DEVELOPMENT OF DATA MART SOFTWARE ON DEPARTMEN OF SUPPLY AND DISTRIBUTION UNIT & PARTS OF FRIGIA COMPANY

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ABSTRACT

Department of supply and distribution unit & parts of frigia company (PDUP) have a wide range of operational activities . the results of all operational data stored in Microsoft Excel format,the design data of the current PDUP dept quite difficult to change all the data into useful information for business decision making, interest due must collect a range of data from various sources in advance when it will do the analysis process. In addition difficulties also occur when doing a process analysis and reporting, which reports the results of the analysis can not display information from various aspects, the subject and the perspective of different businesses.

Data Mart is a solution that can bring together all of the required data in the needs analysis in a form of integrated data design and easy to analysis. and OLAP is a solution that can optimize the data mart functions and to allow the process of analysis done on a multidimensional can analyze data from a variety of aspects, the subject and the perspective of different businesses that can generate information that is convenient for purposes of business decision making in department of supply and distribution unit & parts of frigia company (PDUP)

After conducting tests, the results of this research are expected to assist PDUP department in analyzing data and reporting so as to facilitate PDUP department in taking a business decision to find out the needs of Frigia company.

Kata kunci : Data *Warehouse,* Data *Mart*, *Multidimensional Model*, Metode Kimball, OLAP.

1. PRELIMINARY

PT Frigia AC is a company engaged in the installation of repair services and installation of air conditioning in the area of Bandung located on Soekarno Hatta road number 511 and has several branch workshops in Peta road number 76 and on Jl. Naripan road number 34. PT frigia was established on 1 February 1974 by notarial deed of raden Soetopo No: 472/01/02/1974. PT Frigia AC is also a dealer of large air conditioner manufacturer nippon denso and appointed to be authorize dealer in west java region since 1982 until now.

PT Frigia AC supplies spare parts, units and vehicle coolers from denso suppliers through the department of procurement and distribution of units & parts (PDUP), systems running in most PDUP departments already use computers to manage data in their business processes, Spare part units and their distribution are stored in microsoft excel files which include order data, invoice data and purchase data. The problems that occur today are PDUP operational data that is difficult to convert into the required information, because each separate data separated. Another difficulty is the difficulty in analyzing monthly and yearly periodic reports, such as periodic reports of purchases, orders, and distribution of units. The difficulty is that existing reports can not display information from various categories of business processes in the PDUP department or multidimensional, and there is no tool to analyze and create reports that can be tailored to business needs, as well as in analyzing unit purchase reports based on category types, orders Or distribution within a certain period. The impact of the problems that occur that resulted in the time required to take a business decision to be hampered due to the length of access to data and information needed.

Based on the problems studied, the purpose of this research is to build data mart software in PT.Frigia Airconditioning in the department of Procurement and distribution of units & parts, while the purpose is to assist the PDUP in integrating operational data of purchasing and distribution of spare parts unit separated between its units And assist the PDUP in terms of analysis and preparing reports based on certain periods or specific categories.

2. LITERATURE REVIEW

Data mart is a subset of data warehouses that support to generate report and data analysis on a unit. The data mart contains information relevant to users who want to make a decisionfor the company.

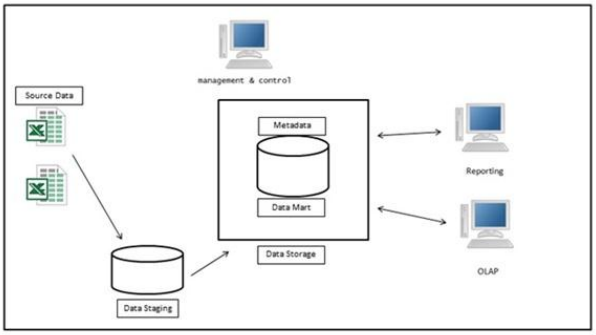


Image 1. Data Mart Architecture [1]

schema that been used on this development is constellation schema, where every fact table connect to one or many dimension table [2]. here is an example of constellation schema .

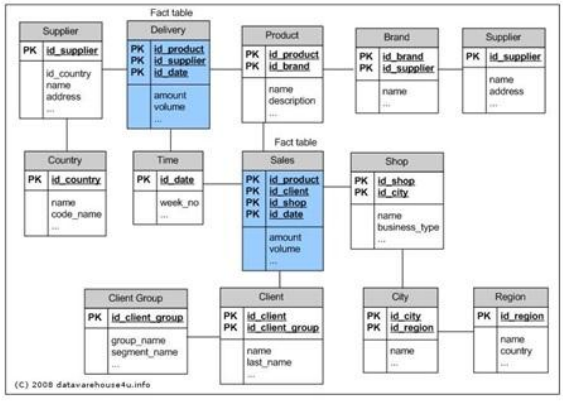


Image 2. *Constelation Schema*

There's four office task that can be done by using data mart , those four task is :

- Reports making
- Data Mining
- Information executive Process
- OLAP

there's a step by step to make a good data mart [3]. those step is :

- Data Extraction

Data Extraction usually deals with a variety of data sources, and uses techniques that correspond to each data source, extracting data from a data source. The data to be extracted is the data selected by the user in accordance with the needs of data mart development.

- Data Transformation

Data transformation involves various forms in combining parts of data coming from different sources .

- Data Loading

After completion of the design and construction of the data mart and the application is used for the first time, will be the initial data into the storage in data mart.

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3. ANALYSIS AND DESIGN

The data in the analysis include order data (data order PT.Frigia to Denso), invoice data (data proof of goods transaction from suppliers), data purchases (data goods already purchased PT Frigia AC from suppliers denso and have been delivered and in store In warehouse) and data delivery (number of delivery from center to branch or from denso supplier to center or branch).

The data source comes from Excel data with the format 97-2003 Workbook (* .xls). Data data is then normalized and become OLTP relation scheme that later facilitate the ETL process.

To illustrate the connectivity between tables in the system used in Frigia Company, following OLTP schema used based on previous Normalization.

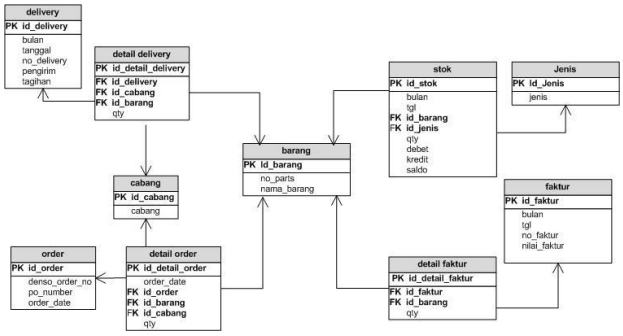


Image 3. OLTP Relation Schema

3.1. Strategic Information Needs Analysis

Strategic information needs analysis is the stage of analyzing any strategic information required by the department of procurement and distribution of units & parts of the data mart to be built. Based on the results of interviews and document analysis in PT.Frigia, the following strategic information needs is :

- Information on the number of units in warehouses purchased by PT Frigia AC in the months and years
- Denso balance information in PT Frigia AC's stock of goods in the period of months and years
- Information on the number of units in warehouses purchased by PT Frigia AC by type in the months and years
- Denso balance information in the stock of PT Frigia AC by type of goods in the period of months and years

- Information on the total value of the rupiah in the purchase invoice in the month and year period
- Information on the number of items on the purchase invoice in the month and year period
- Information on the number of invoices PT Frigia AC in the period of months and years
- Information on the number of goods that PT Frigia AC order in the period of months and years
- Information on the number of order letters and purchase order PT Frigia AC in the period of months and years
- Information on the number of orders of goods based on the PT Frigia AC branch in the month and year period
- Information on the number of deliveries by PT Frigia AC branch in the month and year period
- Information on the number of deliveries by the sender to PT Frigia AC in the month and year period
- Total billing information to PT Frigia AC in month and year period
- Information on the number of deliveries by sender and branch of PT Frigia AC in month and year period

3.2. Analysis of Data Mart Architecture

Analysis of data mart architecture is an analysis performed to get clarity about the process used in building data mart software is good and true. Stages of data mart architecture analysis including :

- Dimensional Modeling
- Data Stagging
- Analysis OLAP
- Deployment

3.2.1. Dimensional Modeling

Dimensional modeling is the stage of the analyst in making the design of data models in the form of multidimensi, multidimensional data modeling is an early stage in building data schema architecture in data mart [4]. As in the process of dimensional modeling consists of 4 stages consisting of :

- Select the business process

Select the business process means understanding and choosing which business processes will be used in the multidimensional data model to be built. Based on what has been described in the analysis of ongoing business processes, there are several business processes in the PDUP department that will be used in data mart in accordance with the business requirements of the PDUP department obtained based on interviews with the PDUP manager and document analysis at the research site.

- Declare the grain

Grain merupakan calon fakta yang dapat dianalisis. Menyatakan grain berarti menentukan apa yang Grain is a candidate fact that can be analyzed. Declaring a grain means determining what the record actually represents in a fact table. Here is an explanation of this stage, where the required information needs what is used in accordance with existing business processes.

- Identify the dimensions

The selection stage of the data generated from the business process is made into dimensions containing descriptive information about facts and associated to address business issues.

- Identify the facts

At this stage selected facts will fill the fact table, in which the selected facts must match the grains and dimensions that have been determined in the previous stage.

3.2.1.1. Designing Data Mart

The design of data mart scheme is an advanced step in the development of data mart based on dimensional modeling, where in this stage the data table mart structure is determined based on the business needs that have been described in the previous stages. This design stage is divided into several stages

- Business Dimension Analysis

At this stage, it explains the business dimension and knows the required dimension model in the data mart based on prior strategic information needs

- Strukture Table Architecture

In this step, the list of dimension table structures and fact tables in the data mart based on the strategic information needs described in the previous table, can be determined dimension table and what facts will be used in the data mart to be built.

fact_jml_order schema

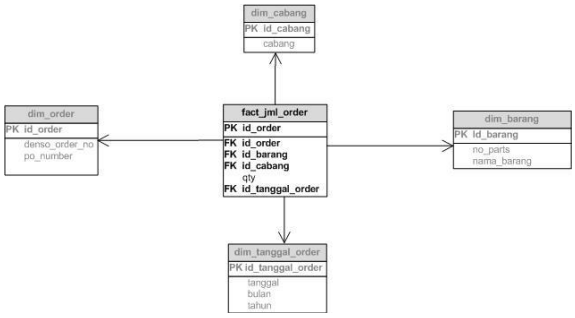


Image 4. fact_jml_order dimensional relation schema

fact_jml_faktur schema

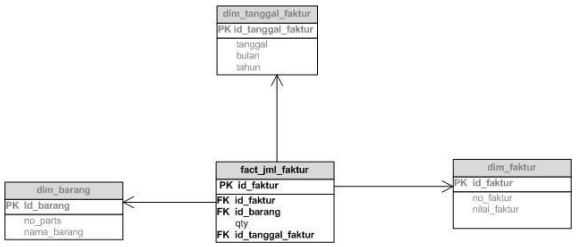


Image 5. fact_jml_faktur dimensional relation schema

fact_jml_stok schema

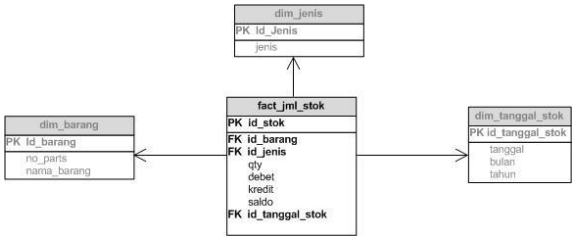


Image 6. fact_jml_stok dimensional relation schema

Skema relasi fact_jml_delivery

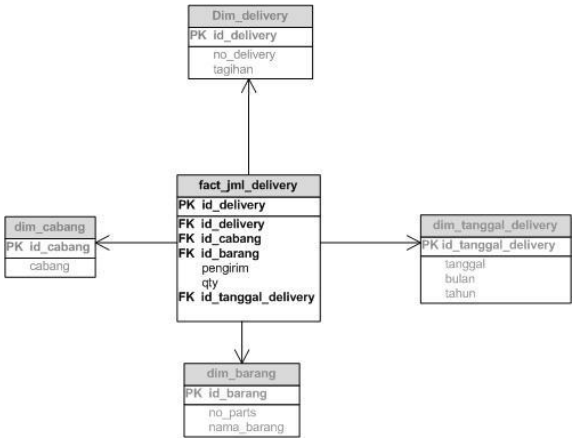


Image 7. fact_jml_delivery dimensional relation schema

- Data Mart Relation Schema

The data relation mart scheme describes the mapping of business dimension of PDUP department consisting of strategic information requirement, business process, fact and business dimension, hence can be known data dimension and data scheme model needed in data mart are as follows:

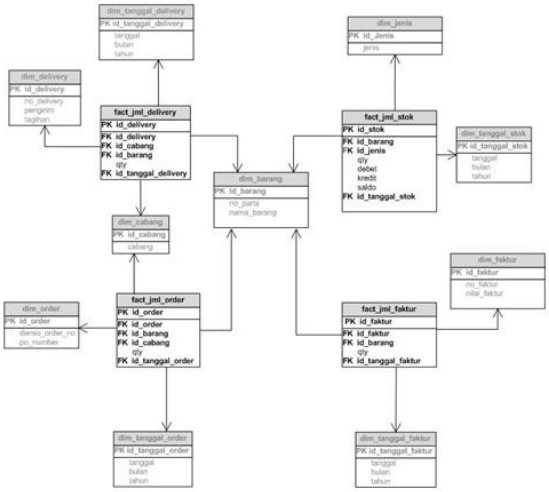


Image 8. Relation schema (constelation schema) data mart departement pengadaan dan distribusi unit & parts (PDUP)

3.2.2. Data Stagging

Analysis of staging data is done by using ETL (extract, transform, and load) process. This staging data analysis aims to convert and reshape data into different forms of OLTP databases into the data mart. The ETL process is a very important process in building the data mart, the higher the truth level of the ETL process the more accurate the information retrieved from the data mart.

3.2.2.1. Extract

The first step in the ETL process is to extract data from the data source. The data to be extracted is the data selected by the user in accordance with the needs of data mart development.

3.2.2.2. Transform

Pada tahap transform terdapat proses cleaning dan conforming.

3.2.2.2.1. Cleaning

Cleaning process cleans unnecessary data from Table that has been extracted, that is to remove unused fields. In this case, does not use the cleaning process because the fields and unnecessary data have been omitted in the normalization process (3NF).

3.2.2.2.2. Conforming

This process is a process for conditioning the shape of a data structure consisting of time attribute conditioning on Table and Table conditioning, so it can be used by data mart. As for some form of conditioning performed is as follows:

- Conforming Date

This stage is done to simplify the filter process in OLAP multidimensional analysis, thereby making it easier to sort data by period of year, month, and day.

tanggal	
bulan	tgl
Januari	11
Januari	11
Januari	13
Januari	15

→

Dim_waktu		
tanggal	bulan	tahun
11	01	2015
11	01	2015
13	01	2015
15	01	2015

Image 9. Conforming date on dimension time (stok , faktur dan delivery)

Order date
05-03-15
15-03-15
15-03-15
24-03-15

→

dim_waktu_order		
tanggal	bulan	tahun
05	03	2015
15	03	2015
15	03	2015
24	03	2015

Image 10. Conforming date on dimension time (order)

- Sort

Sort is done to sort the data based on a certain attribute so that data to be extracted into Table in data mart more neatly and can be adjusted later with the sequence of row numbers and sequence of data entry when entered into data mart as a form of historical record when the data entry to In the data mart.

- Aggregate

Aggregate is done to condition the form of data contents on the attributes that are in each Table fact, such as the total or total attributes. With the aggregate function, it is possible to perform mathematical calculations on an attribute column, such as the sum, count, average and so on functions.

- Lookup

Lookup is performed to condition the data record to be extracted in Table in data mart, by checking the value of each table row that will be extracted, the contents of the value in the Table in the data mart compared with the table value content of the OLTP that will be Extract and then if each line is the same or suitable then continue checking and penelurusan into the next row until no longer found the same value in a row of data, If it has found the row is no longer the new data will be extracted into the end of the line from the lookup process . This technique is commonly called the lookup no match output technique.

3.2.2.3. Load

This process is the next stage of the ETL process, in which data dimensions and facts are loaded into the data mart. Techniques performed in load data are insert techniques and update techniques, where insert techniques will work when there is no data in the Table, and when the data already exists in the Table then the update technique will directly update the data stored in the data mart without eliminating or altering the data Has been there before, but added with new data in accordance with the time period of data update mart feature is done. Here is an explanation of the loading process.

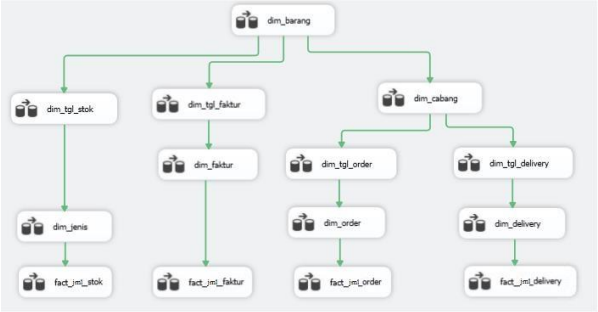


Image 11. Control Flow Load Data

3.2.3. Analysis OLAP

After the data staging process is complete, then the data mart is ready to be used for the OLAP analysis process. This process of analysis is performed to determine the form of OLAP in accordance with the needs of strategic information. OLAP displays and represents data multidimensional [5] Which aims to facilitate the process of analysis of an information.

For the OLAP process, the analytical techniques to be used are roll-up and drill-down. Where the roll up and drill down techniques allow the user to view detailed or concise information (global). The technique is chosen because it is very helpful in the process of filtering data based on each dimension or derivative of each dimension. Filtering data is not only based on one dimension, but can also of some or all dimensions. In addition, with these three techniques the information needs in the department of Procurement and distribution of units & parts (PDUP) has been met. Here is an explanation of the OLAP technique used based on the strategic information needs of the PDUP department. Here is an example of the process olap from one dimension of fact data mart PT.Frigia dept PDUP

3.2.3.4 Proses OLAP untuk Stok Unit dan Barang

The assumption used is when the PDUP wants to know the amount of stock of goods purchased from suppliers by type in the period of a particular month

and year. OLAP process that can be used for this strategic information needs are:

- Roll up is used to view the summary of the number of units and spare parts for the year period.
- Drill down is used to view detail of unit and spare parts by type in the month and year period.

Table 1 shows the Roll up process which will display the Table structure to present the number of units and spare parts in the year period. The sign states data in roll-up condition:

Table 1. Roll up for supply parts and items

Nama Unit dan spareparts	Tahun	
	⊞ 2014	⊞ 2015
⊞ Unit dan spareparts	1470144	1682325

From the results of Table roll up in Table 1 can be done drill down stage if you want to see the number of units and spare parts by type in the period of months and years. The sign states data in drill down condition. Drill down results can be seen in Table 2.

Table 2. Roll up for supply parts and items

Nama unit dan spareparts	Tahun			
	⊞ 2014		⊞ 2015	
	⊟ Bulan-1	⊟ Bulan-n	⊟ Bulan-1	⊟ Bulan-n
⊞ Unit dan spareparts	124953		152758	
⊟ Spareparts car	41643		51437	
⊟ Spareparts bus	26423		22312	
⊟ Unit car	22591		36123	
⊟ Unit bus	15512		12173	
⊟ Freezer	13574		22152	
⊟ Xpro	5210		8561	

3.2.4. Deployment

At this stage all forms of analysis results that have been done combined into a single unified application that becomes a liaison between data mart with the user so that it can facilitate users in accessing data and information contained in the data mart [6]. As before presented in a form of application that can provide information to users, there are data that need to be visualized into a graphic form to further facilitate users in reading and understanding information quickly.

VISUALISASI DATA

In this stage, the existing strategic information needs are presented in the form of an interface page in the form of data visualization into graphical form which enables to facilitate the management of the company in reading or obtaining information quickly. Data graphs are presented in the form of line charts.



Image 12. Data Visualization

4. FUNCTIONAL REQUIREMENTS

Use Case is a function description of a system from a user perspective. The use case works by describing the typical interaction between the user (the user) of a system with its own system through a story of how a system is used. The sequence of steps that describes the user and the system is called a scenario. Each scenario describes the sequence of events. Each sequence is initialized by person, other system, hardware or time sequence. Thus, it is commonly said that use cases are a series of scenarios that are combined together by the general purpose of the user [7].

The functionality requirement analysis is performed to provide Imagean about the system running on Datamart Software.

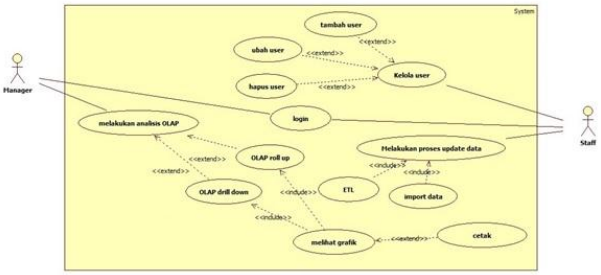


Image 13. Use case Data Mart Software PDUP department of Frigia Company

While the class diagram is a diagram that is used to display some classes and packages that exist in the system / software that we are developing. The class diagram provides a static image / diagram of the system / software and the relationships it contains [8].

Class diagrams also mengiagekan system structure in terms of defining the classes that will be made to build the system. Class diagram is created so that classes created on the software in accordance with the design of class diagrams that exist in the design documentation Class diagram data mart software PT

Frigia AC dept PDUP can be seen in the following image:

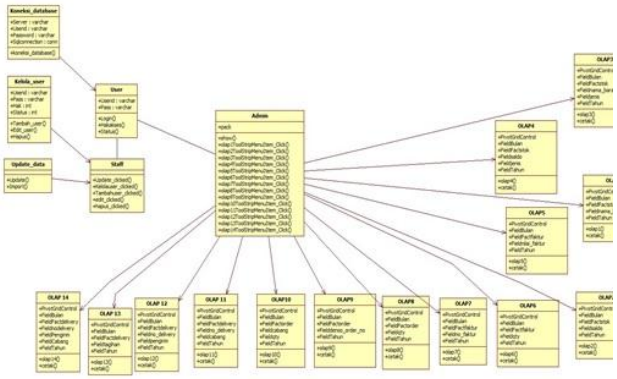


Image 14. Class Diagram Software PDUP department of Frigia Company

5. SYSTEM PLANNING

6.1. Structure Menu Design

The design of the menu structure is the Imagean application usage path so that the built application is easy to understand and easy to use. The design of datamart software menu structure can be seen in the following Image

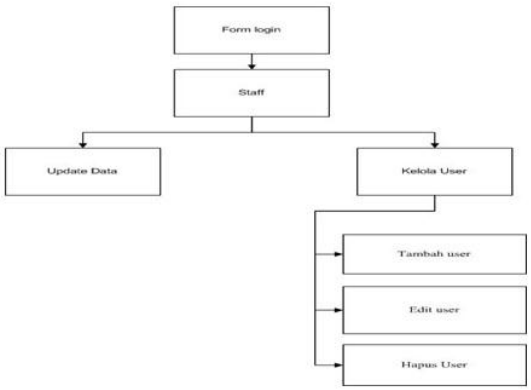


Image 15. Menu structure Staff

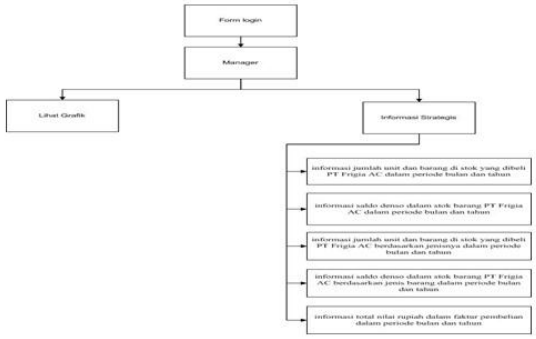


Image 16. Menu structure Manager

6.2. Semantik Network

It is an illustration of the graphical relationship between objects that mengandmagekan relationship between these objects. Semantic network on data mart software. There are 2, semantic manager and semantic staff, the semantic network can be seen in Image 17 and Image 18.

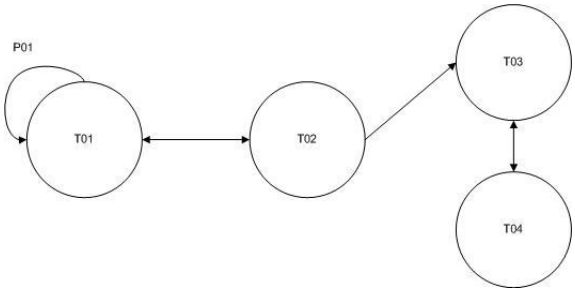


Image 17. Manager Semantik Network

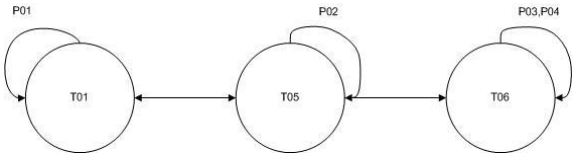


Image 18. Staff Semantik Network

6. FINALE

7.1. Conclusion

Based on the results of the analysis and testing that have been done on data mart software in PT Frigia AirConditioning it can be concluded that:

- The application assists the department of procurement and distribution of units & parts in integrating different data sources and has

different data structures and formats for the analysis and decision support needs of managers and finance of PT Frigia.

- Applications facilitate the procurement and distribution department of units & parts in terms of analysis and reporting in accordance with the needs of strategic information required.

7.2. Suggestion

Based on the results of research that has been done, there are some suggestions that can improve or optimize the performance of application functions built, including is to add other features such as supply chain management, which later the system can manage the unit of stock spare parts and goods needed PT Frigia to Denso Up to the PT Frigia AC customer, so this application can be developed into Business intelligence for reporting and analysis.

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