational database is based on the mathematical concept represented as a table. Classification of data model consists of three categories: object based, record based and physical based. Each type of data model has unique characteristics that differ with the other. This study focuses on relational data model in object based classification.

Relational database management system is one of the structure models that has been matured, but most applied to support business process. This model can be found at various core of infrastructure, such as e-commerce, medical records, billing, human resources, payroll, etc [5]. In relational data model, all of data are classified into entity connected with each other through association or relationship. Entity and relationship are represented as tables which have a number of columns with unique value.

Operational at PT TDI has been integrated in centralized system. All of data have been kept systematically that give positive impact to business continuity. This situation drives the company to improve its technology continuously in order to provide the best service to the customer. Because of that, PT TDI wants to elaborate Customer Relationship Management (CRM) into its operations.

CRM concept has grown quite a long time; many companies have already combined this concept, like Starbucks, Amazon, etc. Highly competition in industry makes a company concern to keep its customers. Customers as the main object of the company have a significant role to influence business process. Many companies compete to attract new customer. It's not an easy way to recruit a customer to be loyal for the company. Based on that situation, this study tries to integrate CRM concept into business process in PT TDI, which is believed can retain customer loyalty.

CRM concept focuses on customer as a first priority. This concept is done by identifying customer's needs, keeping good relation with the customer and facilitating customer's experiences to support marketing, sales and customer service through measurement and evaluation of knowledge sharing process. That way makes customers feel having an inner attachment to the company, then unwilling to move to another company.

CRM system in PT TDI operates using internet infrastructure to support the mechanism of operations because today Internet has been rapidly growing. There are many advantages if Internet is applied in company [6]. The first is to reduce operational cost; marketing and sales activities can be carried out using electronic media, regarding to reduce cost, such as paper cost and advertising cost. The second is competitive advantages; if a company introduces a new innovation before competitors put out the same thing, it can give a good impact to the company to be a pioneer because the first impression of the customers will build awareness in their mindset about the company. The third is to increase communication; the use of the Internet can improve communication with customers, employees, suppliers and distributors because communication can be more intense anytime and anywhere. The fourth is to control; Internet and intranet provide marketing inquiry through customer behavior. The fifth is to improve customer service; Internet can improve internal operations effectively, such as monitoring all inventory and notice criticism and suggestions that come from the customer in real time.

METHOD

This study follows analysis and design method. Analysis method consists of observing business process in PT TDI as the object for this study, identifying information needed to support CRM system, analyzing fact finding result to find the rule or procedure that should be concerned while designing database, mapping CRM architecture into company business process. After doing analysis and collecting information, this study built a model and prototype system to support operational CRM system focusing on database design. The stages of database design method according to database life cycle consist of Database Planning, System Definition, Requirement Collection and Analysis, Database Design, DBMS Selection, Application Design, Prototyping, Implementation, Data Conversion and Loading, Testing and Operational Maintenance. For the design, it was prepared to run in Microsoft SQL 2008 as a platform for the new database system.

RESULTS AND DISCUSSION

Collaboration between CRM and business process in company is not an easy job because this process needs to elaborate company's interests and customer's needs [7]. Implementation of CRM refers to several phases. There are [8]:

Acquiring New Customer

In order to obtain new customer, this model application needs to provide features which can interact with new potential customers. The features for this study include register module, promotion, general announcement and Frequently Asked Question (FAQ). (1) Promotion page; this module is dedicated to support all marketing activities in order to attract new customer to join with the company. Each customer visiting the website can entry their email address, so the company can send the promotion through the email. This page also gives all information about category of promotion products that the company provides. (2) After the customers have an interest to join to the company, they can choose register menu, to sign up and the confirmation will return in 24 hours. (3) General Announcement page will show the company's events. This page will attract customers to join many events that they like to participate. (4) FAQ page is to support customers to look all of the frequently question list that customers asked, so they can consider what advantages and disadvantages the customers get if they join the company.

Enhancing Customer

To complete enhancing features, it is divided into: Transaction Page; the customer can do transaction easily and in real time. In this page, customer can order, cancel transaction, claim product, or return the product that they bought, anytime they want. There are no boundaries and limitations. The model application; it also provides history menu transaction. The customers can check all the transaction that they have done in the company. Reward Point; this menu is to support company to give rewards to the customer based on customer transaction. This event is held to increase customer loyalty and to give positive impact to the company in order to enhance customer particularly.

Retaining Customer

To fulfill this feature, there are several menus that can be implemented. Product; this menu shows company's products, both new product and best seller product. It can inform the customer about what product that is suitable with customer's needs. Critical and Suggestion; the customer can give some input to company relating to selling, product, services, etc. This input can help company reflect what aspect that company needs to improve, in order to prevent losing the customer. Private Announcement; frequently the company wants to interact with the customer privately. As intermediary this menu connects the customer with company. Question; this menu lets the customer propose the question to the company relating to all

aspects that the company has. Questionnaire; to support company doing survey, these features are built in. With this feature, company can easily get a feedback from customer particularly. Forum & Bulletin; this feature can help customer interact with each other as one community.

All these features can be seen in Figure 1 as component architecture of CRM.
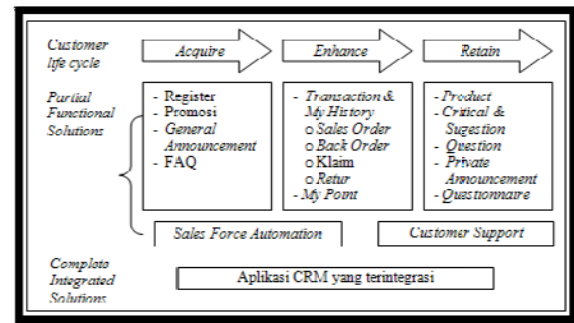

Fig. 1: SEQ Figure * ARABIC 1 Architecture CRM

After the operational procedures have been mapped into CRM architecture, the next step is designing database model to compose the CRM features. The stages of database design are based on database life cycle concept introduced by Connolly and Begg [4]. They are:

Database Planning

This step integrates information system strategy in the company, which clearly defines in mission statement and mission objectives. Mission statement of this study is to design and integrate all of data to support operational process collaborating with CRM concept. Then the mission objectives to identify all activities in the database are: to manage (including: insert, update, select) staff tables, to manage (including: insert, update, select) customer tables, to manage (including: insert, update, select) product tables, to manage (including: insert, update, select) sales order tables, to manage (including: insert, update, select) delivery order tables, to manage (including: insert, update, select) purchase order tables, to manage (including: insert, update, select) return of sales tables, to manage (including: insert, update, select) back order tables, to manage (including: insert, update, select) return of purchase tables, to manage (including: insert, update, select) payment tables, to show sales report and to show purchase report.

System Definition

Before designing a database system, it is essential to identify the scope and boundary of the system not only the current users and application

areas, but also future users and applications. This study covers sales process, purchase, stock, customer registration, supplier registration, and service at PT TDI. This scope covers all day to day activities in the company.

Requirement Collection and Analysis

This step collects data and analysis of information the system need. After doing observation, it found the classification of process, like product, invoice, purchase order, supplier, customer, delivery order, return, and payment. This information is then analyzed to identify the requirement of the new system. The information collected at this stage is lack of structured and including various formats. It must be converting into understandable form to be analyzed.

Database Design

This stage constructs data model to support company operational. It is divided into 3 main phases. They are: 1) Conceptual Database Design; this is the first phase of database design. It involves the creation of a conceptual data model beyond the physical aspects. The data model is designed referring to the documentation in the company. Throughout this process, the model is tested and validated against the user requirements. Table 1 is one of the conceptual results. 2) Logical Database Design; after creating the conceptual data model, the process continued to map the model into a logical data model. This model is based on the target data model for the database. Whereas a conceptual data model is independent of all physical considerations, a logical model is derived from the data model of the target DBMS. To test the correctness of a logical data model, normalization technique is used. Normalization ensures that the relations derived from the data model are not anomaly or do not display data redundancy. The result from this stage is a source for the next phase. Figure 2 is a result from logical data mode.

Table 1: Entities and Attributes Entity Association

Entity Name	Attribute	Description	Data Type and Length	Null	Multi-valued
Product	IdProduct	Product Code	Char (5)	No	No
	ProductName	Product Name	Varchar (50)	No	No
	Type	Category	Varchar (30)	No	No
	Size	Size	Varchar (3)	No	No
	Image	Image	Varchar (15)	No	No
	Price	Price of Product	Decimal (9,2)	No	No

3) Physical Database Design; as a final phase of database design, this phase converts the logical model into a specific DBMS system. For the relational model, this phase involves: creating a set of relational tables and the constraints, identifying the specific storage structures and access methods and designing security protection for the system. Here is an example of the formation of Database Design Language (DBDL) at the physical level design phase:

```
DBDL Produk
    Domain ProductCode Char,Length 5
    Domain ProductNamesVarchar,Length 50
    Domain ProductType Varchar,Length 30
    Domain ProductSize Varchar,Length 3
    Domain ProductImage Varchar,Length 15
    Domain ProductPrice Decimal
Produk (IdProduct ProductCode NOT NULL,
    ProductName ProductNames NOT NULL,
    Type ProductType NOT NULL,
    Size ProductSize NOT NULL,
    Image ProductImage NOT NULL,
    Price ProductPrice NOT NULL,
    PRIMARY KEY (IdProduct)
);
```

DBMS Selection

This stage may be infrequent because some companies that already have had the system can be ascertained; they will use the same platform to connect with the new system. PT TDI already has had a system to support their functionality based on Microsoft SQL Server. Therefore this study is done on Microsoft SQL Server 2008 as a platform of database.
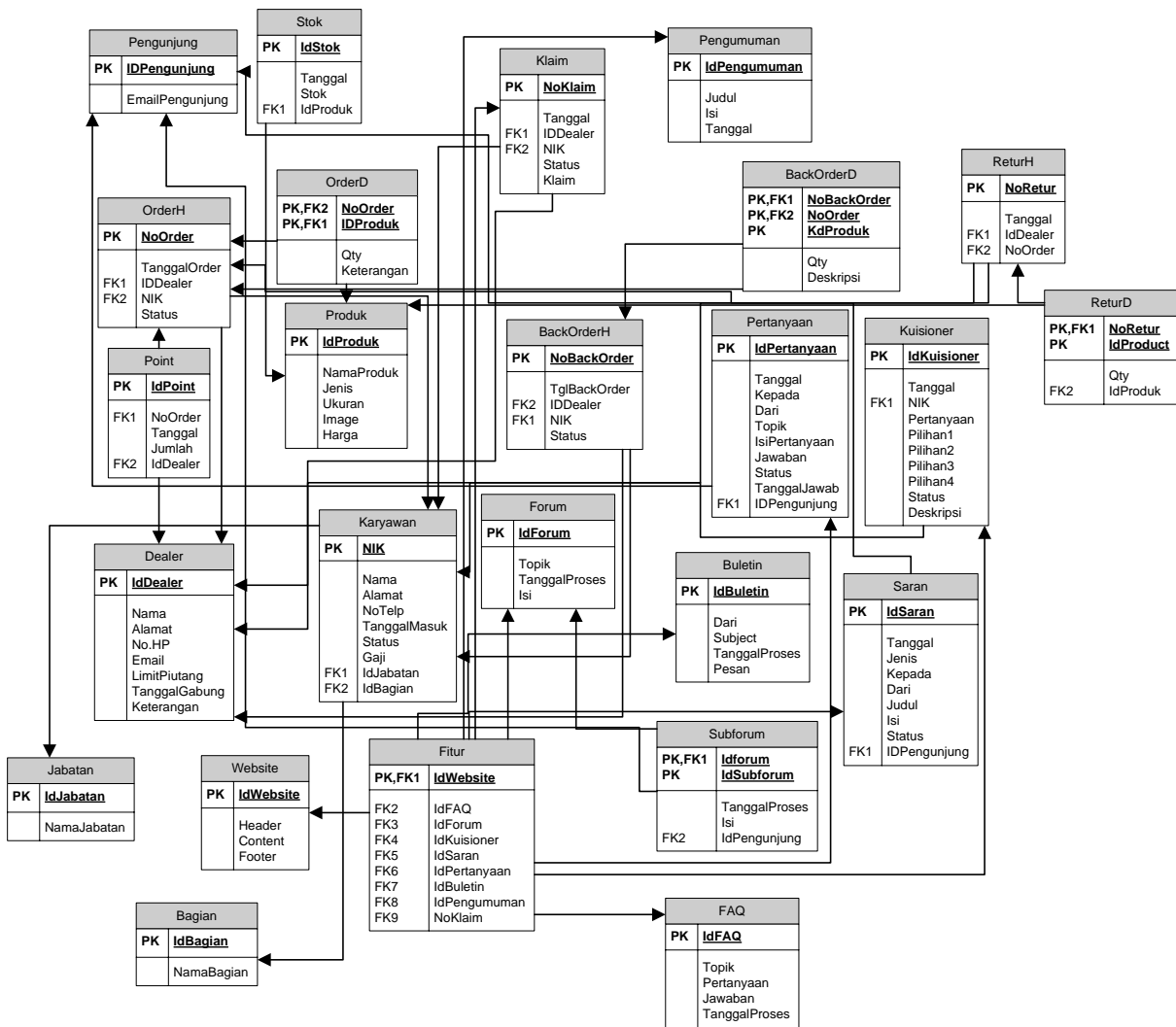
Fig. 2: Logical Data Model

Application Design

After design database has done, next step is to design user interface and application program as external view to process data in database. The example of user interface can be seen in Figure 3.

Prototyping

The main purpose of this stage is to allow users to check the prototype model to identify the new features of the system and to suggest revision to the database system that developed. There are two prototyping strategies in common use today: requirements prototyping and evolutionary prototyping [4].

Requirements prototyping uses a prototype to determine the requirements of a new proposed database system; and once the requirements model are complete, the prototype is destroyed. Although evolutionary prototyping is used for the same purpose, the important difference is that the prototype is not discarded. This study used evolutionary prototyping because the prototyping will be used to develop other new systems.

Implementation

As a result of the design stages, there is implementation of the new model database system and its application to the company. The database implementation is done using the Data Definition Language (DDL) statements according to the selected DBMS. The DDL statements are used to create the database structures and any specified user views. Whereas the application programs and some of supporting features are implemented using the specification of third or fourth generation language (3GL or 4GL). This study used PHP language to construct the web based application program.
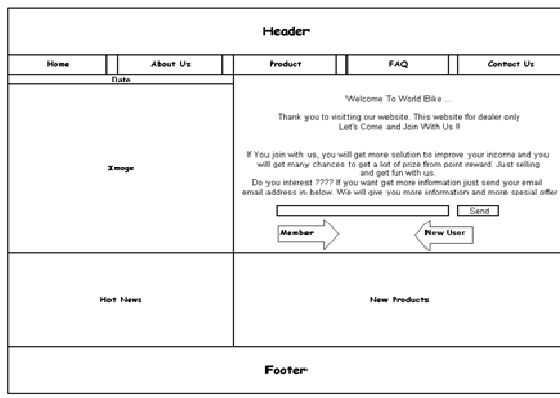
Fig. 3: User Interface

Data Conversion and Loading

This stage is required because new database system is adding an old system. To support this activity, importing and exporting features are applied to convert the data to the required format of the new database system applied. This process is done by cleaning data from the previous database, then loading to the new system.

Testing

Before going to production, the new database system was tested to ensure the faults are not present. Some of the criteria used in this study are performance, recoverability, security and usability. The testing result described that the database system satisfies the user requirement in the first stage.

Operational Maintenance

After the new database system has been implemented, certainly the system should be maintained to keep the great performance. Some activities to do are monitoring the performance of the system, then maintaining and upgrading the database system referring to required utilities in the company.

CONCLUSION

The fact of Database has an important role to support daily activities in company cannot be denied. Most of companies implement database to achieve better performance as well as PT TDI. With the database model in this study, the company can combine CRM into transaction based, anywhere and anytime without particular boundaries. Therefore flow of information from the company to customers can be efficient and effective. It is because the model refers to customer touching application that places the customer as the center of the system.

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