

Development of Warehouse Data Models to Support JNE Delivery Services

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Abstract. In order to help improving the performance of JNE business communities in this globalization era, it is necessary to encourage them to compete with each other in acquiring technology to support all their work activities so that they can be carried out as effectively and efficiently as possible, due to the increasingly dominant role and technology. The data warehouse is one of the concepts oriented to the core components of a business, that is, data can be categorized as a strategic supporting aspect because through the formation of a data warehouse an output can be obtained in the form of a report that can be used as analysis material for the executive in the decision-making process. The objectives to be achieved in this research are to formulate a data warehouse model and application design in accordance with the results of the needs analysis, which can support JNE business actors as a delivery service, as a case study JNE Klaten is used as research object. The methodology used in this study uses analysis and design methods. The method of analysis is carried out by studying literature, conducting surveys and interviews, identifying information needed by executives in decision making, and defining data warehouse requirements which will be built based on Nine-Steps Methodology. The design method is carried out by designing a data warehouse application, as a display interface that contains supporting features from the user side. The results of the research are in the form of data warehouse models and applications that are built based on operational data, which are processed in various dimensions, so that they can form a report to meet the needs of the executive about information and using the data warehouse, the executive can analyze the reports generated from multiple viewpoints easily, and can also be used as a reporting tool.

Keyword: Design, Analysis, Data Warehouse, Strategic, Delivery Service

INTRODUCTION

The need for the presentation of information today must be integrated and continuously increasing. In line with increasingly fierce competition, it requires an optimally integrated system both in terms of information technology that supports the entire process of presenting information, as well as the source of the information produced. The results of all operational data processing that are processed must be in accordance with the needs of the company. The company's ability to obtain information quickly and accurately can be used as a company's competitive advantage in facing the existing competition. In the decision-making process for both short- and long-term periods, business owners of JNE delivery services require various kinds of collaboration data stored in the operational database of this service business. This synergy will certainly require space from the operational database itself. However, the space from the database capacity used to accommodate operational data must have been prioritized in supporting ongoing operational activities. If the operational database is used generating data analysis needs, it will cause problems in the data generation process. These problems occur because the capacity of operational activities and the report generation process are in the same source, thus it slows down transaction operations and hinder the analysis process in decision making. In addition, the information needs usually involve several points of view (dimensions) to be analyzed. However, if you use data from an

operational database, the resulting report format cannot be previewed multidimensionally. To overcome this problem, the JNE Service Owner as a business, engaged in shipping goods by sea, land and air (domestic) requires the participation of a data warehouse in integrating various data spread over many tables in the company's operational database. Thus, the presentation of the information needed in the decision-making process will be faster and easier. In addition, by implementing a data warehouse system, it can provide positive value for business owners of JNE delivery services including:

1. Can be used as a company's competitive advantage. Competitive advantage is obtained by enabling decision makers to be able to access data that was previously unavailable, unknown, or unrecorded information because of the possibility that the information is spread throughout the distribution of existing databases, thus requiring a data warehouse to integrate all of the data. In addition, by implementing a data warehouse, it is believed that the rate of return on investment obtained will be high for companies that successfully implement the data warehouse.
2. Increased productivity of decision makers for JNE delivery services. A data warehouse that integrates data from various separate systems into a form that provides a complete view of a company. Through the process of converting data into more meaningful information, data warehouses enable executives to perform more substantial, accurate, and consistent analysis so that they can support the decision-making process.
3. Through this research, reset warehouse model and application will be formed that can assist executives in analyzing integrated data in the form of reports with representations not only in the form of data, but also being able to view reports in the form of graphs that will facilitate in understanding the contents of the report, so that it can be useful as consideration in the decision-making process carried out.

Data is a basic description of things, events, activities, and transactions that are recorded, classified, and stored but not organized to produce a specific meaning. The involvement of data in the implementation of the company's current operations has played an important role in supporting every activity carried out [1]. Therefore, a container is needed to integrate the existing data. The system that can support the company's operational activities is known as a database system. Database is a collection of data and descriptions of logically related data designed to meet the information needs of a company [3]. Through the application of a database system, it can certainly make it easier for users to process data, display data, and reduce the possibility of errors that will arise in the implementation of company operations. In line with the passage of time, the number of transactions has increased significantly, indicated by the increase in the number of records in each table in the database. An increase in data can lead to a decrease in the performance of the company's operational system, therefore efforts are needed to maintain historical data. On the other hand, the existence of historical data is used as a reference to find out future forecasting patterns based on data that has already occurred.

The data warehouse is superior when compared to database. The database is a collection of data that is managed in such a way based on certain interrelated provisions so that it is easy to manage. Through this management, users can find it easy to find information, store information and dispose of information. The database provides speed and convenience in selecting data so that it can get the required information in a short time. However, the speed of obtaining information depends on the database design. While the data warehouse is a database system commonly used for reporting and data analysis. The database also stores current and historical data with a single place used to generate analytical reports. In application, the data warehouse system can have a positive impact on the JNE delivery service business manager, including the analysis process or information management based on historical data contained in JNE shipping services, making strategic decision-making processes faster based on accurate analysis processes because based on historical data that has occurred before. Data warehouse is a collection of data that is subject oriented, integrated, time variant, and non-volatile in supporting the decision-making process.

Subject-oriented data warehouses are identified and compiled based on the main subject in the JNE delivery service business environment, and not oriented to process or application functions as is the case in the operational environment. The second and most important characteristic of a data warehouse

is integration[2]. Data taken from separate sources, entered into the data warehouse. The retrieved data will be changed, formatted, rearranged, and summarized, repeatedly and continuously, in order to support the operation of the data warehouse system in producing integrated reports, while the data that enters the data warehouse in various ways and has inconsistencies with the application. will not be entered into the system. Forms of data consistency include naming, key structure, attribute size, and physical characteristics of the data. The result of data integration, in the data warehouse only has one form according to the predetermined format. Nonvolatile means that the data does not change, even though the operational data changes. That way, the old data is still stored in the data warehouse. The last characteristic, namely Time Variant, implies that each data in the data warehouse is always accurate within a certain period. The time limit in the data warehouse is much longer than the operational system database because of the difference in the time limit, the data warehouse accommodates more historical data than the operational database. Broadly speaking, the significant differences between operational databases and data warehouses can be seen in the table description below:

Table 1. Differences between operational databases and data warehouses

Characteristics	OLTP System	Data Warehouse System
Main objectives	Support operational processes	Support process analysis
Data age	Current data	Historical data
Data latency	Real time	Depends on cycle length data in data warehouse
Data granulation	The data is detailed	The data is detailed, weighty, and has been
Process Data	Pattern query, insert, delete, update	Less predictable/patterned shape Executed query
Predicted Reports	one dimensional, shape static report	Unpredictable, multidimensional, the report is dynamic
User	Used by all operations	Used on a number of parties executive

The main components in a data warehouse include [4]:

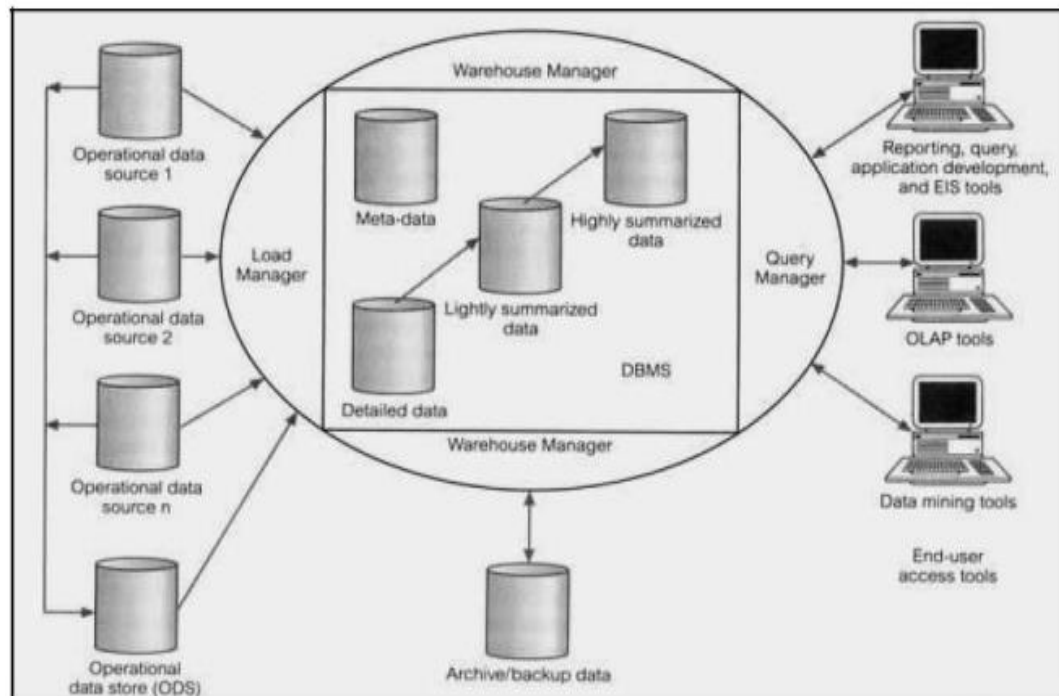


Figure 1 Data warehouse architecture

- 1) **Operational Data**
The data for the data warehouse comes from:
 - a. Mainframe operational data contained in the first generation, namely hierarchies and network databases.
 - b. Departmental data residing on file systems, such as VSAM, RMS, and relational DBMSs (such as Informix and Oracles).
 - c. Personal data residing on personal workstations and servers.
 - d. External systems such as the Internet, commercially available databases, or databases that are dealing with the company's suppliers or customers.
- 2) **Operational Data Store**
Operational Data Store (ODS) is a place to store the latest and integrated operational data, used to meet the needs of the analysis. ODS stores data that has been extracted and has been cleared from the data source. Thus, the process of integrating and restructuring data for data warehouse becomes simpler.
- 3) **ETL Manager**
The ETL manager performs all operations related to the ETL function (Extract, Transform, Loading) data into the data warehouse. Data can be extracted from data sources or in general taken from the Operational Data Store.
- 4) **Warehouse Manager**
Warehouse manager performs all operations related to data management in data warehouse, such as: data analysis to ensure consistency, transformation and unification of data sources from temporary storage media to the data warehouse table, form indexes and views on the table, generate denormalization process, generate aggregation, and back up and archive data.
- 5) **Query Manager**
Query manager performs all operations related to setting the entered query by users. The operations performed by this component are in the form of directing queries on the right tables and query execution scheduling.
- 6) **Detailed Data**
This component stores all the detailed data in the database schema. In general, some data are not stored online, but can be done in aggregation. Periodically detailed data is added to the data warehouse to support data aggregation.
- 7) **Lightly and Highly Summarized Data**
This component stores all data that has been summarized (aggregated), which is generated by the warehouse manager. Data needs to be summarized in order to speed up query performance. Data summary continues updated as new data enters the data warehouse.
- 8) **Archive / Data Backup**
This component stores detailed data and summary data for the purpose of storing and backing up data. Although summary data is obtained from detailed data, summaries need to be backed up when the data is stored beyond a certain period in the storage of detailed data.
- 9) **Metadata**
This component stores all metadata definitions (information about data) used in the data warehouse processes. Metadata is used for various purposes, including: extracting and loading processes, metadata is used to map data sources in the warehouse; in the warehouse management process, metadata is used to automate the creation of summary tables; as part of the process in query management, metadata is used to direct a query to the right data source.
- 10) **End-User Access Tools**
The main purpose of a data warehouse is to support the strategic decision-making process in business. Users interact with the data warehouse using end-user access tools. Based on their use, there are four categories of end-user access tools, namely: Reporting and Query Tools, Application Development Tools, Online Analytical Processing (OLAP) Tools, and Data Mining Tools

RESEARCH METHODS

In this study, the methodology used to support the implementation of decision making by the owners of the JNE delivery service business consists of two types of methods, including:

- a) Method of Analysis The analysis process is carried out through several stages, including:
 1. Literature study, namely studying the literature that discusses the methodology for establishing a data warehouse.
 2. Conduct a survey on the current system which is carried out by conducting interviews with parties who support the company's operations and executives who will use the data warehouse system that was formed.
 3. Analyzing the information needed by executives in making decisions, which will later be used as a reference in designing the data warehouse system.
 4. Identify the prerequisites for the system requirements to be built to match the existing requirements.
- b) Data Warehouse Design Method. At the design stage, JNE delivery services, models and applications are designed based on the results of the analysis of the problems encountered. The data warehouse design method used consists of nine stages known as the Nine-Steps Methodology approach introduced by Ralph Kimbal.

RESULTS AND DISCUSSION

In the establishment of a data warehouse system at JNE Delivery Services, it involves four main components of an interconnected system, consisting of:

- 1) Data source is the source of origin of the company database used in the formation of the data warehouse. In designing this data warehouse, the data source is data from the company's transactional database related to the company's main processes, namely the process of selling goods delivery services, the process of shipping goods, and the billing process at PT JNE.
- 2) Data transformation is the process of converting data that originally came from the operational database into the appropriate form in the data warehouse system. This process is known as the ETL (Extract, Transform, Loading) process. Extract is the process of taking operational data and selecting the data to be used in the data warehouse. Transformation is carried out so that the data has a consistent nature and its integrity is guaranteed so that it can produce precise and accurate information. Loading is the process of storing data that has been transformed into a data warehouse. The stages of data transformation from an operational database into a data warehouse are as follows.
 - Read and select data from operational databases related to the sales process for delivery services, delivery processes, and billing.
 - Uniform certain data to make the data consistent and integrated, and perform calculations on the data according to the output that will be generated by the data warehouse.
 - Perform the data transformation process so that the data is ready to be entered into the data warehouse. This process is carried out using the Data Transformation Services (DTS) facility contained in the SQL Server DBMS
- 3) Users are end users who access or use data warehouse applications that have been designed.
- 4) The data warehouse system makes it easier and faster for end users to obtain the data needed in the form of reports to support analysis needs on the executive side.

Stages of Data Warehouse Design for the owner of the JNE freight forwarding service:

1. Selecting Process
Based on the results of the analysis that has been carried out, it can be concluded that the orientation of the formation of a data warehouse system is carried out when the goods delivery service process is carried out by JNE. In this data selection process, the required components of this Data Warehouse are:
 1. Data Source/Data Source : Source data is a data warehouse that comes from various sources, such as from internal data / external data, archived, and other data.

2. Staging data : The extracted and loaded data is in the same format but does not change the value of the data.
 3. Data Storage : Media for storing data from staging data.
 4. Metadata : Components that provide an explanation of a data that exceeds the data dictionary. The types of metadata are Metadata Transformation and Extract, User Metadata and Operational Metadata.
 5. Information Delivery : The process of conveying information to users which can be through online, email and intranet techniques.
 6. Management and Control : Is the process of managing and controlling contained in the data staging and metadata stages.
2. Choosing Grains
- Grain is data of prospective facts to be analysed. through grain selection, it can be decided what things will be represented in the fact table records. The grains contained in the design of this company's data warehouse system include:
- ☐ Sales. In this process, the data analysed includes which branches are the most productive in selling services, what types of services are most often chosen by customers, what types of goods are often sent, and the number of service sales transactions that occur. Measurements were made using the Linkert scale. Respondent data by gender, shown in the table 2. below:

Table 2. Respondents by gender

Gender	Number of people	Percentage (%)
Man	45	45%
Girl	55	55%
Amount	100	100%

While the presentation table based on age can be seen in table 3. below:

Table3. Presentation table based on age

Age	Number of people	Percentage (%)
17-19 Year	20	20%
20-22 Year	25	25%
23-25 Year	35	35%
26-28 Year	20	20%
Amount	100	100%

And in Table 4. shows the presentation of respondent data based on work.

Table 4. Presentation of respondent data based on work.

Profession	Number of people	Percentage (%)
Student	25	25%
Employee	25	25%
Entrepreneur	45	45%
Etc	5	5%
Amount	100	100%

And the number of respondents based on the frequency of JNE users is shown in table 5. Below:

Table 5. Respondents based on the frequency of JNE users

JNE Users	Number of people	Percentage (%)
2-5 Times	46	46%
Above 5 times	54	54%
Amount	100	100%

- ☐ Delivery. The data analysed includes which cities most frequently carry out shipping transactions and become delivery destinations, which cities are often used as transit points, the routes that are often used, the average time period required to deliver goods to the destination city, as well as the factors that often the reason the delivery is not accepted by the recipient. In the JNE delivery service, the number of respondents to consumer satisfaction can be shown in the table 6.

Table 6. Respondents to consumer satisfaction

Butir	SS		S		KS		TS		STS		Total	Total
	F	%	F	%	F	%	F	%	F	%	F	%
26	10	10%	51	53%	21	22%	10	10%	8	5%	100	100%
27	10	11%	66	68%	17	17%	2	2%	5	2%	100	100%
28	39	40%	52	54%	5	5%	0	0	4	1%	100	100%
29	15	15%	62	64%	15	16%	4	4%	4	1%	100	100%
30	16	16%	43	44%	27	28%	10	11%	4	1%	100	100%

- ☐ Billing. If the delivery of goods is by COD, then the billing process from the analysed data includes the number of customers who make credit, which customers have passed the due date, the number of billing transactions, and the maturity period of each invoice.

3. Identification and adjustment of dimensions. Shown in table 7. below:

At this stage, the dimensions are adjusted to the existing grain.

Table 7. Identification and adjustment of dimensions

Grain/Dimension	Branch	Service	Items	Time	Reason	Route	Customer	Status
Productive Branch	√			√				
Service Type Favorite		√		√				
Item Type Favorite			√	√				
Number of Transactions Sales	√	√	√	√				
Favorite Route				√		√		
Favorite Home Town				√		√		
Transit City Favorite				√		√		
Destination City Favorite				√		√		
Time Delivery Items by JNE				√				
Reason				√	√			
Falling Customers Tempo				√			√	√
Number of Transactions Billing	√			√			√	√
Maturity Status							√	√

4. Selection of facts

In this stage, the selection of facts according to needs is carried out. Every fact that formed, consisting of dimension attributes and measure data. Further identified facts will be formulated

in the form of reports, diagrams, or graphs that can represent data in a form that is easy to understand for users. The facts that are formed from the design of this data warehouse are:

- Sales, including TIME, CODE_BRANCH, CODE_SERVICES, CODE_PRODUCT, TOTAL_TRANSACTION
 - Delivery, including TIME, ROUTE_CODE, REASON_CODE, DURATION, TRANSACTION_NUMBER
 - Billing, including TIME, CUSTOMER_CODE, BRANCH_CODE, STATUS, TOTAL_BILLING, TOTAL_INVOICE, DURATION_PAYMENT
5. Saving pre calculations in fact table
- The pre calculations made in the design of this data warehouse include shown in table 8. below,

Table 8. The pre calculations made in the design of this data warehouse include

FACTS	ATTRIBUTE	PRECALCULATION
SALES	TOTAL_TRANSACTION	COUNT(NO_SHIPMENT_RECEIVE)
SHIPPING	DURATION	DATE_RECEIVE- DATE_NOTE_SHIPPING
BILLING	QUANTITY_BILLING	COUNT(NO_INVOICE)
	TOTAL_INVOICE	AMOUNT_SALES-(DISCOUNT* (TOTAL_SALES))
	DURATION_PAYMEN	DATE_PAY_DATE_INVOICE

6. Complete the dimension table.
- At this stage, a text description is added to the dimensions. The description should be easily understood by she user. The following is a text description of the dimension table, and shown in table 9. below:

Table 9. The description should be easily understood by she user.

Dimension	Attribute	Description
Time	CODE_TIME DATE DAY SUNDAY MONTH SEMESTER YEAR	Reports can be viewed by time period determined, which can be based on the year, semester, month, week, day, and date.
Reason	CODE_REASON DESCRIPTION_REASON	Reports can be viewed based on reason data which often happens at the time of delivery.
BRANCH	BRANCH_CODE DESCRIPTION_BRANCH CITY NAME	Reports can be viewed based on existing branches in the company.
Route	CODE_ROUTE ROUTE_START NAME_CITY_START ROUTE_TRANSIT CITY_TRANSIT ROUTE_DESTINATION CITY_DESTINATION	Reports can be viewed by routes used in the process of shipping goods from one place to another.
Customer	CUSTOMER_CODE BRANCH_CODE CUSTOMER'S NAME	Reports can be viewed by customer who carry out the transaction of delivery of goods.
Service	CODE_SERVICE NAME_SERVICE	Reports can be viewed by type of variation services available to the company.

Item	ITEM CODE DESCRIPTION_BARANG TYPE_ITEM	Reports can be viewed by type items frequently sent by customers.
Status	STATUS	Reports can be viewed by fall status the time when the payment is made.

7. Selection of database duration.

The time period of the data used in this data warehouse is shown in table 10 below:

Table 10. The time period of the data used in this data warehouse

Database Name	Name Databases	OLTP Time Period Data	Transformation to the data warehouse	Data duration warehouse
OLAP	OLTP			
OLAP_ATR	DB_ATR	2007	2007-2010	4 Years

8. Track changes from dimensions slowly

Observing changes in the dimensions of each dimension table can be done through three ways: method, namely replacing directly on the dimension table, forming a new record for every change that occurs, and changes in the data that form a new, different column. In this design the second method is used, namely if there is a change in the attributes in the table, it will cause creation of a new record. For example, such as a change in the customer's address, it will. This results in adding a new record to the dimension table while still keeping the old record. This is done to keep the old data stored, so it can be known changes that occur from start to finish.

9. Deciding the priority and mode of the query

In this stage, we discuss the ETL (extract, transform, and loading) process, backups are carried out periodically, and analyze the capacity of data storage media. shown in table 11 and 12 below

A. ETL (Extract, Transform, and Loading) Process

Table 11. ETL (Extract, Transform, and Loading) Process

Insurer Answer	Intensity Activity	Description
Division Information Technology(IT)	Once a Month	Process ETL into this dimension and fact table will carried out by the IT division, outside of office operating hours, every end of month

B. Backup process

Table 12. Backup Process

Insurer Answer	Intensity Activity	Information
Division Information Technology(IT)	Once a Day	The backup process of the data contained in the data warehouse and operational database will be carried out by IT division, outside office hours jam

C. Analysis of storage media capacity

In the data processing process, the capacity of the storage media is one of the factors that need to be considered be taken into consideration. Transactions that occur every day on transactional/operational data (OLTP) will lead to data growth in the company's operational database, which will also affect the growth of data in the data warehouse. Therefore, it is necessary to analyze the growth of the data to assist in estimating the size of the media data storage needed for several years to come. This is done with perform calculations on the number of records generated per each existing table for a certain period, then accumulated

by using the size of the space based on the type the data used for each attribute contained in the table formed in the databases. So that it can be taken into consideration in the process of implementing a system that done later.

CONCLUSION

Example, Implementation and Results

Examples and implementation of data warehouse services in this JNE delivery service, can be displayed in the logical architecture design of the data warehouse. The source of the data used is the source of the data obtained from the operational data of the delivery service. RDBMS, which is used for service operational data storage. From the ODS (Operational Data Store) data source, a selection process is carried out. The selection process is the process of selecting the data needed in the data warehouse system from the data source. Not all data from data sources are used in this data warehouse, for that the selection process is carried out. The next process after selection is extraction, moving the sorted data into a separate database system from the operational database system. The separation of this database is so that the operational system is not disturbed by the processes in the data warehouse. The selected data is then carried out a cleansing process, namely the data cleaning process and the transformation process, both of which are carried out data staging or temporary databases. Then the loading process, which is the process of entering the data from the previous process into the data warehouse. MyJNE implementation can be seen in Figure 2.



Figure 2. MyJNE implementation

MY JNE app function

1. Checking JNE shipping rates throughout Indonesia
2. Checking JNE delivery status
3. Check the nearest JNE location lokasi
4. Conduct buying and selling transactions between sellers and individual buyers

How to use the MY JNE app

1. Download the MYJNE application on Google Playstore and search for the MYJNE application or click the link: <https://goo.gl/Hy4DrD> , complete the requested information. MY JNE will send a confirmation email and the customer must click the link contained in the email. The customer's account will be active after filling in all the required fields and the customer's phone number will be directly connected to his JNE shipment.
2. **My Shipment feature**, JNE customers will find it easy to view shipping history, this facility is only for registered users (Registered User).
3. **The Check Tariff feature**, this tariff or shipping fee checking service facility can be used by both registered users (registration) and as users without logging in (Guest User). The user can enter the city of origin in the From column, and the destination city in the destination/destination column (To), and the application will inform the shipping rate according to the desired city.
4. **JNE Nearby feature** , this service facility to find the location of the nearest JNE outlet/service point to you can be accessed by both registered users (Registered User) and users without logging in (as Guest User). This service facility is available in the JNE Nearby menu. Make sure you have activated the GPS feature on your smartphone to use this service facility.

5. **My COD Features**, My COD (Cash On Digital) is a feature in the MY JNE application that provides online shopping payment services with an escrow system. MY COD Act as a neutral transaction mediator to minimize the risk of loss that can be experienced by the seller or buyer. This COD service facility is intended for registered users and this service facility can be found in the My COD menu. After downloading the MYJNE application, customers can make transactions by registering as a user on the MYJNE application. When REGISTRATION, customers can make MYCOD transactions. Without MY COD REGISTRATION, it will be INACTIVE. By using MYCOD, the data of sellers and buyers are directly recorded in the MYJNE system and connected to their phone numbers.
6. **The My COD Wallet feature**, you can press the red round button with a picture of a cube at the bottom of the MY COD WALLET page to get started. The facilities available at MY COD WALLET include transferring funds to fellow MY COD wallet users (TRANSFER), topping up or adding funds to a virtual account (TOP UP), disbursing funds to a designated account (CASH OUT), and viewing transaction history. been done in MY COD WALLET (HISTORY). This MY COD WALLET service facility is intended for registered users (Registered User) and this service facility is found in the My COD WALLET menu.

The implementation of the JNE delivery service can be seen in Figure 3.

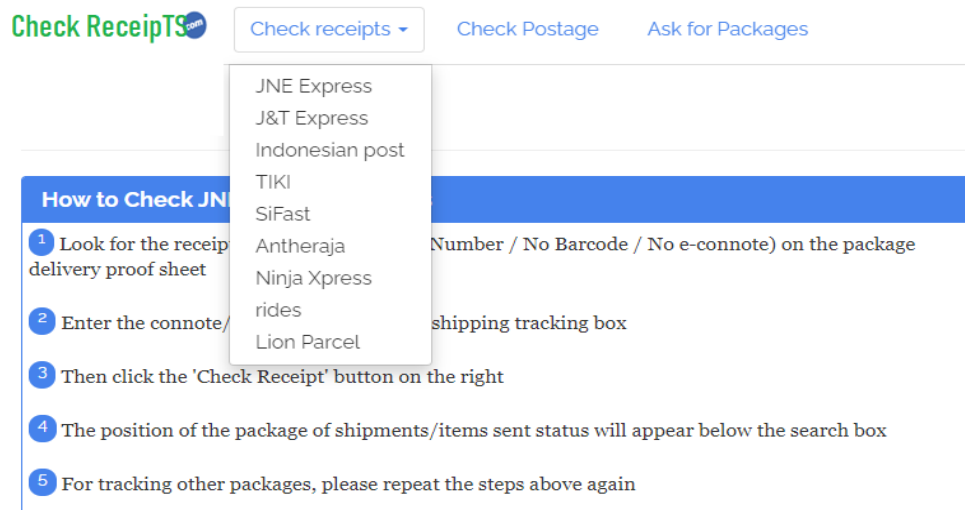


Figure 3. The implementation of the JNE delivery service

An example of data on delivery of goods through the JNE delivery service can be seen in Figure 4.

Figure 4. An example of data on delivery of goods through the JNE delivery service

And in Figure 5 below is the implementation of sending data via JNE

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In the establishment of a data warehouse system at JNE Delivery Services, it involves four main components of an interconnected system, consisting of: 1). Data source is the source of origin of the

company database used in the formation of the data warehouse. In designing this data warehouse, the data source is data from the company's transactional database related to the company's main processes, namely the process of selling goods delivery services, the process of shipping goods, and the billing process at PT Atlas Transindo Raya. 2). Data transformation is the process of converting data that originally came from the operational database into the appropriate form in the data warehouse system. This process is known as the ETL (Extract, Transform, Loading) process. Extract is the process of taking operational data and selecting the data to be used in the data warehouse. Transformation is carried out so that the data has a consistent nature and its integrity is guaranteed so that it can produce precise and accurate information. Loading is the process of storing data that has been transformed into a data warehouse. The stages of data transformation from an operational database into a data warehouse are as follows. 3). Read and select data from operational databases related to the sales process for delivery services, delivery processes, and billing. 4). Uniform certain data to make the data consistent and integrated, and perform calculations on the data according to the output that will be generated by the data warehouse. 5). Perform the data transformation process so that the data is ready to be entered into the data warehouse. This process is carried out using the Data Transformation Services (DTS) facility contained in the SQL Server DBMS.

Schematic Design

In designing the data warehouse system, this company uses a star schema, where the fact table placed in the center, surrounded by dimension tables. The use of this star schema was chosen because of the shape of the This schema is easy to understand and use, making it easier to perform the query formation process. The star schema produced in this study consists of three schemes, namely the sales scheme, the shipping, and billing schemes. The sales scheme and goods delivery scheme through JNE can be seen in Figure 6 and Figure 7 below.

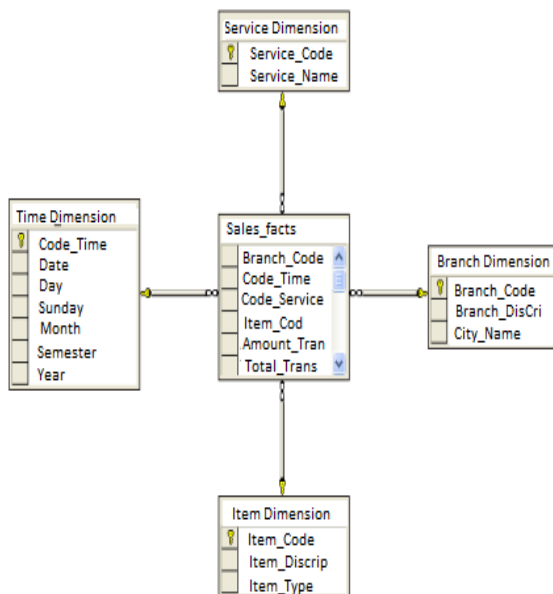


Figure 6. Sales Star Schematic

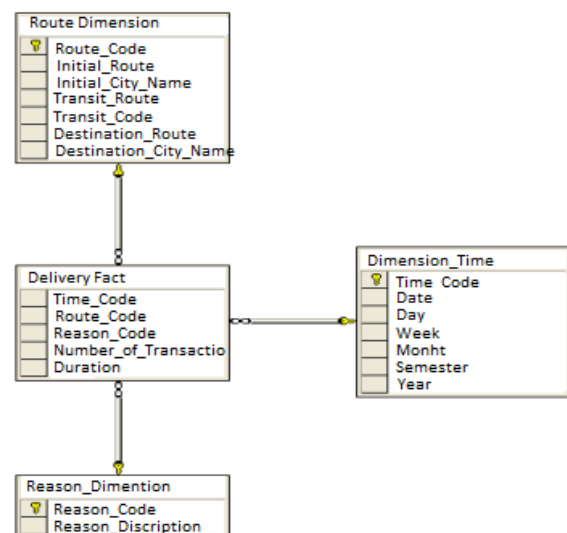


Figure 7. Freight Forwarding Scheme

Figure 8. below is an example of goods delivery data with JNE.

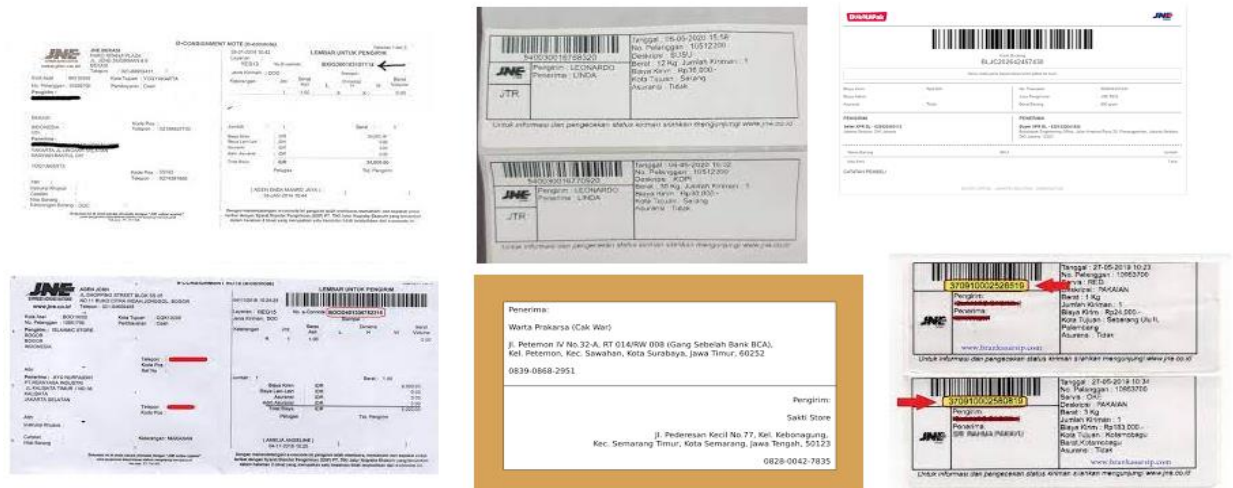


Figure 8. below is an example of goods delivery data with JNE.

Figure 9. shows the OLP design of Freight for delivery

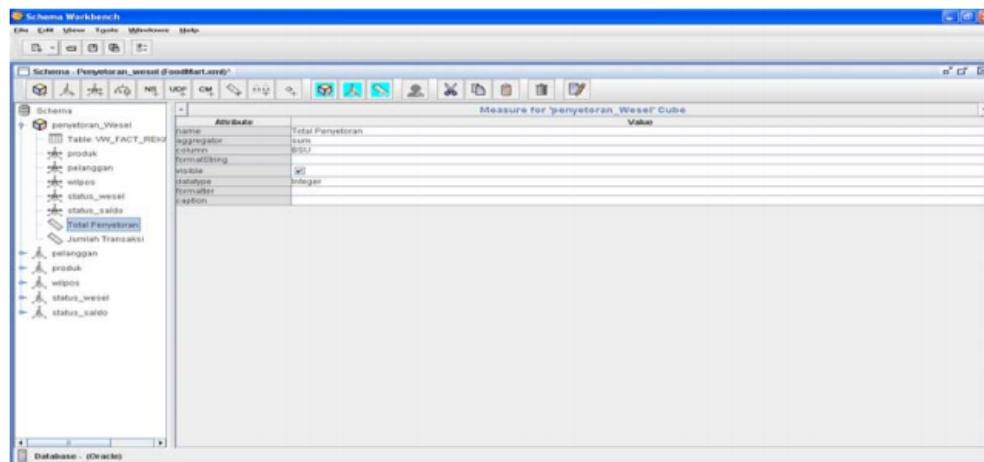


Figure 9. shows the OLP design of Freight for delivery

JNE is one of the shipping service companies that many people use to deliver goods. This delivery service is indeed very familiar with online business people who often send their merchandise out of the region. JNE has again made it easy by launching the JNE application on an Android phone, namely My JNE. This application allows you to check delivery packages such as check receipts, postage rates, and much more. Features of the JNE, My JNE Application on Android Smartphones include: 1. JNE Nearby; 2. Tracing & Tracking; 3. Check Tariff; 4. My Shipments; 5. My COD (Cash on digital); 6. My COD Wallet; 7. MY JOB (JNE Online Booking).

The advantages of this My JNE Android Application User: (1). The appearance of the JNE Application is Light and Simple; (2). Air Waybill Tracking Features Shown in More Details; (3). Faster Scanning Barcode Tracking Air Waybill; (4). Can Monitor Package Delivery Status with My Shipment; (5). Check Your Postage Fees; (6). Finding the Nearest JNE Location with JNE Nearby; (7). Transaction Media named My COD.

IMPLEMENTATION PLAN

In implementing this data warehouse system, the need for specifications is needed appropriate hardware and software, so that it can support operations optimally. Following minimum required specifications: Server computer : Processor: Intel® Itanium® Processor 9000 Sequence, Hard disk: 1 TB, Memory: 8GB, Monitor: 20" LCD; Client computer: Processor: Intel® Core 2 Duo 3.2 Ghz, Hard disk: 1TB, Memory: 4GB, Monitor: 20" LCD; Operating system: Windows Server 2018 Service Pack 3; DBMS: SQL Server 2018; Supporting software: Microsoft Visual Studio 2018. KDD (Knowledge Discovery in .) process database) can be broadly explained as follows shows on Figure 10. The Planning Implementation Flow Chat is shown in Figure 11 while the analysis on the implementation of the implementation can be shown as in Figure 12.

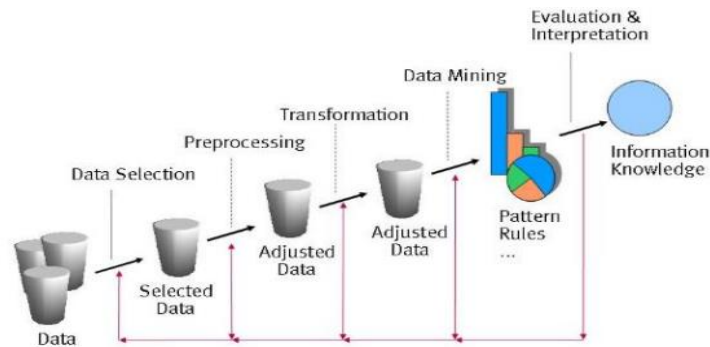


Figure 10. Data Mining Process

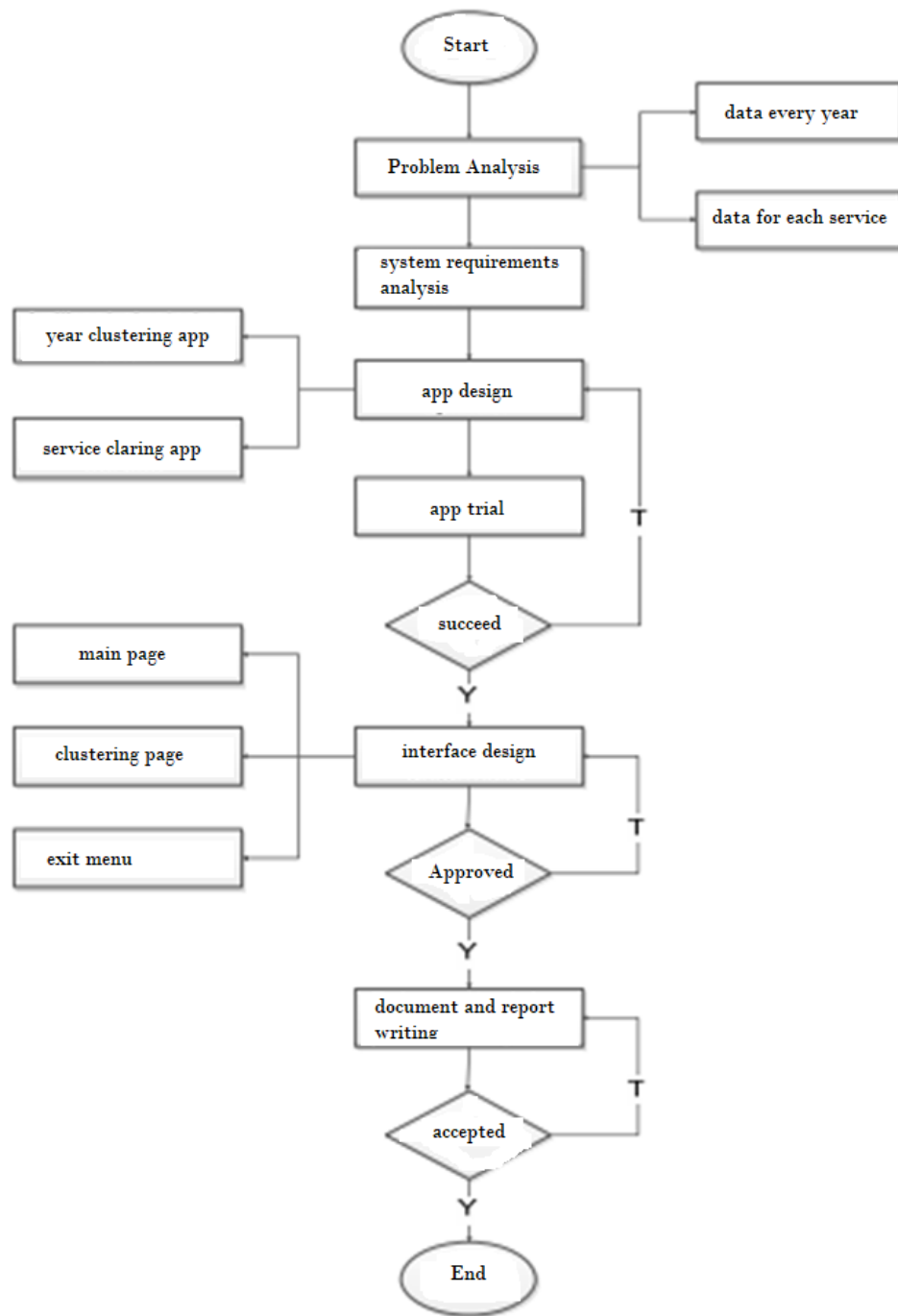


Figure 11. The Planning Implementation Flow Chat

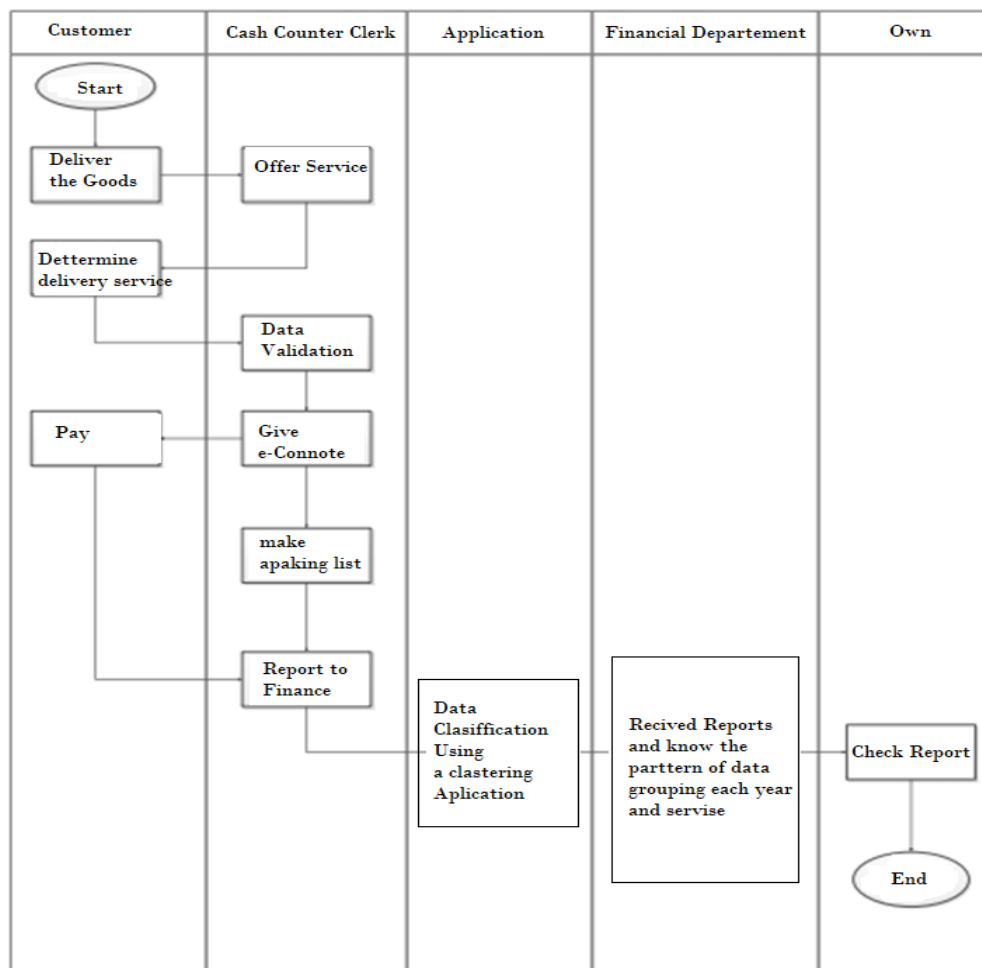


Figure 12. The analysis on the implementation

Input Needs Analysis The data used is a data service PT. JNE Agent Klaten in the last three years, namely from 2019 until 2021. The following is an example of data service REG (Regular), OKE (Economy Shipping) and YES 2019, which is shown in Table 13:

TABLE 13. Data service YES,REG and OKE

		Reg	Yes	Oke			Reg	Yes	Oke			Reg	Yes	Oke
2019	1	8788	2788	2348	2020	1	23610	3527	7361	2021	1	21506	4678	4252
	2	8541	1887	2484		2	23244	3600	6380		2	20991	4800	3805
	3	8885	1854	3079		3	16046	2894	7431		3	22400	3281	3112
	4	9093	1785	3888		4	16661	2874	6774		4	23255	3781	3446
	5	9763	1685	4158		5	16258	2849	4282		5	23898	3696	3784
	6	10400	1997	4331		6	16699	2806	3981		6	22590	3631	3275
	7	10502	1994	5731		7	19275	3133	4430		7	22984	4475	2822
	8	10487	2819	4025		8	15102	3240	2296		8	18356	3785	2017
	9	10593	2061	4618		9	17884	3049	3606		9	23509	4050	2770
	10	12116	2306	5461		10	14061	2556	5363		10	24912	4484	2433
	11	11671	2543	5463		11	24346	4266	2906		11	23854	4262	2417
	12	13010	2545	6139		12	13490	2848	4657		12	23060	4340	2677
	Total	132849	26264	52725		Total	216676	37642	59467		Total	280235	58263	54810

While the state transition diagram can be drawn, as shown in Figure 13 below:

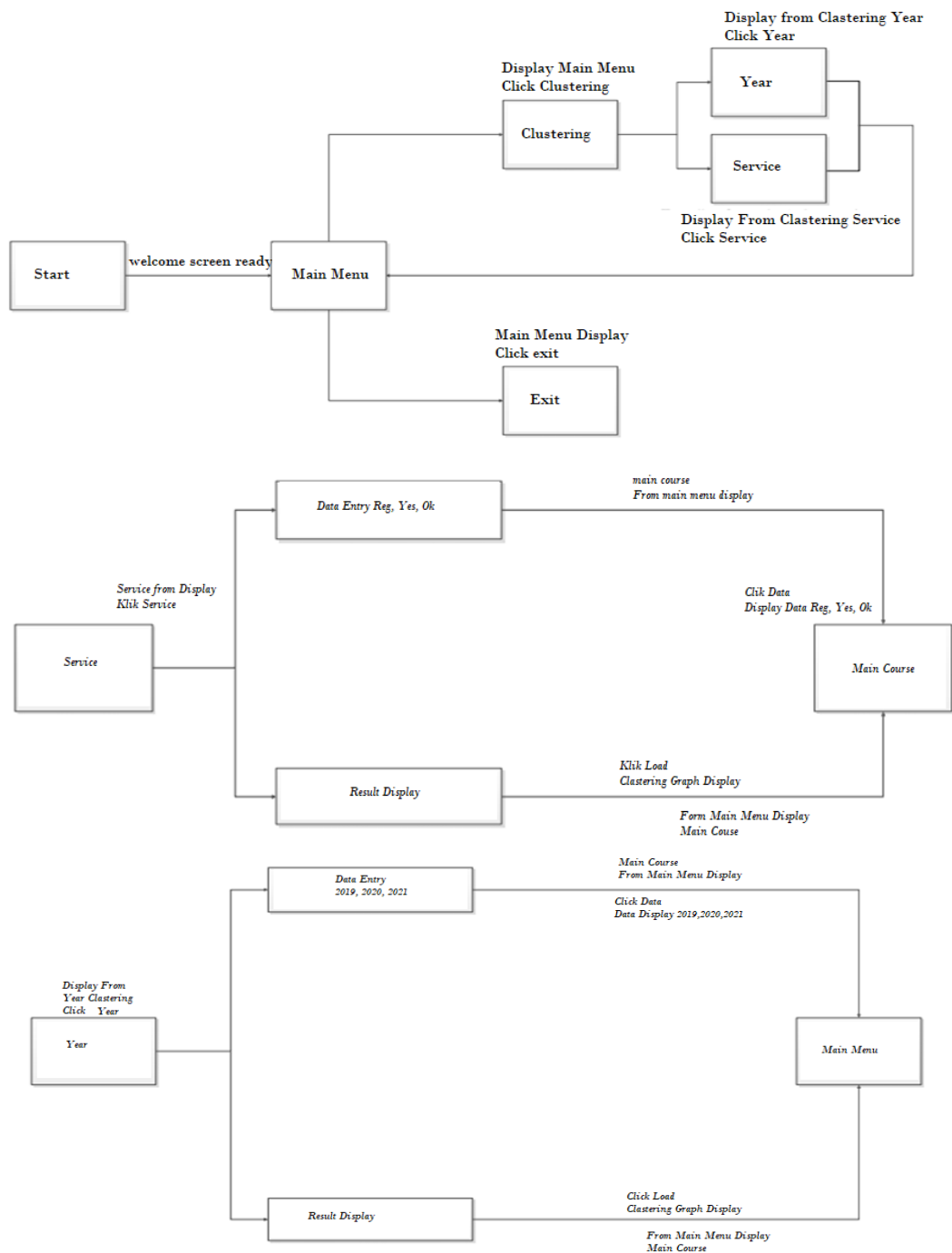


Figure 13. The state transition diagram

An overview of the implementation of year clustering year 2019, 2020,2021 can be shown in Figure 14 below:



Figure 14. The implementation of year clustering year 2019, 2020,2021

Delivery Service ERD on JNE can be seen as shown in Figure 15 below:

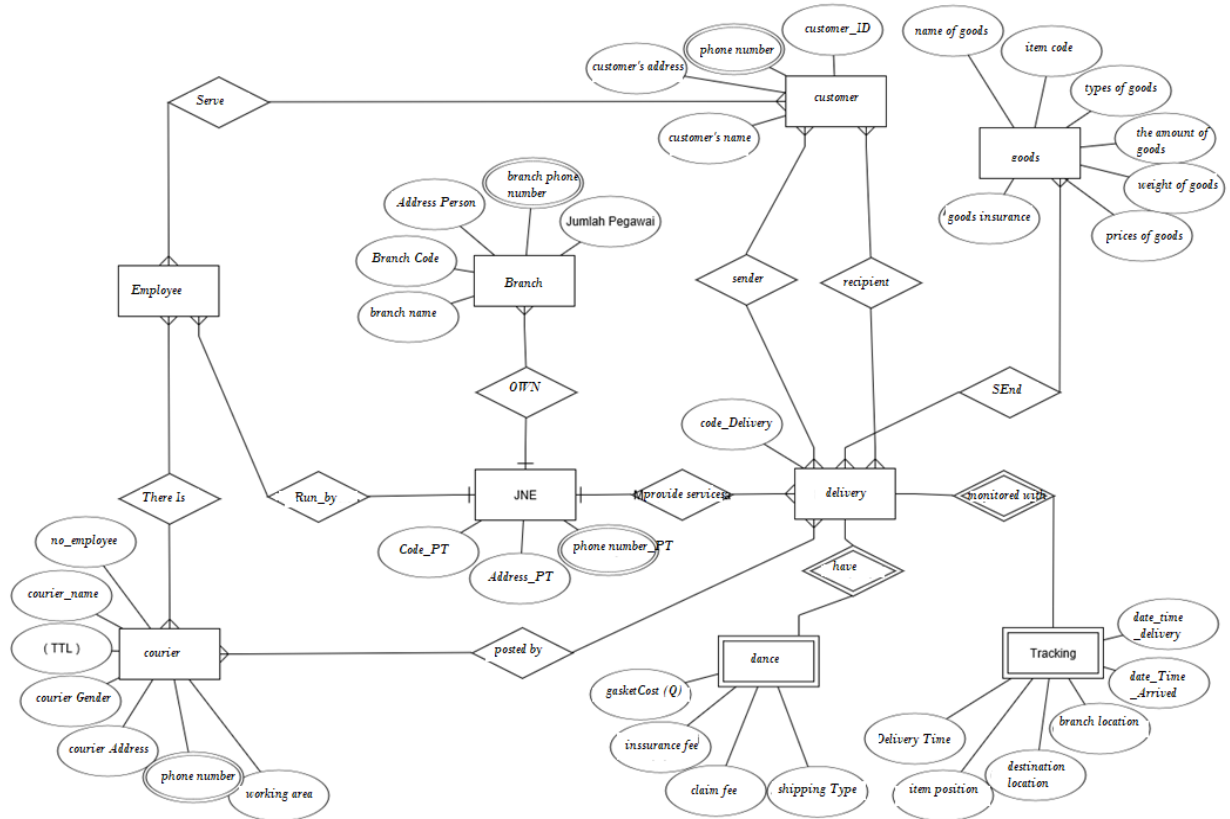


Figure 15. Delivery Service ERD on JNE

ACKNOWLEDGMENT

In designing the data warehouse system, this company uses a star schema, where the fact table placed in the center, surrounded by dimension tables. The use of this star scheme was chosen because of the shape of the This schema is easy to understand and use, making it easier to perform the query formation process. The star scheme produced in this study consists of three schemes, namely the sales scheme, the shipping, and billing schemes.

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