PEMBANGUNAN PERANGKAT LUNAK DATA MART PT. FOXIMAS MANDIRI PADA DIVISI PRODUKSI

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ABSTRAK

PT. Foximas Mandiri is a private company engaged in the production of leather shoes. In making the production of the final report is still experiencing difficulties because of all document production is still not computerized, with a wealth of data already integrated to make the production manager of the difficulties in analyzing the development of production and difficulty in collecting data that will be used as a strategic information.

Based on the problems that exist in PT. Foximas Mandiri, it is necessary to build a software data marts, where data is the final report of production can be made as good as possible and the data contained can be well integrated to allow companies to control the production and can be utilized as much as possible to provide ease in searching data according to the needs of the production manager so that the necessary data can provide information quickly and detail, in the form of multidimensional tables and charts that can later be analyzed to assist in decision making. Data mart software development using UML (Unified Modeling Language), a data mart is part of a data warehouse that helps in creating reports and analysis of data on a unit.

Based on the results of testing black box testing and interviews can be concluded that the construction of a data mart software can facilitate in obtaining strategic information quickly and detail required by the production manager of PT. Foximas Mandiri to speed up the process of analyzing the future production that will assist decision-making by the production manager and help facilitate the production manager in making the final report multidimensional production according to the needs of PT. Foximas Mandiri.

Kata kunci : PT. Foximas Mandiri, Strategic Information, Data Mart.

1. PENDAHULUAN

PT. Foximas Mandiri is a private company engaged in the production of leather shoes. PT. Foximas Mandiri believed to be a manufacturer of leather shoes were sent to all outlets of leather shoes throughout Indonesia and meet the demand of making military boots for government agencies, especially the military and police.

Currently the production of the manufacture of the final report is still experiencing difficulties because all documents are still not computerized production, with a wealth of data already integrated to make the production manager of the difficulties in analyzing the development of production and difficulty in collecting data that will be used as a strategic information. In presenting the information that has a period of time will require considerable time to serve it due to data retrieval and processing is slow and the lack of a system that can provide prompt and detailed information. For it is necessary to build a software data marts, where data is the final report of production can be made as good as possible and the data contained can be well integrated to allow companies to control the production and can be utilized as much as possible to facilitate the search data in accordance the production manager needs to be able to present the necessary data quickly and detailed information, in the form of multidimensional tables and charts that can later be analyzed to assist in decision making. The aim of the software build a data mart at PT. Foximas Mandiri is to:

1. Assist the production manager in the display needs of strategic information quickly and succinctly, as well as to provide information that is multi-dimensional with tables and graphs are easier to analyze the production company to help make decisions that are made by the production manager.
2. Assist the production manager in making the final report production multidimensional.

Boundary problem applied in the construction of a data mart software, among others, that:

1. Data is taken from data held by the Production Division is the data production and data SPK.
2. Modeling for software development using UML (Unified Modeling Language).
3. Examining the data mart using OLAP (On-Line Analytical Processing).
4. Data on testing data marts that from 2013 to 2014

5. The process of creating data marts with ETL process (Extract Transform Loading).
6. Development of software using visual studio 2012
7. DBMS using Microsoft SQL Server 2012

1.1 Data Mart

Data mart is a part of a data warehouse that supports the creation of reports and analysis of data on a unit. The data mart contains information relefan for users who want to make a decision.

There are four tasks that can be performed by the data mart [2], four tasks are as follows:

1. Preparation of reports
   Making the usefulness of the report is one of the most common data marts do. By using a simple query obtained reports per day, per month, per year, or whenever desired time period.
2. On-Line Analytical Processing (OLAP)
   With the data mart, all the information both detail and summary results needed in the analysis of easily obtained. OLAP is a concept of multidimensional data and allows the user to analyze the data in detail, without typing any SQL commands.
3. Data Mining
   Data mining is the process of digging (mining) knowledge and new information from a large number of data in the data mart.
4. The process of executive information.
   Data marts can make a summary informais matters with the aim of making business decisions, without the need to explore the entire data. By using a data mart of all reports have been summarized and can also mengetehaui all the details are complete, thus simplifying the decision-making process.

1.2 Model Dimensional Data Mart

Dimensional model of the data mart consists of a fact table and table dimensions,

There are several models of the scheme contained in the modeling data marts, the star schema, snowflake schema, and constellation schemes. Explanation of each model scheme is as follows:

1. Star Schema

This scheme follows the shape of a star, where there is one fact table in the center of a star with several surrounding dimension tables. All associated with the dimension tables to the fact table. The fact table has several primary key in the dimension table. Here is an example of a star schema can be seen in Figure 1.

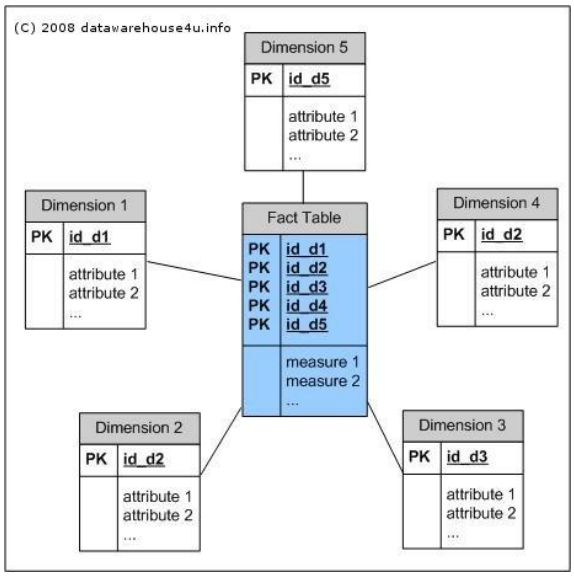


Figure 1 ***Star Schema***

2. Snowflake Schema

Snowflake Schema is an extension of a star schema with an additional dimension tables that are not directly related to the fact tables. The dimension tables associated with another dimension tables. Here is an example of the snowball scheme can be seen in Figure 2.

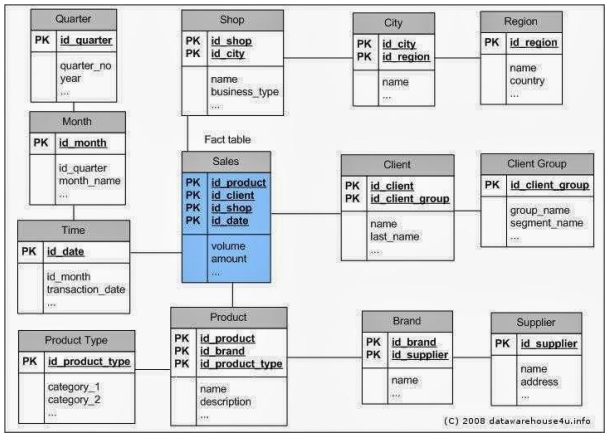


Figure 2 ***Snowflake Schema***

3. Schematic Constellation

In this scheme there are multiple fact tables that use one or more dimension tables. Here is an example constellation scheme can be seen in Figure 3.

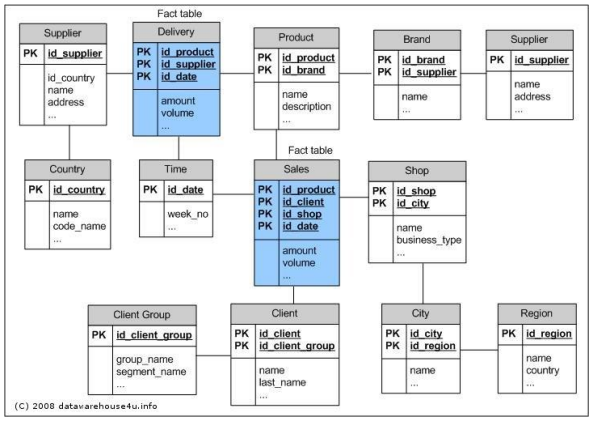


Figure 3 Schemes Constellation

1.3 ETL (*Extract, Transform, Loading*)

Process ETL (Extract, Transform, Loading) is a process to be followed in the establishment of a data mart [3]. The purpose ETL is to collect, filter, process and combine data from multiple sources to be stored into the data mart. Here is an explanation of each process ETL:

1. Data Extraction (Extract)

Data extraction is the process of collecting data from various operational systems, using either a query or application ETL. There are few data extraction functions, namely:

a. Automatic data extraction from the source application.
b. Screening or selection of data extraction.
c. Delivery of data from various data sources to the application platform.
d. Change the format of the data layout of the original format.
e. Storage in a temporary file for incorporation with the extraction from other sources.

2. Data Transformation (Transformation)

Transformation is the process by which data extraction results filtered and modified in accordance with the applicable business rules. The steps in the transformation of the data is as follows:

a. Mapping the input data of the original data schema to schema data marts.
b. Perform data type conversions.
c. Clean up and dispose of the same data (duplication).
d. Checking the reference data.
e. Filling the empty values with default values.
f. Combining data.

3. Charging Data (Loading)

Data entry is the process of inserting the data obtained from the transformation into a data mart. How to enter data is to run a SQL script periodically.

1.4 OLAP (*On-Line Analytical Processing*)

OLAP (Online Analytical Processing) is technology that processes data into multidimensional structures, providing quick answers to query complex analyzes with the aim to organize large amounts of data, to be analyzed and evaluated quickly and provides speed and flexibility to support the analysis in real-time [1].

There are several characteristics of OLAP, namely:

1. Allowing businesses see data from a logical standpoint and multidimensional data warehouse.
2. Facilitating complex queries and analysis for the user.
3. Allows the user to drill down to display more detailed data or roll-up for the aggregation of a dimension or multiple dimensions.
4. Provide a process of calculation and comparison data.
5. Showing the results in tables or graphs.

The advantage of OLAP, namely:

1. mengingkatkan business end-user productivity, IT developers, and entire organization.
2. Oversight and more timely access to strategic information can make decisions more quickly.
3. Reduce application development for the IT staff to make the end user can change the scheme and make your own models.
4. Storage data integrity control of the organization through corporations as OLAP applications depending on the data warehouse and OLTP systems to update the data source level.

OLAP can be used to do as [1]:

1. Consolidation (roll-up)
   Consolidation involves grouping data.
2. Drill-down
   A form that is the opposite of consolidation quick to describe the data into the data in more detail. The figures for the roll-up and drill-down can be seen in Figure 4.

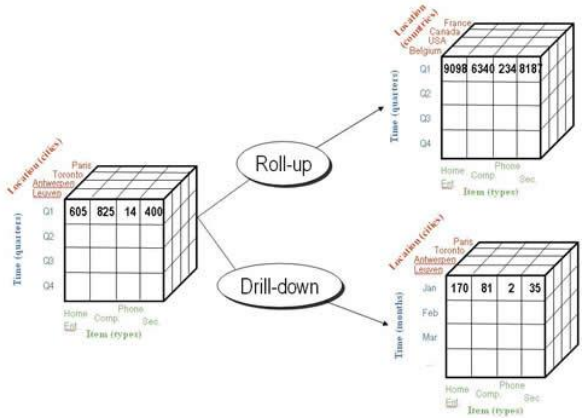


Figure 4 *Roll-up* dan *Drill-down*

3. Slicing and dicing

Lays in the ability to see data from the point of view. Overview for slicing and dicing can be seen in Figure 5.

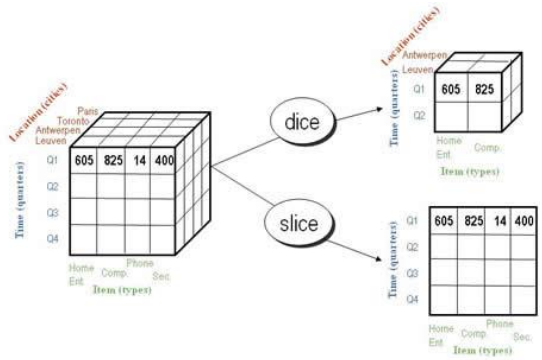


Figure 5 *Slicing* dan *Dicing*

1.5 SSIS (*SQL Server Integration Service*)

SSIS (SQL Server Integration Services) is a platform to build a reliable system for data integration, extraction, transformation, and loading used in data warehousing [4].

SQL Server Integration Services architecture in general contain various components, such as:

1. SSIS Deginer. Is a tool that is used to create and manage integration service package. In SQL Server 2012, this tool is integrated with Visual Studio 2010 that is part Bussiness Intelligence project.
2. Runtime Engine. This component allows you to perform all the SSIS packages that have been created.
3. Task and executable binary.
4. Data Flow and Data Flow Engine. Components of the data flow is an encapsulation of data flow engine that provides a buffer in memory and in charge of moving the data from the data source to the destination data. While the data flow is a source of data, data destinations, and transformations.
5. Integration Services service. Allows SQL Server Management Studio can be used to monitor and regulate the SSIS package SSIS storage used.
6. SQL Server Import and Export Wizard. This tool is used to copy data from source to destination data.

2 ISI PENELITIAN

There are several stages in the development of software analysis of data marts, namely:

1.1 Analisis Kebutuhan Informasi

Analysis of information needs is the stage to analyze what is needed by PT. Foximas Mandiri for the data mart to be built. The information will be presented in detail. In interviews with the production manager, the information needed for the development of data marts is as follows:

1. Information number of shoes produced by pertanggal shoe model, monthly and yearly.
2. Information number of shoes produced by pertanggal shoe size, monthly and yearly.
3. Information number of shoes produced by models of shoes and shoe size pertanggal, monthly and yearly.
4. Information number of shoes produced by no spk (work order) As, per month and per year.
5. Information number of shoes produced by no spk (work order) and pertanggal shoe model, monthly and yearly.
6. Information number of shoes produced by no spk (work order), shoe model and size pertanggal, monthly and yearly.
7. Information on numbers of shoes are ordered by customer name pertanggal, monthly and yearly.
8. Information on numbers of shoes are ordered based on the model of shoes pertanggal, monthly and yearly.
9. Information on numbers of shoes ordered by the customer's name and pertanggal shoe model, monthly and yearly.
10. Information based on the number of reject shoe shoe models pertanggal, monthly and yearly.
11. Information amount reject shoes by size pertanggal, monthly and yearly.
12. Information based on the number of reject shoe shoe model and size pertanggal, monthly and yearly.

1.2 Sumber Data

In this study, the data source used is by using OLTP contained in PT. Foximas Mandiri. The following diagram OLTP relation PT. Foximas Mandiri can be seen in Figure 6:

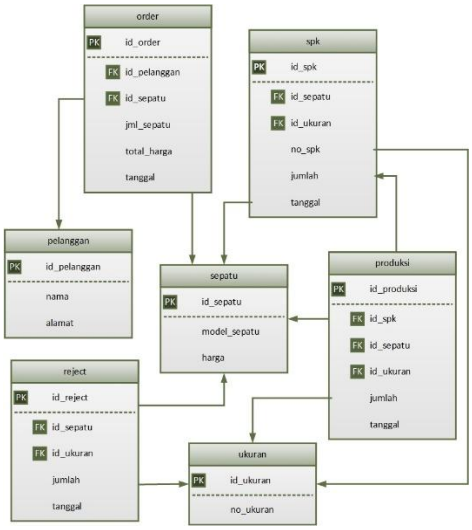


Figure 6 Diagram Relasi OLTP PT. Foximas Mandiri

1.3 Analisis Arsitektur Data Mart

At the core layer, operational data will be extracted by the process of ETL (Extract Transform Loading) into the data mart.

1. Extract

This process is the selection of data from existing data sources for the manufacture of data marts, some tables will be made in the data mart that production tables, table size, table shoes, spk table, table order, customers' tables, and tables reject. The attributes that exist in the table will be extracted no change still remains the same as an existing data source in OLTP. The process of extracting data from the data source into the data mart is as follows:

a. Process extract on the production table

Process extract on the production table, do the retrieval of data from OLTP database. Column in the extract is id_produksi column, id_spk, id_sepatu, id_ukuran, number, and date. The results of the data extract on the production table can be seen in Table 1:

Table 1 *Extract* Produksi

Nama Tabel	Field
Tabel Produksi	id_produksi
	id_spk
	id_sepatu
	id_ukuran
	Jumlah
	Tanggal

b. Process extract in table size

Process extract on the size of the table, do the retrieval of data from OLTP database. Column in the extract is id_ukuran column, and no_ukuran. Results of extract data in table sizes can be seen in Table 2:

Table 2 *Extract* Ukuran

Nama Tabel	Field
Tabel Ukuran	id_ukuran
	no_ukuran

c. Extract process on the shoe table

Process shoes extract the table, do the retrieval of data from OLTP database. Column in the extract is id_sepatu column, model_sepatu and price. Results from shoes extract the data in the table can be seen in Table 3:

Table 3 *Extract* Sepatu

Nama Tabel	Field
Tabel Sepatu	id_sepatu
	model_sepatu
	Harga

d. Process extract in table order

Process extract in table order, do the retrieval of data from OLTP database. Column in the extract is id_order column, id_pelanggan, number, and more. Results of extract data in table order can be seen in Table 4:

Table 4 *Extract* Order

Nama Tabel	Field
Tabel Order	id_order
	id_pelanggan
	Id_sepatu
	Jml_sepatu
	Total_harga
	Tanggal

e. Extract process in the customer table

Extract process in the customer table, do the retrieval of data from OLTP database. Column in the extract is id_pelanggan column, name, and address. Results of extract the data in the customer table can be seen in Table 5:

Table 5 *Extract* Pelanggan

Nama Tabel	Field
Tabel pelanggan	id_pelanggan
	Nama
	Alamat

f. Process extract the table spk

Spk extract processes on the table, do the retrieval of data from OLTP database. Column in the extract is id_spk column, no_spk, and date. The results of the data in the table spk extract can be seen in Table 6:

Table 6 *Extract* Spk

Nama Tabel	Field
Tabel spk	id_spk
	Id_sepatu
	Id_ukuran

	no_spk
	Jumlah
	Tanggal

g. Process extract the reject table

Process extract the reject table, do the retrieval of data from OLTP database. Column in the extract is id_reject column, id_sepatu, id_ukuran, amount and date. The results of the data in the table spk extract can be seen in Table 7:

Table 7 *Extract* Reject

Nama Tabel	Field
Tabel reject	Id_reject
	id_sepatu
	Id_ukuran
	Jumlah
	Tanggal

1. Transform

The process of transformation is done consists of two processes, namely:

1. Cleaning

Cleaning process is performed to clean out unused data from a table that has been extracted. Here is a field name is omitted in the process of cleaning:

a) In the table the shoe does not require the price field.
b) In the table the customer does not require the address field.
c) In the table the order does not require field total_harga and date.
d) In the table spk does not require a date field.

2. Conditioning

Conditioning process that is data that has been through the cleaning process will be changed the format of the data into the format of the data mart Operations. For this process the format changed only the name of the table and change the date to id_waktu. The following tables in conditioning among other things:

1) Conditioning the production table

In the conditioning process production table will be renamed to fact_produksi table because the table has a measure of production that the parameters used in the fact table in the form of numeric data or data that can be measured. while for the date field becomes id_waktu. On the date field will generate a new table that is the time dimension table that is to explain the information required by the time of data analysis. For more details on the process conditioning production table can be seen in Table 8:

Table 8 Table Conditioning Production

Tabel Produksi	
No	**Field**
1	Id_produksi
2	id_sepatu
3	id_ukuran
4	Jumlah
5	Tanggal

→

Fact_produksi	
No	**Field**
1	Id_produksi
2	id_sepatu
3	id_ukuran
4	jumlah
5	id_waktu

Tabel Produksi	
Tanggal	Date

→

Dim_waktu	
id_waktu	integer
tanggal	integer
bulan	integer
nama_bulan	nvarchar(50)
tahun	integer
full_date	date

3. Loading

When the data is extracted and transformed, then the data is entered into the data mart. The process of loading the application data marts will be performed automatically after the process is complete transform. The technique used is updated, a process which will immediately update the data mart without changing existing data.

1. Analysis of Data Mart Layer

In this layer, the data that have been through the ETL process will be stored in a centralized storage logic, ie the data mart. The tables that will be required in making the design of the data mart, namely the fact table production, the fact reject the order and the fact table. In addition there is the dimension tables that will be used together in multiple fact tables, dimension tables namely shoes, table size dimension, the customer dimension table, dimension tables and dimension tables spk time. Schemes used in the construction of a data mart is a constellation scheme. The following constellation scheme in the construction of a data mart can be seen in Figure 7:

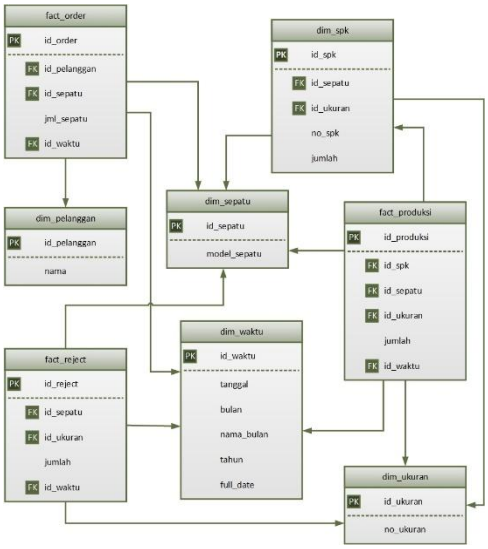


Figure 7 Scheme Constellation

Table 9 Explanation Schema Data Mart

No	Nama Tabel	Jenis Tabel
1	Fact_Produksi	Fakta
2	Fact_order	Fakta
3	Fact_reject	Fakta
4	Dim_Sepatu	Dimensi
5	Dim_Ukuran	Dimensi
6	Dim_Pelanggan	Dimensi
7	Dim_Waktu	Dimensi
8	Dim_Spk	Dimensi

1.4 Spesifikasi Kebutuhan Perangkat Lunak

Analysis of software requirements specification contains a description of the software needs to be built both functional requirements and non-functional requirements. Table software requirements specification can be seen in Table 10 and Table 11:

Table 10 Functional Specifications Software Requirements

Kode Kebutuhan	Kebutuhan
SKPL-F-1	Administrators and managers can access production applications.
SKPL-F-2	The system can update the data in the data mart.
SKPL-F-3	The system can make the process of ETL (Extract Transform Loading).
SKPL-F-4	Production managers can perform analysis against the data mart.
SKPL-F-5	The system can display the results of the analysis in the form of tables and graphs.
SKPL-F-6	The system can provide a printed report.

Table 11 Software Requirements Specification Non-Functional

Kode Kebutuhan	Kebutuhan
SKPL-NF-1	The system can run on windows platform.
SKPL-NF-2	The system can run on hardware conforming to the medium.
SKPL-NF-3	The programming language used is C #.

1.5 Analisis Kebutuhan Fungsional

Functional needs analysis aims to outline the process and the activities that need to be applied to the system to be built.

1.5.1 Use Case Diagram

Use case diagram is a description of the system functionality or behavior. The following use case diagram in the software can be seen in Figure 8*:*

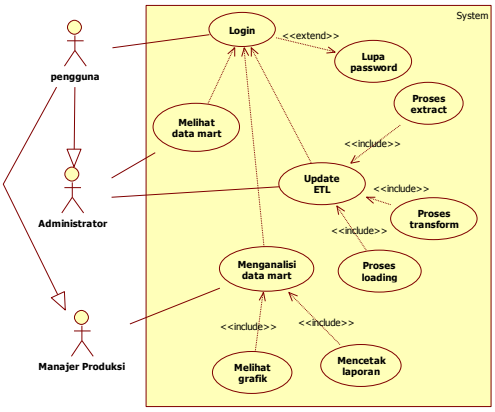


Figure 8 *Use Case Diagram*

1.5.2 Activity Diagram

Activity diagrams model the flow of work from the order activity in a process that refers to the existing use case diagram. Activity diagram is updated ETL activities performed by the user to enter new data into the data mart. Activity diagram of ETL updates can be seen in Figure 9:

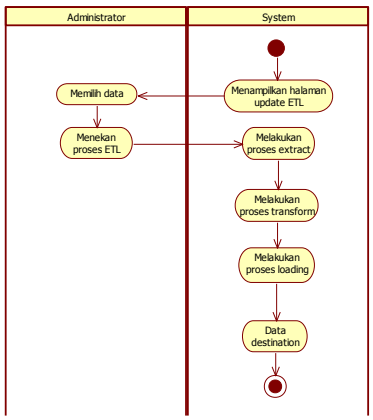


Figure 9 *Activity Diagram Update* ETL

1.5.3 Sequence Diagram

Sequence diagram illustrates the interaction between each object in every use case in a time sequence. Sequence diagram for ETL updates can be seen in Figure 10:

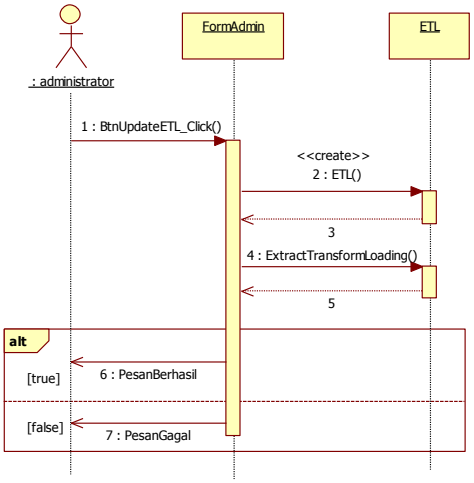


Figure 10 *Sequence Diagram Update* ETL

1.5.4 Class Diagram

Class diagram describing the structure and relationships between objects in the system. This structure includes attributes and methods that exist in each class. Class diagram of software that will be built data marts can be seen in Figure 11:

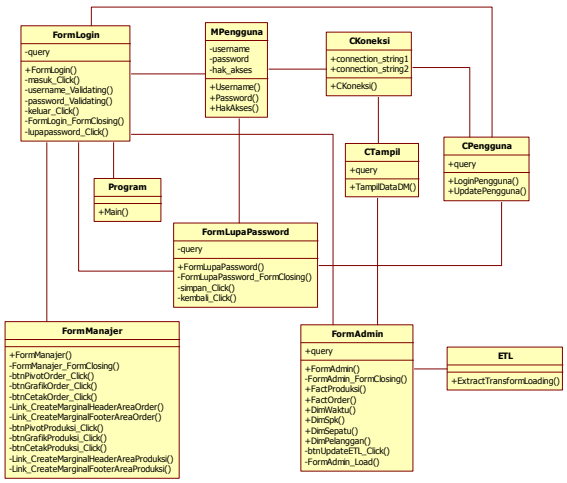


Figure 11 Class Diagram

1.6 Implementasi Basis Data

Making the database is done using Microsoft SQL Server DBMS application 2012. Implementation of database in SQL language is as follows:

Table 12 Implementation Table dim customer

Dimensi Pelanggan

```
CREATE TABLE [dbo].[dim_pelanggan](
	[id_pelanggan] [int] NOT NULL,
	[nama] [varchar](30) NOT NULL,
 CONSTRAINT [PK_dim_pelanggan] PRIMARY KEY
CLUSTERED
(
	[id_pelanggan] ASC
)WITH (PAD_INDEX = OFF,
STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY
= OFF, ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS
= ON) ON [PRIMARY]
) ON [PRIMARY]

GO
```

Table 13 Implementation Table in shoes

Dimensi Sepatu

```
CREATE TABLE [dbo].[dim_sepatu](
	[id_sepatu] [int] NOT NULL,
	[model_sepatu] [varchar](10) NOT NULL,
 CONSTRAINT [PK_dim_sepatu] PRIMARY KEY
CLUSTERED
(
	[id_sepatu] ASC
)WITH (PAD_INDEX = OFF,
STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY
= OFF, ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS
= ON) ON [PRIMARY]
) ON [PRIMARY]

GO
```

Table 14 Implementation Table fact production

Fakta Produksi

```
CREATE TABLE [dbo].[fact_produksi](
	[id_spk] [int] NOT NULL,
	[id_sepatu] [int] NOT NULL,
	[id_ukuran] [int] NOT NULL,
	[jumlah] [int] NOT NULL,
	[id_waktu] [int] NOT NULL
) ON [PRIMARY]

GO

ALTER TABLE [dbo].[fact_produksi]  WITH CHECK
ADD  CONSTRAINT [FK_fact_produksi_dim_sepatu]
FOREIGN KEY([id_sepatu])
REFERENCES [dbo].[dim_sepatu] ([id_sepatu])
GO

ALTER TABLE [dbo].[fact_produksi] CHECK
CONSTRAINT [FK_fact_produksi_dim_sepatu]
GO

ALTER TABLE [dbo].[fact_produksi]  WITH CHECK
ADD  CONSTRAINT [FK_fact_produksi_dim_spk]
FOREIGN KEY([id_spk])
REFERENCES [dbo].[dim_spk] ([id_spk])
GO

ALTER TABLE [dbo].[fact_produksi] CHECK
CONSTRAINT [FK_fact_produksi_dim_spk]
GO

ALTER TABLE [dbo].[fact_produksi]  WITH CHECK
ADD  CONSTRAINT [FK_fact_produksi_dim_ukuran]
FOREIGN KEY([id_ukuran])
REFERENCES [dbo].[dim_ukuran] ([id_ukuran])
GO
```

```
ALTER TABLE [dbo].[fact_produksi] CHECK
CONSTRAINT [FK_fact_produksi_dim_ukuran]
GO

ALTER TABLE [dbo].[fact_produksi]  WITH CHECK
ADD  CONSTRAINT [FK_fact_produksi_dim_waktu]
FOREIGN KEY([id_waktu])
REFERENCES [dbo].[dim_waktu] ([id_waktu])
GO

ALTER TABLE [dbo].[fact_produksi] CHECK
CONSTRAINT [FK_fact_produksi_dim_waktu]
GO
```

1.7 Implementasi Antar Muka

Implementation of the software interface consists of multiple pages. Following implementation of the software interface data marts.



Figure 1 Page Login

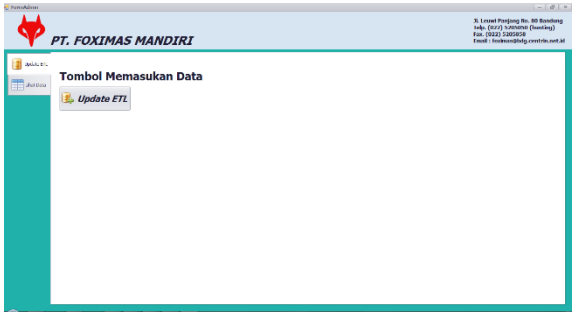


Figure 2 Page Update ETL

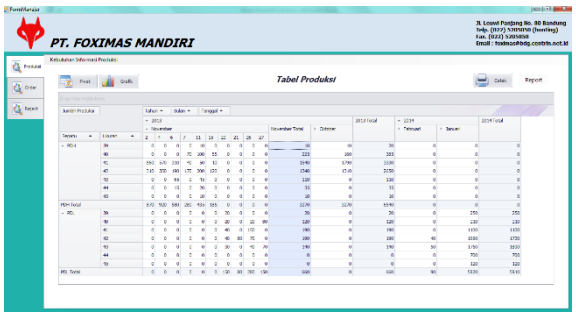


Figure 3 Guide Analyzing Data Mart

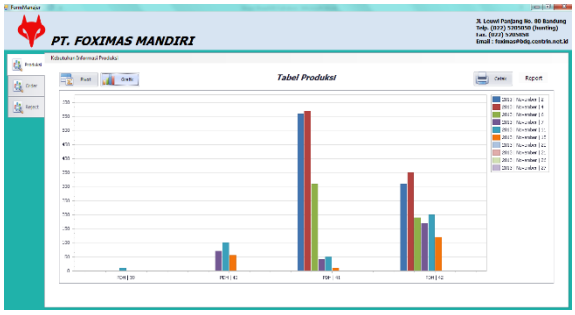


Figure 4 Pages Viewed Charts

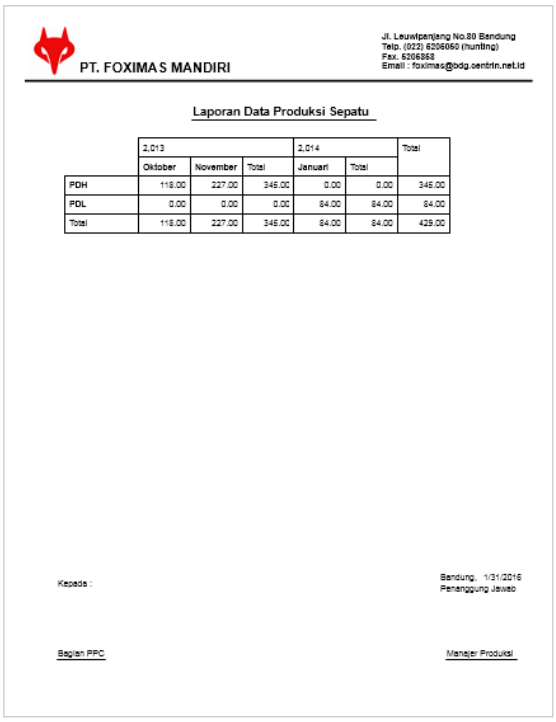


Figure 5 Page Print Reports

2. PENUTUP

2.1 Kesimpulan

Based on research that has been done on the analysis, design, implementation, and testing of the software is a data mart for the production division at PT. Foximas Mandiri, it can be concluded as follows:

1. Application Data Mart provides ease in obtaining strategic information quickly required by the production manager of PT. Foximas Mandiri, and can help the decision making process so as to accelerate the process of analyzing made by the production manager for handling the products that have been produced.
2. Application Data Mart helps in making the production of the final report required by the production manager at PT. Foximas Mandiri.

2.2 Suggestions

This follows after the data mart software development at PT. Foximas Mandiri then some suggestions in developing a future are as follows:

1. The system not only analyzes the Production Division, but analyzing all the divisions that exist in PT. Foximas Mandiri in order to meet the company's strategic information greater.
2. For software development of data marts on PT. Foximas Mandiri can be extended by adding divisions and manufacturing has been no final report format adjusted to the respective division - each to be used as a data warehouse software.

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