DATA MART SOFTWARE DEVELOPMENT AT PT. SAMSAN INTERTEX PRODUCT DIVISION

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ABSTRAK

PT. Samsan Intertex represents a foreign private company engaged in the production of textiles, especially in the manufacture of fabrics including polyester fabrics grey, polycotton, rayon, cotton and so on that would later be used as the basic material necessities of clothing. Corporate parties in particular on the part of the production is experiencing some difficulties, namely the difficulty in changing all of your existing data into useful information for the benefit of business decision-making by the electrical company because each data stored in different systems. Other problems also occur when the data generated for the needs analysis for the production management can not convey information from various aspects and different business point of view, this is because has not been the availability of a tool which provides analysis of data needs that can be tailored to the information needs of the company. Based on the existing problems in the production of PT Samsan Intertex, to facilitate the parties ' production management in strategic information so it can be used for the benefit of business decision-making, because the data mart allows the integration of various types of data from different types of applications or systems. A data mart is a great solution that will provide a positive impact for the company to take advantage of the data results of the operational activities of the production that is very much optimally.

Keyword : Data mart, Dimensional modeling, Fact constellation

1. INTRODUCTION

Production division of PT Samsan Intertex is one part handling in the production process, on the part of production there are several departments, including the Department of Sizing, Beaming, Warping Department Department Department Department of Weaving and Inspecting Department warehouse. The existing system on the part of the current production is largely already uses computers to manage the data in the business process, data from the results of the operations of production are already stored in the database is provided by the information system production. The problems currently faced by the production that is part of the difficulty in changing all of your existing data into useful information for the benefit of business decision-making by the electrical company, since each data stored in a separate system.

Other problems also occur when the data generated for the needs analysis for the production management can not convey information from various aspects and different business point of view, this is because has not been the availability of a tool which provides analysis of data needs that can be tailored to the needs of a diverse company information because for this production only part party perform a recapitulation of all data in one by one from different types of data sources and then made the report based on the needs of certain reports recapitulation report, such as the amount of fabric production, recap of the amount of fabric inspection (inspecting), number of threads rekapituliasi incoming and outgoing and recapitulation number of fabric in and out. In this case it certainly needed the report system is dynamic and easy to use are useful to support the parties in the conduct of the company's production management, evaluation of the results of operational activities on the part of Samsan Intertex PT. production.

Based on problems in the production of PT Samasan Intertex, hence the need to built a data mart software to facilitate the parties ' production management in strategic information so it can be used for the benefit of business decision-making, because the data mart allows the integration of various types of data from different types of applications or systems [1]. A data mart is a great solution that will provide a positive impact for the company to take advantage of the data results of the operational activities of the production that is very much optimally.

2. CONTENT

2.1 Theoretical Base

2.2.1 Data Mart

Data mart is a part of a data warehouse that is useful to support report generation and data analysis of a portion of the operational departments within a company [1]. The data mart contains relevant

information for the user who will be able to facilitate in decision-making.

2.2.2 Dimensional Modeling

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

1. Star Scheme

Star schema consists of two kinds of tables, namely the fact and dimension tables. The fact table contains the facts of the quantitative data about a business such as the number of units sold, number of bookings and more. The dimension tables contain descriptive data on business subjects. Table dimensions are usually a source of attributes used to categorize, or summarize the facts in the query, report, or graph [1]. For more details can be seen in Figure 1 below.

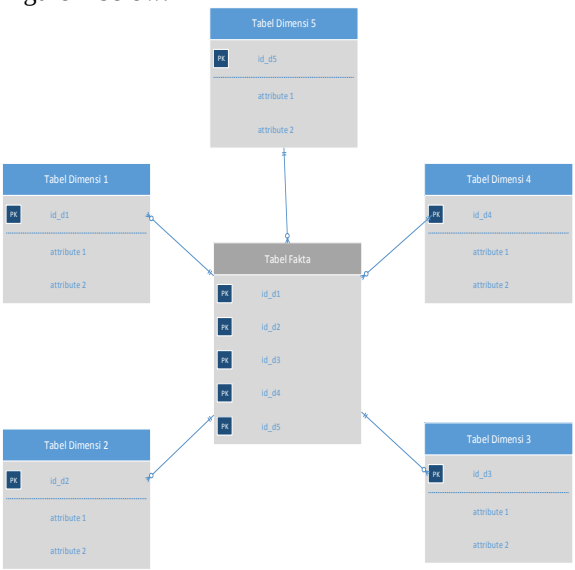


Figure 1. Star Scheme

1. Snowflake Scheme

Snowflake schema is a method of normalizing the dimension tables in star schema where after all the dimension tables have been completely normalized. The principle of this scheme is to normalize the table by removing the attribute with low cardinality and formed a separate table. Reasons do snowflaking also is for saving storage space in one table and attribute search in more detail in a dimension table [1]. For more details can be seen in Figure 2 below.

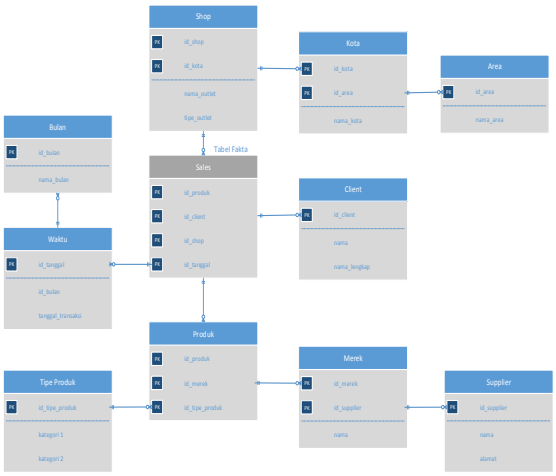
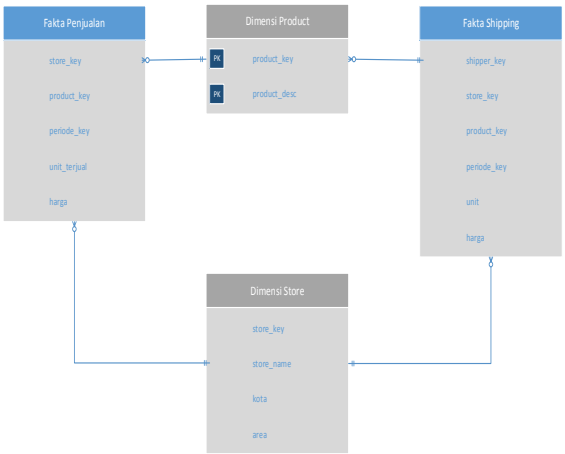


Figure 2. Snowflake Scheme

2. Fact Constellation

This scheme is more complex than sekma star and snowflake schema for this schema contains two or more tables facts. This scheme allows a lot of dimension tables associated with the fact table. Fact Constellation scheme is very flexible, but it can sometimes be difficult in the setting and support. The main disadvantage of this scheme is more complicated design because many variants of aggregation to be considered, and also to answer the query may need multiple single SQL statement [2]. For more details can be seen in Figure 3 below.



Gambar 3. Fact Constellation

2.2.3 Staging Area

Data staging is a process commonly called ETL process (Extract, Transform, and Load). Data staging aims to determine what data is used as fact data and dimensional data that exists in dimensional models, ways of extracting, conditioning the data schema to the needs, and the process of moving data from the data source to the dimensional models [2] .As for an explanation of the ETL process are as follows :

1. Extract

This process is the stage to determine your table and fields that will be in the extract from the data source into dimensional models [2].

2. Transform

This process is a process of conditioning the schematic form of data, be it a table or attributes to fit your needs. Transform process is done cleaning and conditioning [2].

a. Cleaning

Cleaning process to clean the data that does not need from the table that has been extracted, which removes unused fields.

b. Conditioning

This process is a process to perform the conditioning form data schema that consists of conditioning attributes and conditioning time on the table so that the table name can be used by dimensional models.

3. Load

This process is the final stage of the process of staging the data, where the data facts and dimensions loaded into the dimensional models. The technique is done in delivering the data depending on business needs, such as technical updates, where the technique will immediately update the data stored in the dimensional model without eliminating or changing existing data previously [2].

2.2.4 OLAP (On-Line Analytical Processing)

OLAP (On-line Analytical Processing) is one way to process data in a data warehouse. OLAP analytics to provide answers to queries for data that is multidimensional. OLAP provides a multidimensional way to display data in the data mart or data warehouse with OLAP cube can be created to organize the data and make a summary of data for efficient query. This technique there are various kinds, among which are drill-down and slice and dice [4].

2.2 Systems Analysis

2.3.1 Analysis of Problem

Analysis of the problem is the stage of analyzing and then lays out the existing problems. Based on the results of interviews conducted with the company on the production, here are the problems that exist in PT. Samsan Intertex:

1. Difficulty in capturing and reviewing the existing data in any part of the production as a separate data source.
2. Difficulties in obtaining information necessary for strategic business decisions.

Tab1e.1 Analysis of Problem

No	Problem	Problem Source	Solution	Benefit
1	difficulties analyzing data	Database Design	*Data mart*	Ease in analyzing the data that is multidimensional and dynamic
2	Difficulties in obtaining strategic information	unavailable a tool	OLAP *(On-Line Analytical Processing)*	The ease in obtaining strategic information

2.3.2 Analysis of Data Source

Analysis of the data source is an analysis of existing data on the production of PT. Samsan Intertex, where the data is data that is used for report generation and decision making production manager. The data sources are analyzed data derived from the production results of operations, as described in Table 2 below.

Table 2. Data Sources

No	Data	Sumber
1	Produksi	*Database* produksi
2	Stok benang	*Database* benang

2.3.3 Strategic Information Needs

At this stage is the stage to determine what information is required by the production department to 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:

Table 3. Strategic Information Needs

No	Strategic Information
1	1. Information on the number of warper sizing production based on raw materials and lots in the period of the day, month, year. 2. Information on numbers of long (yard) on the production of raw materials and sizing based on the lot within a period of the day, month, year.
2	3. Information on the number of beam beaming production based on raw materials and lots in the period of the day, month, year. 4. Information on numbers of long (yard) on the production of raw materials and beaming by lot within a period of the day, month, year.
3	5. Information on numbers of long (yard) on the production AJL based on the type of fabric and machines in the period of the day, month, year
4	6. Information on numbers of long (yard) on WJL a production based on the type of fabric and machines in the period of the day, month, year.
5	7. Information on numbers of long (yard) on the production WJL c based on the type of fabric and machines in the period of the day, month, year.
6	8. Information on production warping beam number based on the type of fabric in the period of the day, month, year. 9. Information on numbers of long (yard) on the production of warping based on the type of fabric in the period of the day, month, year.
7	10. Information on the number of beam production drawing based on the type of fabric in the period of the day, month, year.

No	Strategic Information
8	11. Information on numbers of long (yard) on inspecting production based on the type of fabric and machines in the period and month. 12. Information on the amount of fabric std inspecting production based on the type of fabric and machines in the period and month. 13. Information on the amount of fabric nstd inspecting production based on the type of fabric and machines in the period and month.
9	14. Information on the number of incoming thread yarn warehouse based supplier and grade in the period and month. 15. Information on the number of threads out shed yarn based supplier and grade in the period and month.
10	16. Information on the balance amount pd cloth fabric warehouse based on the type of fabric and the buyer in the period and month. 17. Information on the balance amount sp cloth fabric warehouse based on the type of fabric and the buyer in the period and month. 18. Information on the balance amount dp cloth fabric warehouse based on the type of fabric and the buyer in the period and month.

2.3 Analysis Data Mart

Analysis of the data mart is an analysis carried out so that the process of software development in the data marts produski PT. Samsan Intertex can be done better and more focused. The stages of analysis of the data mart to be built is illustrated in Figure 4 below.

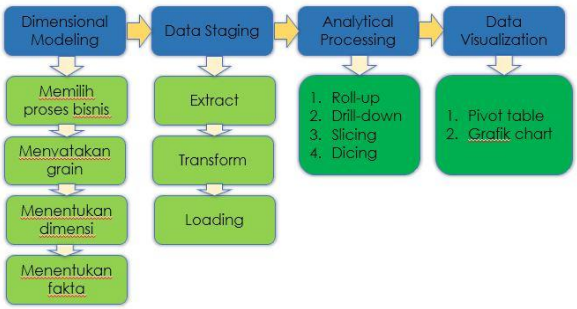


Figure 4. Analysis Data Mart

Metode yang digunakan dalam pembangunan *data mart* yang adalah mengikuti metode pembanguan *data warehouse* yang telah disesuaikan dari Ralph Kimball, diantaranya terdiri dari teknik *dimensional modeling*, *data staging*, *analytical processing* dan *data visualization.*

2.3.1 Dimensional Modeling

Dimensional modeling is the analysis phase to draft in the form of multidimensional data model, multidimensional modeling of this data is an initial stage in building the architecture of the data in the data mart schema

1. *Select the business process to model*

At this stage is to understand and choose which business processes that will be used in multidimensional data model to be built. Based on the analysis and interviews conducted, it was decided the establishment of a data mart orientation carried out on some business processes, including the following:

1) The production process.

The production process is a series of continuous processing operations are carried out at the production, of which consists of the production process of sizing, beaming production process, the production process of weaving, drawing production process, the production process and the process of inspecting warping.

2) Process thread storage.

A yarn storage process activities regarding the importation of yarn, yarn storage and distribution of yarn according to the request for the preparation of the production process in the warehouse department yarn.

3) Process fabric storage.

The process of storing a cloth fabric storage activities results from a production process in the warehouse department fabric.

2. Declare the grain of business process

Grain is the fact that the data of the candidates can be analyzed. Stating grain or granularity means determining what records will be used on the fact table. Below is an explanation of these stages, which determined the information needs are to be used in accordance with the business processes that have been at the stage of choosing a business process.

Table 4. *Grain* of Business Process

Business Process	*Grain*
Proses produksi	Informasi produksi sizing
	Informasi produksi beaming
	Informasi produksi AJL
	Informasi produksi WJL A
	Informasi produksi WJL C
	Informasi produksi warping
	Informasi produksi drawing
	Informasi produksi inspecting
Proses penyimpanan bahan baku	Informasi stok benang
Proses penyimpanan kain	Informasi stok kain

2. *Choose the dimensions that apply to each fact table row*

Dimensions are used to explain the information to the needs of businesses that used to support a fact so do multidimensional analysis. Here is an explanation of the dimensions that will use the data mart:

Table 5. Dimension Used

Strategic Information	Dimension
1. Information on the number of warper sizing production based on raw materials and lots in the period of the day, month, year. 2. Information on numbers of long (yard) on the production of raw materials and sizing based on the lot within a period of the day, month, year. 3. Information on the number of beam beaming production based on raw materials and lots in the period of the day, month, year.	1. bahan baku 2. lot 3. waktu

Strategic Information	Dimension
4. Information on numbers of long (yard) on the production of raw materials and beaming by lot within a period of the day, month, year.	
5. Information on numbers of long (yard) on the production AJL based on the type of fabric and machines in the period of the day, month, year. 6. Information on numbers of long (yard) on WJL a production based on the type of fabric and machines in the period of the day, month, year. 7. Informasi jumlah panjang (yard) pada produksi wjl c berdasarkan jenis kain dan mesin dalam periode tanggal, bulan, tahun.	1. kain 2. mesin 3. waktu
8. Information on production warping beam number based on the type of fabric in the period of the day, month, year. 9. Information on numbers of long (yard) on the production of warping based on the type of fabric in the period of the day, month, year.	1. kain 2. waktu
10. Information on the number of beam production drawing based on the type of fabric in the period of the day, month, year.	1. kain 2. waktu
11. Information on numbers of long (yard) on inspecting production based on the type of fabric and machines in the period and month. 12. Information on the amount of fabric std inspecting production based on the type of fabric and machines in the period and month. 13. Information on the amount of fabric nstd inspecting production based on the type of fabric and machines in the period and month.	1. kain 2. mesin 3. waktu
14. Information on the number of incoming thread yarn warehouse based supplier and grade in the period and month. 15. Information on the number of threads out shed yarn based supplier and grade in the period and month.	1. supplier 2. grade 3. waktu
16. Information on the balance amount pd cloth fabric warehouse based on the type of fabric and the buyer in the period and month. 17. Information on the balance amount sp cloth fabric warehouse based on the type of fabric and the buyer in the period and month. 18. Information on the balance amount dp cloth fabric warehouse based on the type of fabric and the buyer in the period and month..	1. kain 2. buyer 3. waktu

3. Identify the numeric fact that will populate each fact table row

At this stage is the selection of facts that will populate the fact table, where the facts have to be in accordance with the grain and the dimensions specified in Table 4 and Table 5.

Table 6. Fact Used

No	*Grain*	Fact
1	Informasi produksi sizing	*Fact* sizing
2	Informasi produksi beaming	*Fact* beaming
3	Informasi produksi AJL	*Fact* AJL
4	Informasi produksi WJL A	*Fact* WJL A
5	Informasi produksi WJL C	*Fact* WJL C
6	Informasi produksi warping	*Fact* warping
7	Informasi produksi drawing	*Fact* drawing
8	Informasi produksi inspecting	*Fact* inspecting
9	Informasi stok benang	*Fact* yarn stock
10	Informasi stok kain	*Fact* grey stock

3.1 Data Staging

Staging data analysis is done by using the process of ETL (Extract, Transform and Load). This analysis aims to determine what data is used, extracting, conditioning schemes and processes the data with the need to move data from the data source to data marts.

1. *Extract*

Extract process is to determine the stage of your table and fields to be extracted from the data source to data marts. As one example of the data extraction process from data source to data marts are as follows:

Table 7. Extracting on Sizing

Nama Tabel	*Field*
tbl_sizing	id_sizing
	id_bahan_baku
	id_lot
	warper
	creel
	panjang_yd
	tanggal

The process of extracting the sizing table to do the retrieval of data from the production OLTP database. The extracted column is a column id_sizing, id_bahan_baku, id_lot, warper, creel, panjang_yd and date.

2. Transform

Transform process is a process of conditioning the schematic form of data, be it a table or attributes to fit your needs. Transform process is done cleaning and conditioning.

1. Cleaning

Cleaning process is the process of cleaning data that is not needed from the tables that have been extracted, which removes unused fields. Here is one example of the cleaning process is done.

Table 8. Cleaning on Sizing

Nama Tabel	*Field*	*Field* Hasil *Cleaning*
tbl_sizing	id_sizing	id_sizing id_bahan_baku id_lot panjang_yd tanggal
	id_bahan_baku	
	id_lot	
	warper	
	creel	
	panjang_yd	
	tanggal	

2. Conditioning

Conditioning process is a continuation of the cleaning process, the data that has been through the cleaning process will be changed the format of the operational data into a data mart format. Here is sa; ah one example of a table in doing conditioning process.

Table 9. Conditioning on Sizing

tbl_sizing	
No	***Field***
1	id_sizing
2	id_bahan_baku
3	id_lot
4	panjang_yd
5	tanggal

*fact*_sizing	
No	***Field***
1	id_sizing
2	id_bahan_baku
3	id_lot
4	panjang_yd
5	id_waktu

conditioning process sizing table which is changing its name to the table fact_sizing and conditioning field dim_waktu date to table further inserted into the data mart database.

3. Loading

Data that have been through the ETL process will then be stored in a centralized storage logic, ie data mart. Schemes used in the construction of a data mart is a scheme fact constellation.

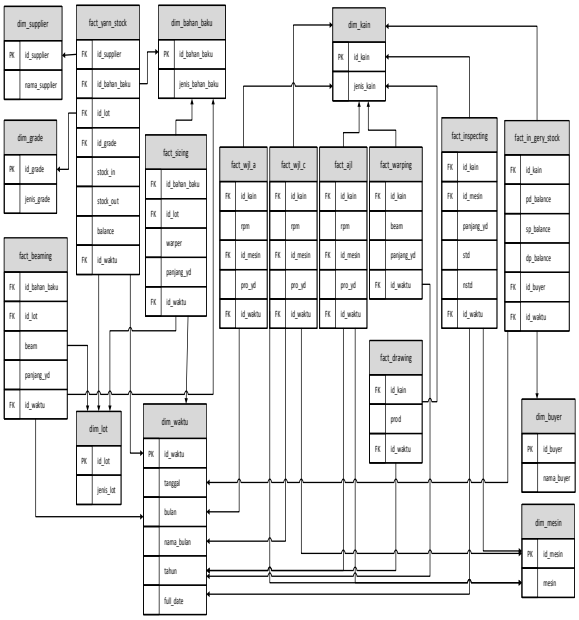


Figure 5. Fact Constellation

3.2 OLAP (*On-Line Analytical Processing*)

OLAP process that will be used in the data mart is slicing and dicing. Both of these techniques have been selected because it is very helpful in the process of filtering the data based on each dimension and derivatives of each of these dimensions.

a) Roll-ups

Roll-up is the process by which we want to see the data globally. For example, display the amount of production per month beaming. Rollp-up can display information based on the amount of production beaming month into year period. Here is an example of a roll-up process can be seen in Table 10 below.

Table 10. *Roll-up*

Tahun	Bulan	Panjang Yd Total
2015	Januari	1900901
	Februari	1821137
	Maret	1875485
	April	1765555
2015 Total		21221993

Tahun	Panjang Yd Total
2015 Total	21221993

b) Dril-down

Dril-down is the reverse roll-up, where we want to see the data in more detail. For example, display the number of beaming in production perbulan. Drill-down can display information based on the amount of production beaming periods per year to the amount of fabric produced in a period of a month. Here is an example of a drill-down process can be seen in Table 11 below.

Table 11. *Drill-down*

Tahun	Bulan	Panjang Yd Total
2015	Januari	1900901
	Februari	1821137
	Maret	1875485
	April	1765555
2015 Total		21221993

Tahun	Bulan	Bahan Baku	Panjang Yd Total
2015	Januari	DTY 75/144	366612
		DTY 75/36	524939
		DTY 75/72	293540
		ITY 135/108	715810
	Januari Total	1900901	
	Februari	DTY 75/144	395252
		DTY 75/36	429500
		DTY 75/72	244000
		ITY 135/108	752385
	Februari Total	1821137	
	Maret	DTY 75/144	661490
		DTY 75/36	298330
		DTY 75/72	369135
		ITY 135/108	546530
	Maret Total	1875485	
	April	DTY 75/144	397010

		DTY 75/36	324704
		DTY 75/72	564800
		ITY 135/108	479041
	April Total	1765555	
2015 Total	21221993		

c) Slicing and dicing

Slicing and dicing is the process of taking pieces of the cube by specific values in one or more dimensions. For example, to see the beaming production produced by year and month. Here the process of slicing and dicing can be seen in Table 12 below.

Table 12. Slicing and Dicing

Tahun	Bulan	Bahan Baku	Panjang Yd Total
2015	Januari	DTY 75/144	366612
		DTY 75/36	524939
		DTY 75/72	293540
		ITY 135/108	715810
	Januari Total		1900901
	Februari	DTY 75/144	395252
		DTY 75/36	429500
		DTY 75/72	244000
		ITY 135/108	752385
	Februari Total		1821137
	Maret	DTY 75/144	661490
		DTY 75/36	298330
		DTY 75/72	369135
		ITY 135/108	546530
	Maret Total		1875485
	April	DTY 75/144	397010
		DTY 75/36	324704
		DTY 75/72	564800
		ITY 135/108	479041
	April Total		1765555
2015 Total			21221993

Slicing: *Dicing:*

2015	Januari	DTY 75/144	366612
		DTY 75/36	524939
		DTY 75/72	293540
		ITY 135/108	715810
	Januari Total		1900901

Tahun	Bulan	Bahan Baku	Panjang Yd Total
	Maret	DTY 75/144	661490
		DTY 75/36	298330
		DTY 75/72	369135
		ITY 135/108	546530
	Maret Total		1875485
2015 Total			22300478

3.3 Data Visualization

At this stage all forms of the OLAP analysis results that have been stored in the data mart will be presented in the form of the chart so as to facilitate the user in comparing between the data with other information, in a display that is easy to understand. Complicated data can be simplified when visualized in the form of graphs. Here is an example of presentation of data in graphical form.

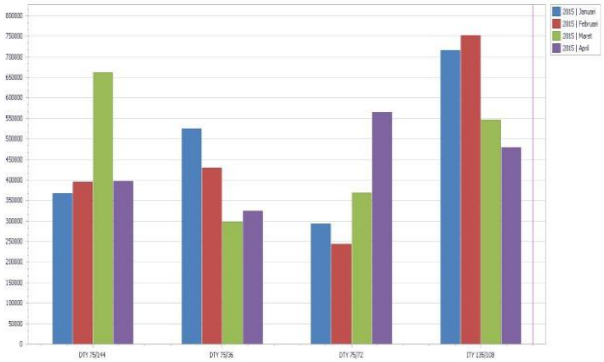


Figure 6. *Bar Chart*

2.4 Software Functional Needs

Analysis of software requirements specification contains a description of the software needs to be built both functional requirements and non-functional requirements. Table specification of functional requirements can be seen in Table 13 and non-functional requirements specifications can be seen in Table 14 below.

Table 13. Software Functional Needs

Kode Kebutuhan	Keterangan
SKPL-F-1	Users can log into the application
SKPL-F-2	Users can update the data in the data mart
SKPL-F-3	Users can make the process of ETL (Extract, Transform, Load)
SKPL-F-4	Users can perform OLAP analysis
SKPL-F-5	Users can view the results of the analysis in the form of tables and graphs
SKPL-F-6	Users can print reports

Table 14. Software Non-Functional Needs

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

2.5 Analysis Functional Needs

Functional needs analysis aims to outline the activities and needs to be applied to the system to be built. The need for application functionality on a data mart to be built consists of a use case diagram, activity diagram, sequence diagram, and class diagram.

2.3.1 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 7 below.

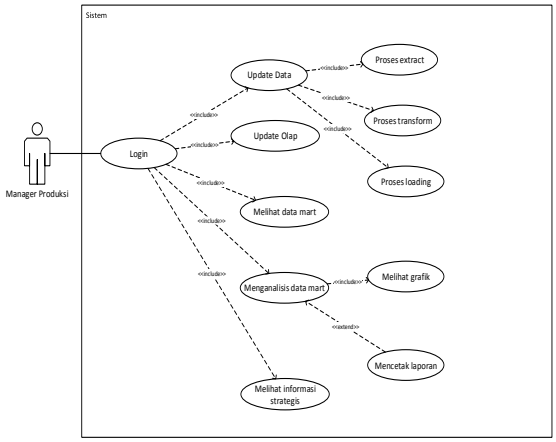


Figure 7. Use Case Diagram

2.4.1 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 8 below.

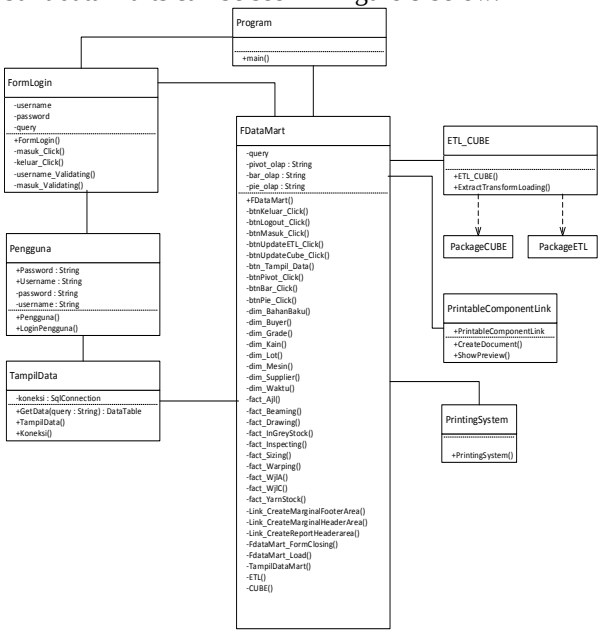


Figure 8. *Class Diagram*

2.6 Interface Implementation

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

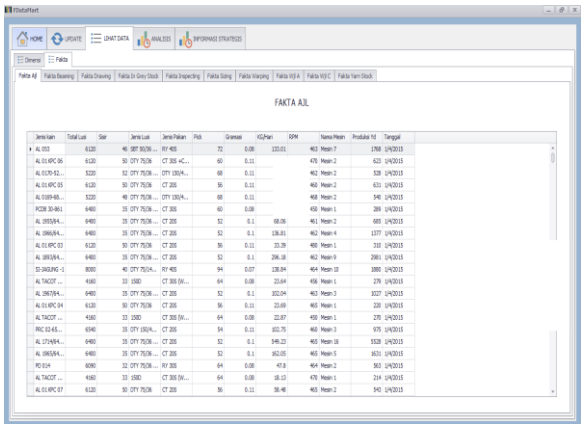


Figure 9. Viewing Data Interface

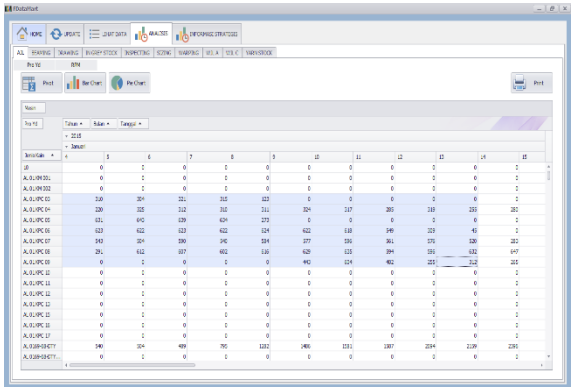


Figure 10. Analithical Interface

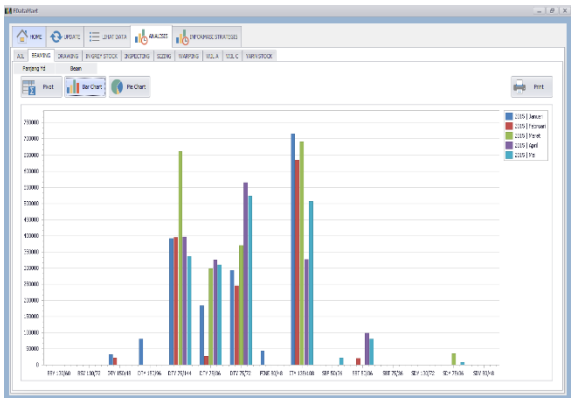


Figure 11. Bar Chart Interface

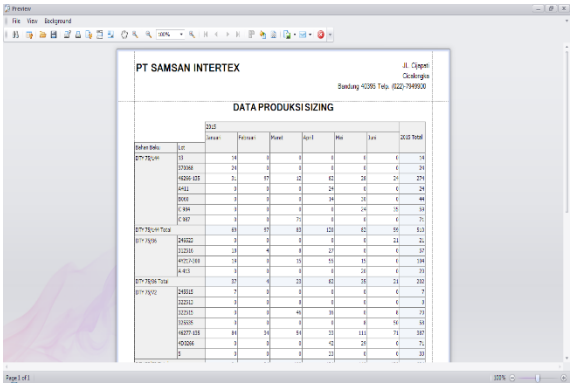


Figure 12. Document Preview Interface

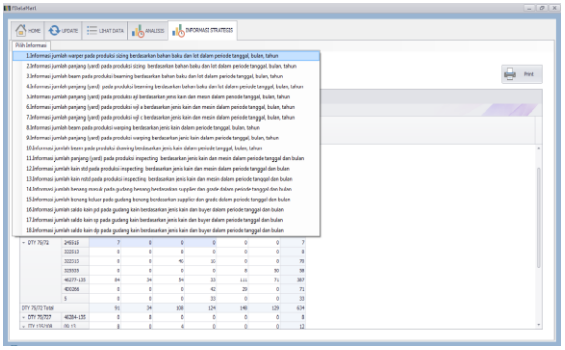


Figure 13. Strategic Information Preview

3. CLOSURE

3.1 Conclusion

Based on research that has been done on the analysis, design, implementation, and testing of the software data marts on the production of PT. Intertex Samsan this, it can be concluded as follows:

1. Application of the data mart helps in integrating the existing data on the production, so as to facilitate the production manager to view and review of data from different sources quickly.
2. required by the production manager for the handling of raw material stock and stock fabrics in production for long-term planning, can provide information on various aspects and business viewpoint succinctly, as well as accelerate the process of evaluating operating performance of production on the production so as to maximize a business decisions are made by the production manager.

3.2 Advice

Here are some suggestions that can be used in software development more data marts are as follows:

1. The system not only analyzes bagain production only, but analyzing all parts in the PT. Samsan Intertex in order to meet the strategic information needs of all parts involved in the company.
2. The software is already built data marts can be developed further by adding a section - the other part is in the company, so that the future can be built data warehouse software for PT. Samsan Intertex.

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