THE DEVELOPMENT OF THE APPLICATION OF A DATA WAREHOUSE AT PT JKL

Choirul Huda; Rita Puspita Sari; Muharram Hasein Haekal; Tri Agustaria
Computer Science Department, School of Computer Science, Bina Nusantara University
Jl KH Syahdan 9, Jakarta 11480, Indonesia.
choirulhuda@gmail.com

Abstract: One rapidly evolving technology today is information technology, which can help decision-making in an organization or a company. The data warehouse is one form of information technology that supports those needs, as one of the right solutions for companies in decision-making. The objective of this research is the development of a data warehouse at PT JKL in order to support executives in analyzing the organization and support the decision-making process. Methodology of this research is conducting interview with related units, literature study and document examination. This research also used the Nine Step Methodology developed by Kimball to design the data warehouse. The results obtained is an application that can summarize the data warehouse, integrating and presenting historical data in multidimensional. The conclusion from this research is the data warehouse can help companies to analyze data in a flexible, fast, and effective data access.

Keywords: Data Warehouse; Inventory; Contract Approval; Inventory; Dashboard

INTRODUCTION

A variety of science and technology aspects is always experiencing progress, in accordance with the development of the way human beings think and the suitability of the times. One of the rapidly developing technologies today is information technology, which can help decision-making in an organization or a company. The data warehouse is one form of information technology that supports those needs, as one of the right solutions for companies in decision-making. With the data warehouse, allowing the data that consists of a recording of an incident in a certain period of time and consists of a variety of aspects or point of views can be proceeded and served more effectively, flexible, and fast. Ref [1] stated that data warehouse system is connected with different data resources (heterogeneous) and is used by the decision makers to analyze the condition and the development of organizations.

Ref [2] explained that the role of technology in daily life is more important at this moment of time. Yet the lack of dynamically presented information and cross time often becomes a problem in analyzing the conditions of companies. The recorded data, which is getting more and more abundant, can cause focus-loss in analyzing data, and also need to take quite a long time to help decision-making. The data warehouse, as one of the information technology aspects, is the right solution for companies in decision-making. With the data warehouse, all the data which are related with decision-making can be stored in sufficient cross time, and also can produce a complete, dynamic, and fast media presentation of information. The analysis is conducted on the condition of companies, the analysis of the strength, weakness, opportunity, and threat, so that companies' needs could be identified.

PT JKL, as a joint venture company with Manufacturer Hanover Leasing Corporation, United States of America which established in 1982, is one of the oldest funding companies in Indonesia. PT JKL was spreading wings in the fields of leasing, consumer financing, and factoring, and then became independent multi finance company with the highest ranking in Indonesia and reflected strong financial performance, experienced management team, high capital, and various competitive advantage as one of the biggest domestic multi finance company in Indonesia, which make the company continuously hold against economic cycle and the volatility of the market. As the growth of the transaction, historical data that is produced is getting more difficult to be analyzed using static format of the report as current presented.

It takes quite a long time to gather many reports from various period of printing to help the leadership make decisions. Analyzing from various point of views also needs a very long time, so that the decision-making at PT JKL needs a tool that help presenting information faster, complete, and dynamic. The availability of the application of data warehouse at PT JKL is expected to help meeting the needs of the application of data warehouse, so it can help the process of decision-making. The objective of this research is to be able to analyze the needs at PT JKL

with the support of the application of data warehouse, so the decision makers can obtain information faster, complete, accurate and dynamic.

Literary Review

The definition of data warehouse, according to ref [3], is a collection of data that is oriented on the subject, integrated, time variant, and a collection of data had not changed that supports the decision making process management. Moreover, it can be used for multiple purposes, including the need for unknown future. Referring to ref [3], data warehouse has four main characteristics, which are subject oriented, integrated, non-volatile, and time variant.

According to ref [4], Online Analytical Processing (OLAP) is a dynamic blended analysis and a combination of a large amount of multidimensional data. According to ref [5], Dashboard is a component that generally has the Performance Management Systems, Performance Measurement Systems, BPM Suites, and BI Platforms. A dashboard provides a visual display from important information that is combined and managed in a single screen, so the information can be understood enough with all see, and also to be explored.

Inventory, Asset, Credit, Contract, and Report

Ref [6] stated that, assets are the value of something possessed by the company. One which is included as an asset is a building or edifice that is possessed by the company. So, if a company has a building worth one billion rupiah, the assets which are counted is that one billion rupiah. Ref [6] stated that a credit-sale transaction, if the order of a customer has been completed with shipping goods or the delivery of service, for a period of a certain time, the company has an account receivable to customers.

A contract is an event where a company or an individual that make a mutual promise to do a thing based on mutual agreement. The form of that agreement is a series of words that contains the spoken or written promises and agreements. According to Ref [6], a report is the final result of a process which contains information that is out of a system. A report can be computer printed and a presentation on a computer screen monitor.

METHOD

According to ref [7], the construction of data warehouse has nine stages as it is considered to be a reference in data warehouse development at PT JKL. Firstly, the selection process, which is the right selection process will refer to a certain basic data mart. What is done in this stage is the selection of the subject of problems that is faced from the data warehouse that is going to be made, then continued with identification business process and the need that is related with that subject of the problem. Based on the analysis result of the process of business and the necessity of PT JKL, there are three process that includes the snapshot of the contract agreement, the supervision on the assets, and the snapshot of the assets.

The second stage is grain selection, which determines all the things that are going to be shown in the table of fact. When choosing the grain for the table of fact, the table of dimension can be identified, for example, in the process of supervising the asset, the finance to repossess asset must be shown based on time. Time can be used as the table of time dimension to determine the calculation of the cost for repossess asset. The third stage is identification and dimensional adjustment, which is based on the user's needs. Dimension sets the context to give a statement about facts in the table of fact. Doing the analysis of relation with the measurement of grains that had been determined to the information needed.

The fourth stage is the selection of facts that are going to be used for data mart. All the facts should be expressed at the level proposed by the grain, which are the fact of contract agreement's snapshot, the fact of the asset, and the fact of the asset's snapshot. The fifth stage is the storage of pre-calculation in the table of fact. Once the table of fact is chosen, each of those tables of facts should be considered a remake to determine whether there is still a chance to do a calculation or pre-calculations, which is the need to save a calculation of the total cost of installment, and also the interest loan, the total cost to repossess and et cetera.

The sixth stage is the installation of table of dimension. In this stage, returning to the table of dimension and adding as much description texts as possible into the table of dimension. Then, completing the table of dimension which has been determined in accordance with the need. The seventh stage is the selection of duration from the database. The duration measures how long and how far to return to the table of fact. The data that comes to the data warehouse is five years historical data.

The eighth stage is the determination of the need to slowly keep track of the change of dimension. The change of dimension can occur along with the time passing in the table of dimension. The change which referred to is the addition of the data or the change of the data. There are three kinds of slowly changing dimensions, which are the attribute of the changing dimension is re-written, the attribute of the changing dimension causes a new dimension record is made, the attribute of the changing dimension causes an alternative attribute is made so that both of them can be accessed on the same dimension record.

The ninth stage is the determination if physical design. In this stage, we are going to discuss the problems of physical design. The most crucial and influential physical design for end-user to the

data mart is the physical order from the table of fact to the disk, and the presence of stored pre-store or aggregations. Other that those problems, there are problems of physical design that affecting the administration, back up, indexing performance and safety. The design of the data warehouse by using this Kimball's method is going to be explained in the next section which is the design of the data warehouse.

RESULTS AND DISCUSSION

According to the stages that had been done and referring to the methodology that had been used, the image of business model and data warehouse are obtained at PT JKL as it was explained below.

Vision and Misision

PT JKL has a vision to become a financial solution partner which also contributes to the improvement of the public living standard by focusing on providing a trustworthy and effective financial solution for the consumers. Reaching a great rate of the returning capital and creating a positive image in the capital market, providing a workplace that is conducive, fair, and challenging, that is going to encourage the best potential of the employees. Establishing a long term partnership relations. Giving a positive contribution for the community where we are operating.

SWOT Analysis

According to SWOT (Strength, Weakness, Opportunity, Threat) analysis, PT JKL has the strength as one of the major role in the biggest industry that stands alone, providing the funding of heavy equipment and four-wheeled vehicles which owns diversifies and other kind of vehicles. The weakness which is identified, relates to the difficulties to analyze the data because the provided data is still in a form of detail data, so that it takes a long time in the process of decision-making. The opportunity, that is owned, is the new market segments, including international market, and the opportunity because the competitors cannot satisfy the customer's demand. The threat, that is faced, is a new competitors in the same area and the busniess activity that is competing.

Critical factors

Based on the factor's result, that has an important role for the company's development to decide the business' strategy, some factors can be identified: (1) The development of human resources to run the company's operational activites. (2) Increasing the best services will attract many consumers to give their trusts for the company. (3) Increasing the number of customers to gain more profits. (4) The expansion of the undertaking business to branches as the company's first step of expanding the area in Indonesia.

Data Subejct

The data subject is a collection of datas, that can be used to show some information that are required for the executives. The data subject at PT JKL can be seen in the following table:

Table 1: Data Subject

No	Variable	Description
1	Customer	Showing the information from the customer.
2	Employee	Showing the information from the employees.
3	Product	Showing the information from the product package which is offered.
4	Asset	Showing the information from the asset/object which is in the process.
5	Insurance	Showing the information from the Insurance Company which is going to provide the insurance to credit.
6	Inventory	Showing the information from the object that has been withdrawn from the customer.
7	Principal	Showing the information from the principal debt.
8	Interest	Showing the information from the number of loan interests.
9	Supplier	Showing the Supplier information.
10	Repossess	Showing the information about the improvement of the goods
11	Area	Showing the information about the available area in Indonesia.
12	Branch	Showing the information about Branch from the area.

Business Function

Based on the running system analysis result at PT JKL, a busniess function is obtained as the following table:

Table 2: Business Function

No	Description
1	The business strategy of the company
2	The manager and the stokeholder
3	The manager of financial information manager
4	The customer's data analysis
5	The unpaid credit management
6	The bill's check in accordance of maturity
7	The supervision and the manager of the assets
8	The process of the income goods into the inventory
9	The improvement of inventory goods
10	The auction of inventory goods

Matrix

Matirx is used as the explanatory entanglement or the relation between two aspects in the ongoing system. It is made in a form of table that contains the value of 'x', which means do have a relation, meanwhile '-', which means do not have a relation.

Table 3: The Matrix of the Organization Unit Vs Location

Organization \ Location	Head Office	Region	Area	Branch
Board of Commissiones	X			
Board of Directors	X			
Audit Committee	X	X		
Remuneration Committee	X	X		
Nomination Committee	X	X		
Risk Management Committee	X	X	X	X
Corporate Secretary	X	X	X	X
Regional Manager/Regional Coordinator		X		
Branches				X
Marketing Division			X	X
Operation Division			X	X

Table 4: The Matirx of Organization Unit Vs Data Subject

Organization \ Data Subject	Customer	Employee	Product	Asset	Insurance	Inventory	Principal	Interest	Supplier	Repossess	Area	Branch
Board of Commissiones		X		X					X			
Board of Directors		X	X	X	X							
Audit Committee		X		X	X							
Remuneration Committee		X										
Nomination Committee		X										
Risk Management Committee	X	X	X	X	X				X		X	X
Corporate Secretary		X		X	X						X	X
Regional Manager/Regional Coordinator		X	X	X	X	X						
Branches	X	X	X	X	X							
Marketing Division	X	X	X								X	X
Operation Division	X	X	X			X	X	X		X	X	X

Table 5: The Matrix of Business Function Vs Organization Unit

Organization \ Data Subject	Business Strategy	Manager and stokeholder	Financial information manager	Customer's data analysis	Credits management	Bill's check	Supervisor and manager of the assets	Inventory process	Improvement of inventory goods	Auction of the inventory goods
Board of Commissiones	AR	I	AR							
Board of Directors	AR	AR	I				R			
Audit Committee		AER	AER							
Remuneration Committee	AR						R			
Nomination Committee	AER		AER							
Risk Management Committee			ER				E			
Corporate Secretary	AER		I				I			
Regional Manager/Regional Coordinator		IW	W	I			I			
Branches				AER			I			
Marketing Division				AER						AI
Operation Division				AER	AER	AER	I	AER	AER	AER

Descriptions:

R : Direct Management Responsibility
The organization is responsible to business function.

A : Execution/Policy Making Authority
The organization has the right and authority of business function.

I : Involve in the function
The organization gets involved in business function, but it is not responsible/does not have authority of the business function.

E : Technical Expertise
The organization gets involved and has technical skill that is required by business function.

W : Actual Execution of the Work
The organization that can do patnership activities according to the bunsiness function.

Table 6: The Matrix of the Application and Data Subject

Appilcation	Customer	Employee	Product	Asset	Insurance	Inventory	Principal	Interest	Repossess	Area	Branch
Billing	X		X		X		X	X		X	X
Payment Acceptance		X					X	X		X	X
Repossess				X		X			X	X	X
Inventory				X		X			X	X	X
Inventory Selling	X		X	X	X					X	X

Table 7: The Matrix of Business Function Vs Data Subject

Business Function	Customer	Employee	Product	Asset	Insurance	Inventory	Principal	Interest	Repossess	Supplier	Area	Branch
Business strategy of the company	CRUD	R	CRUD	CRUD	R			RU				
Manager and stokeholder	R		CRUD					CRUD		RU		
Financial information manager	RU		RU	CRUD							RU	CRUD
				CRUD							RU	CRUD
Customer's data analysis	R		R	R		RU					R	CRUD
Unpaid Credit management			R	R			CRUD				R	CRUD
Bill's check according to maturity	R			CRUD	R	R				RU	RU	RU
Supervisor and manager of the asset			R	R		CRUD			RU		RU	CRUD
Incoming process of inventory goods			R			RU			CRUD		RU	CRUD
Improvement of inventory goods			R	R		RU			RU		RU	CRUD
Auction of inventory goods												

Descriptions:

R : Read, the readable data subject in doing the business function.

C : Create, the data subject that can be made in doing the business function.

U : Update, the data subject that can be changed in doing the business function.

D : Delete, the data subject that can be erased in doing the business function.

Table 8: The Matrix of the Business Function Vs Executive

Business Function	Commisioner	Director	Audit Commitee	Remuneration commitee	Nomination commitee
Business strategy of the company	AR	AR	AER	AR	AER
Manager and stokeholder	I	AR	AER		
Financial information manager	AR	I			
Customer's data analysis					
Unpaid Credit management					
Bill's check according to maturity					
Supervisor and manager of the asset				R	
Incoming process of inventory goods					
Improvement of inventory goods					
Auction of inventory goods					

Descriptions:

R : Direct Management Responsibility
The organization is responsible to business function.

A : Execution/Policy Making Authority
The organization has the right and authority of business function.

I : Involve in the function
The organization gets involved in business function, but it is not responsible / does not have authority of the business function.

E : Technical Expertise
The organization gets involved and has technical skill that is required by business function.

W : Actual Execution of the Work
The organization that can do patnership activities according to the bunsiness function.

Table 9: The Matrix of the Business Function Vs the Application

Business Function	CONFINS				
	Billing	Accepting payment	Repossess	Inventory	Inventory Selling
Business strategy of the company					
Manager and stokeholder					
Financial information manager		CRUD			
Customer's data analysis	RU	RU			
Unpaid Credit management	CRUD	RU			
Bill's check according to maturity	RU	RU			
Supervisor and manager of the asset			RU	RU	RU
Incoming process of inventory goods			R	CRUD	RU
Improvement of inventory goods			CRUD	RU	R
Auction of inventory goods					CRUD

Descriptions:

R : Read, the readable data subject in doing the business function.
C : Create, the data subject that can be made in doing the business function.
U : Update, the data subject that can be changed in doing the business function.
D : Delete, the data subject that can be erased in doing the business function.

The need of information

To support the executives in decision-making, informations are needed about the percentage of the instalments, the cost of inventory, the cost of repossess, the quality of contract agreement that had been operating can be seen based on year, quarter, and month.

The problems

Based on the analysis that has been done at PT JKL, its is found several problems that is faced by on the ongoing systems, including the application that is used right now still does not have display format that is flexible, so the information that is limited showed, the operationa data, and relation on the company's OLTP table has a high complexity so the process of managing the data is less effective and efficient that can affect the performance when the data is being accessed. It takes a long time to provide the report that is summarized and multidimensional which is required by the executives in helping to make a decision.

The architecture design

The architecture design of data warehouse that is proposed using the architecture of the centralized data warehouse. The components of the centralized data warehouse's architecture that is proposed is including data sources, data transformation, ETL manager, warehouse manager, the application for users, and meta data. The architecture has the components inclusing data sources that is obtained from the CofinsIM database. The second component is the data transformation, functioning to transform the data from data sources to data warehouse. The third component is the ETL manager that manages several activities or all the applications that are related with the data ETL into data warehouse. The fourth component is the warehouse manager, handling all the operations that are related to the data management in the data warehouse. The last component is the access device, that is used by the user of data warehouse to access the content of data warehouse. To see more detail of the architecture that is proposed as seen in the following figure.
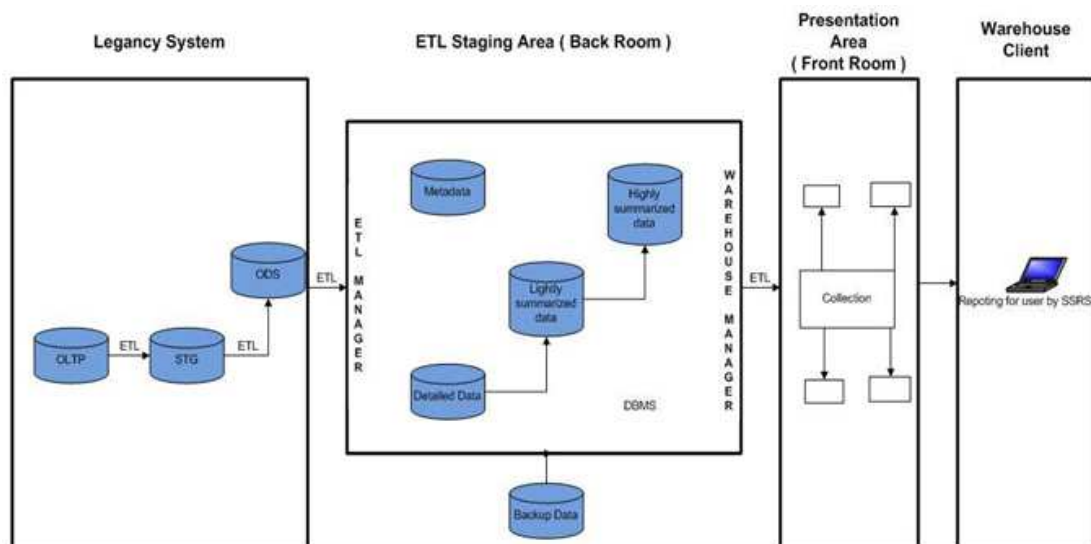

Fig. 1: The PT JKL Architecture of Data Warehouse

The Deisgn of a scheme of stars

Data warehouse that is proposed, designed with the scheme of stars consists of several tables that are functioned as facts followed with several tables that are functioned as dimensions. There are three schemes of stars including the stars' schemes of SS Agreement, SS Asset, and Asset.
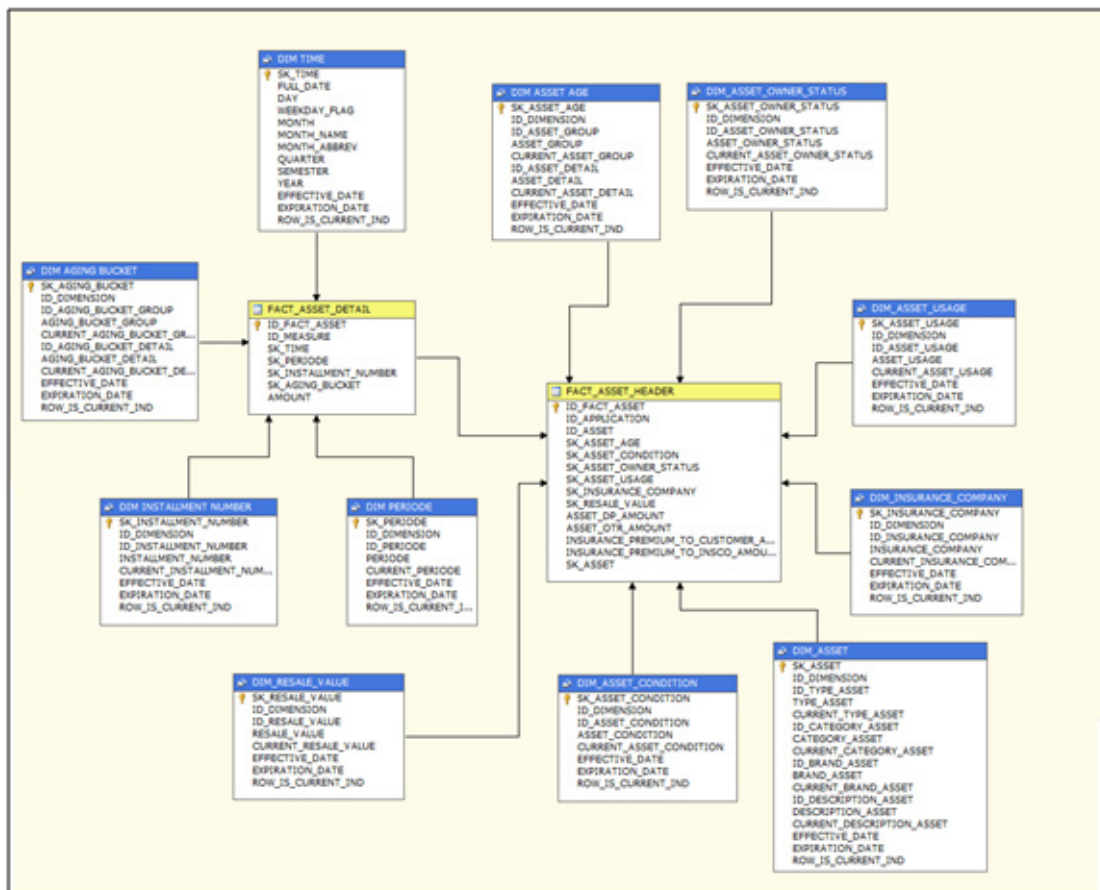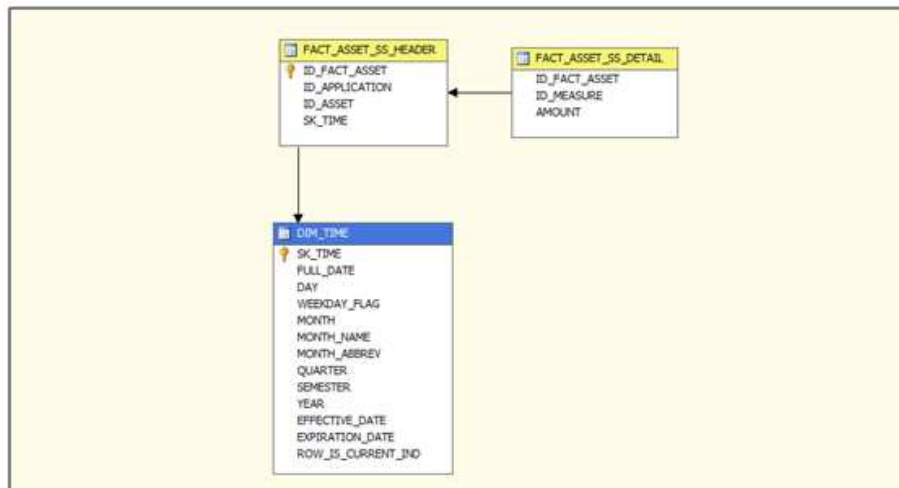
Fig. 2: The Scheme Stars of Fact Asset

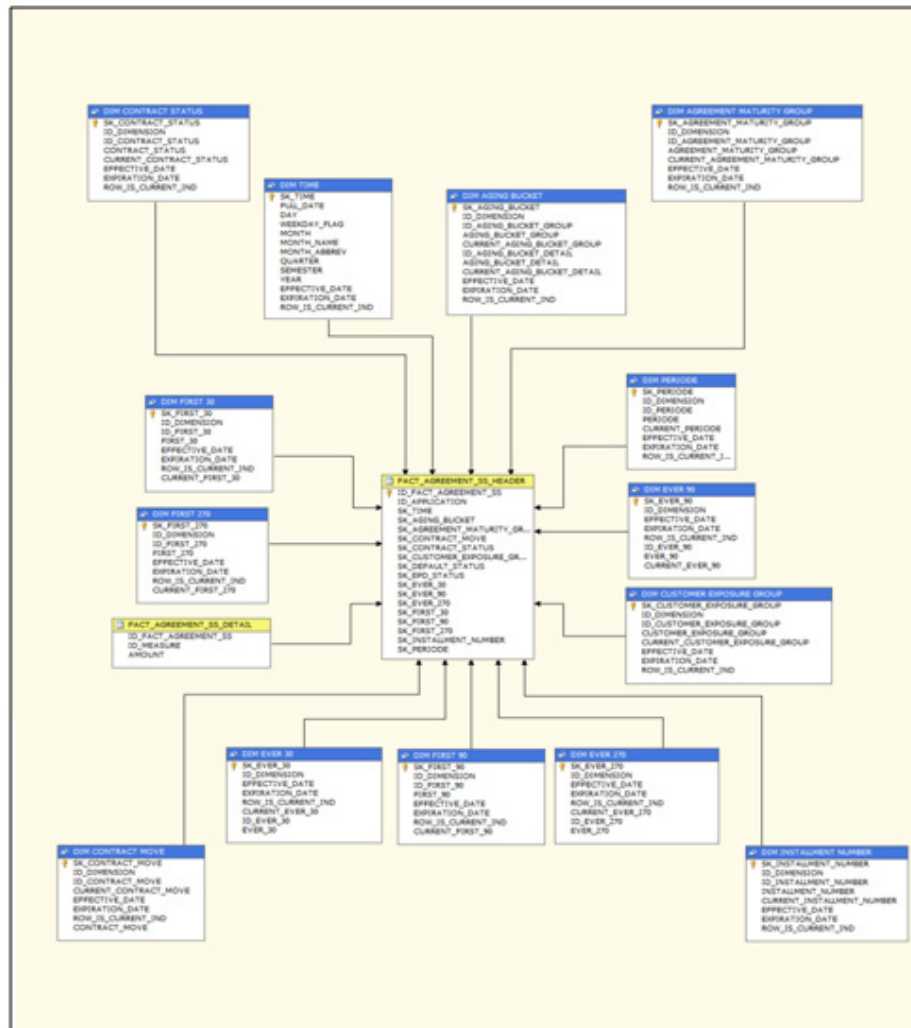Fig. 3: The Scheme Star of SS Fact Asset

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Fig. 4: The Scheme Star of SS Fact Agreement

The Structure of Application Menu

As for the illustration to the process of accessing the dashboard is as follows:
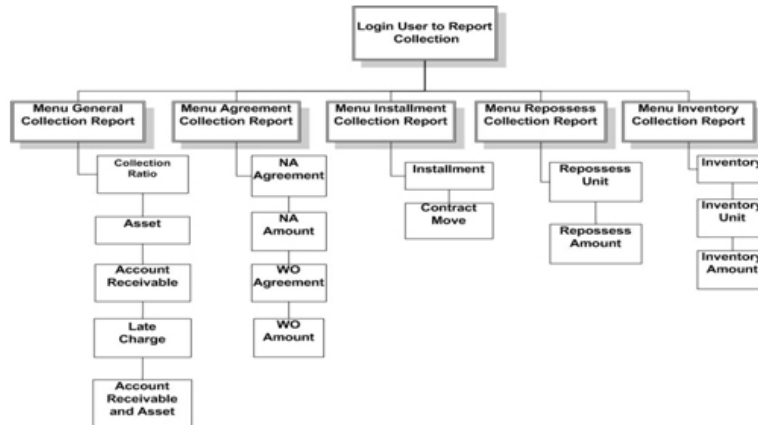

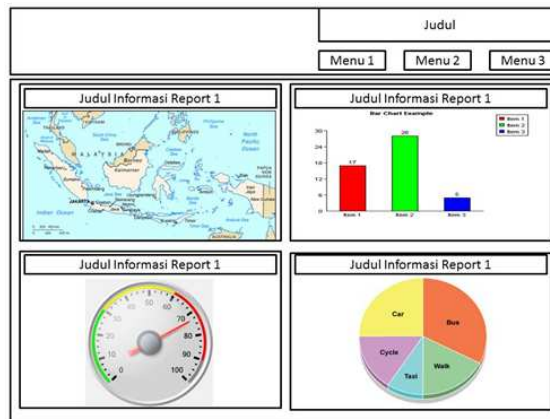Fig. 5: The Hierarchy to the Process of Accessing Dashboard

Fig. 6: The Design of Report Dashboard

The Design of the Application's Display

The display of the application which provides information in a shape of report graphic. Each of the reports provide the information which is required by the managers to help them in making the right decision. The process of providing the data into various forms of bar chart, pie chart and line chart, has already been adjusted with the need of the company in order to be able to analyze the data according to the information that is obtained from the report. Here is the report displays from the result of data analysis obtained from the data warehouse:
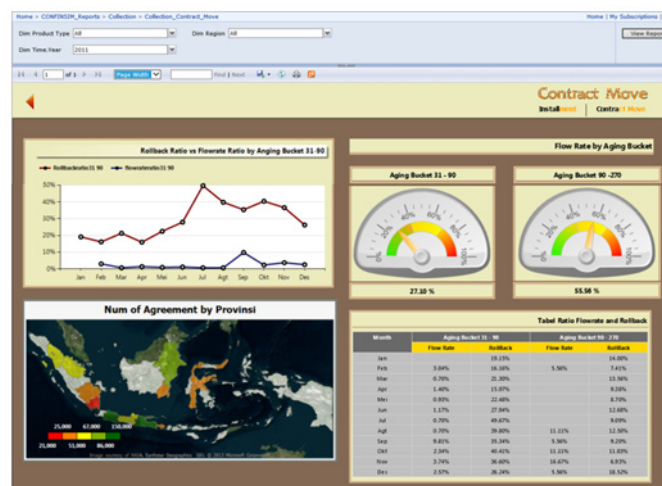

Fig. 7: The Design of Report Dashboard
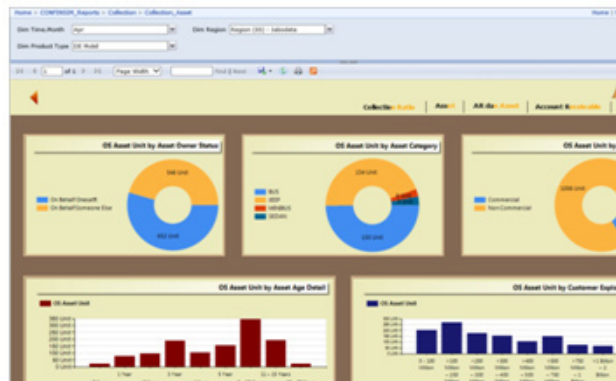

Fig. 8: The Report of Non Accruel (NA)

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Fig. 9: Dashboard OS Asset Unit subject area Collection

The Plan of Implementation

To implement this data warehouse application, the hardware and the related software support are needed that can support. The specification of the hardware includes the server component, a minimum PC with 2 processor Intel® XEON® CPU E5645 @ 2.40 GHz 2.40 GHz, a 64 GB memory, a 693 GB hard disk. The next component is the client, a minimum PC with 2 processor Intel Core 2,6 GHz, a 4 GB memory, a 198 GB hard disk. The third component is Network Interface Card (NIC), a card which is functioned as a bridge from a computer to a computer network. The fourth component is the Switch/Hub, which is used to connect the client to the server. From the software, DBMS Microsoft SQL Server 2012 is needed, and the Program of Data Warehouse Application. And it also needs a Microsoft Window 8 64-bit operating system, x64-based processor.

Table 10: The Schedule of Implementation Activities

	Activity	Weeks											
		1	2	3	4	5	6	7	8	9	10	11	12
1.	The Installation of the Hardware	■											
2.	The Installation of an Operating System and DBMS		■										
3.	The Installation of the Application Program of Data Khasanah			■									
4.	Data Transfer				■	■	■	■	■				
5.	The Manual of Operating Data Khasanah									■			
6.	Training										■		
7.	The Test of the System											■	■

Description : 1 week = 31 hours.

Evaluation

After the design and the implementation of data warehouse application at PT JKL is done, the evaluation result is obtained by doing an interview on the general manager which is the presentation of the report in forms of chart, graphic, and table that has been described based on the user's needs. Moreover, it is also supported by several menus so the manager of the executive can use the dashboard easily. The selection and combination of the display's colors has been compatible with the executives. However, there are several contents that has not been managed well.

CONCLUSION

With the available of this data warehouse, the executives who needs a support to make a decision, get the information that is obtained more completely related to the business function, the format of data which is provided in varies and a lot easier to be understood because the data, that is processed, is summarized data so that it becomes more efficient and effective to predict the need of the company. Through the dashboard application, the executives can see the report which is required quickly with more flexible display.

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