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BUSINESS INTELLIGENCE FOR EVALUATION E-VOUCHER AIRLINE REPORT

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**Abba Suganda Girsang, Sani Muhamd Isa, Atria Dika Puspita,
Finda Anisa Putri, Nindhia Hutagaol**

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Computer Science Department, BINUS Graduate Program-Master of Computer Science,
Bina Nusantara University, Jakarta, Indonesia 11480

ABSTRACT

As the airline company in Indonesia which is the one of domestic leading airlines, Sriwijaya Air has been created the electronic voucher called e-voucher Sriwijaya Air for loyal customers. The e-voucher is used as a flight ticket payment instead of cash payment to buy a ticket. The e-voucher consists of some attributes such as destination, flown date, and flight class. Particularly, a marketing manager needs to review the utilization of e-voucher when a ticket has been approved in every year. The proposed solution is to redeploy existing OLTP database into data warehouse. The data warehouse already developed using nine-step Kimball's methodology. All data will be analyzed using OLAP to present a report in a visual form such as dashboard. Furthermore, airlines company can produce an analysis report using business intelligence.

Key words: Business Intelligence, Data Warehouse, ETL, Reporting, Pentaho System.

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1. INTRODUCTION

In this modern technology era, business intelligence becomes one of the popular applications which is used by the company or organization. Business intelligence used to maintain internal data such as operational data or transactional data into a knowledge that can be used in the future decision making. Generally, business intelligence applications get more attention through his ability to analyze data by company's specified requirement. It always associated with data warehoused technology and already applied over many areas such as health, finance, education, and also airlines.

Basically, technology data warehouse is already recognized as a reliable infrastructure which is not only support the implementation of business intelligence but also CRM application or decision support system in various companies [1]. As well as BI companies,

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most of their business process is already influenced by business intelligence technology, ex. business retailer, etc. Business intelligence applied to analyze the forecasting of product demand, determine the right price for the customer, the perfect target market, customer segmentation, product recommendations, campaign planning, and so on [2].

The obstacle in data warehouse technology and business intelligence deployment is complexity and considerable costs that must be spent by the company due to the latest data warehouse technology. Currently, cloud technology announced as a good solution for handling huge amounts of data such as Teradata Unified Data Architecture (UDA). UDA integrated the data warehouse, data exploration platform, and Hadoop. The technologies linked to a business processes, so that the implementation process use large amounts of data processing has been tested good, easily, and fast i.e. 35G in 7 minutes [3]. However, many companies still considering about this technology because of complexity and give out a huge cost to apply.

To handle the challenge, in this paper [4] Parra compared these two open source technologies can be used to analyze data without consider about cost, named Pentaho and Jaspersoft. They also tested for time processes when input data on the ETL and report processed. Parra concluded Pentaho's processing data performance is better than Jaspersoft which is approximately 42.28% whereas Jaspersoft experts in reporting is only 43.12% than Pentaho application.

In this study, Sriwijaya Air data will be used as input for e-voucher airlines report in order to enhance services for loyal customers. Based on customer's feedback, Sriwijaya Air needs to analyze whether the program is already running efficiently or not.

Sriwijaya Air gives the e-voucher as a payment method for purchase the ticket and could mixed both of e-voucher and available payments method in Sriwijaya Air. In fact, Sriwijaya Air have not a reporting system to analyze usage e-voucher's data that already running. So that the aim of this paper is reporting system development that will help marketing manager to analyze the usage of 500.000 ± e-voucher. This also will be used to measure whether e-voucher program is already running efficiently or not by applying data warehouse technology to maintain the huge data of PT Sriwijaya.

2. REVIEW OF RELATED LITERATURE

2.1. Data Warehouse and Business Intelligence Technology (BI)

Strategic knowledge is very important to any field of industry which is generated from historical and currently data. Marketing manager can use any data from organization activities such as data in e-voucher production, sales, purchase, debts, and so forth to determine strategic decisions. As long as operations are performed, historical data also automatically increased, so that data warehouse have to handle and manage all data and business intelligence used to analyze and answer strategic knowledge needs. The technologies can be applied not only in manufacturing or finance industry but also in the various areas of the industry. However, these applications give prodigious impact for companies in financial perspective that escalate revenue because it can produce appropriate strategy for company. In the same time, company also need to allocate huge cost due using BI solution software license that tends to make a lot of companies consider to implement these technologies.

As shown in [5], Chung explained about how BI make an effectively strategies and help company plan their business, reduce stock, and increase profitability by using demographic data and trend of customer's demand on purchasing [5]. Therefore, Sriwijaya Air requires analysis to understand the way how to make customers become loyal and escalating the profit. Experience on business in present or future is crucial things to be managed by company. In

this case, Business Intelligence can provide history, current analytic, and prediction for business.

Business Intelligence Technologies can be applied using RDBMS which is processed with Structured Query Language (SQL). For example, Cognos software as Business Intelligence tool from IBM that can running SQL query for the dashboard.

After RDBMS, there is database that have NoSQL relation called MongoDB. MongoDB (from “humongous”) is a NoSQL database that open source, so it is not required to join table. NoSQL means “not only SQL” which is MongoDB not only able to non-relational database but also relational database. MongoDB is more simple than traditional relational databases. Although MongoDB is NoSQL relation, MongoDB database can be performed well on data warehouse which is store and processing among huge data. It can be concluded that NoSQL database is very useful when the data is so hugely.

2.1. Pentaho Open Source Tools

Tarnaveanu said that Pentaho BI is an open source tools to provide organizations with best-in-class solutions for their enterprise BI needs [6]. Pentaho makes information will be generated by data-driven so that knowledge about company performance will be impacted for the company. Pentaho able to cover these application areas such as reporting, dashboard, analysis, and data mining.

Pentaho also able to develop static report through OLAP Cube, customize the dashboard as company desire, and so on. However, first time before using BI tools is creating schema based on company needs. Then perform ETL process from schema to physical database. And the last is design a dashboard through OLAP Cube.

Pentaho Analysis formed by Mondrian Relational Online Analytical Processing (ROLAP). ROLAP engine supported for Relational Database Management Systems (RDBMS). ROLAP used to transform physical database from ETL process to Mondrian schema. Mondrian schema will be an architecture for dashboard consist of many cubes contains all measurement, many dimensions, and many hierarchies. It can use either SQL query or auto-query. And uses of open source BI now becoming solution for data warehouse development. For example, Pentaho Business Analytics allow rapid, easy, flexible, and scalable implementation to company analytic.

3. METHODOLOGY

The first methods of this study are collecting the requirement for analysis. The one of requirement is data and the required data is e-voucher transactional tables. The e-voucher transactional tables described in the form of ERD design which is already defined by company. The goal of this step is helping to determine the proper report and facilitate the design of the data warehouse and business intelligence. Second is designing dimensional design data based on company needs are called star schema. The data will be transform based on star schema. Star schema consist of dimension and fact tables and it represented the fundamental relationship of business processes as well. Third is Extract, Transform, and Load (ETL) process. ETL process is a combination of transaction tables’ extraction, load, and transform it based on star schema that already defined. Fourth, designing OLAP Cube as the architecture of BI. This stage is done by applying one of the OLAP engine i.e. Mondrian OLAP cube. And the last is designing a dashboard to visualize data in the form of graphs using Pentaho business analysis. For overall, the proposed method described in Figure. 1.



Figure 1. Proposed Method Step

3.1. Select Data Grain

Grain selection is determined by the basic information that will be displayed on the report. Before design a star schema, the first thing to do is identify the grain through the e-voucher file. And the grain for this analysis is the e-voucher transaction data. The e-voucher contains detailed information such as flight class, date issued, flight date, destination and e-voucher status.

3.2. Identifying Table Dimension

Dimensional data modeling consists of fact tables that connected to multiple dimension tables. At this stage, the dimension tables which is used in the ETL process consists of three-dimension tables based on analysis goals. And the dimension is status, destination, and class flight.

3.3. Select the Main Table Fact

At this stage, the fact table is determined by analyzing each dimension and then creating a table fact that contains all the information for reporting. Information on existing transaction database based on dimension has been integrated into fact table as reference table for measurement. And the relation of star schema described in Figure. 2.

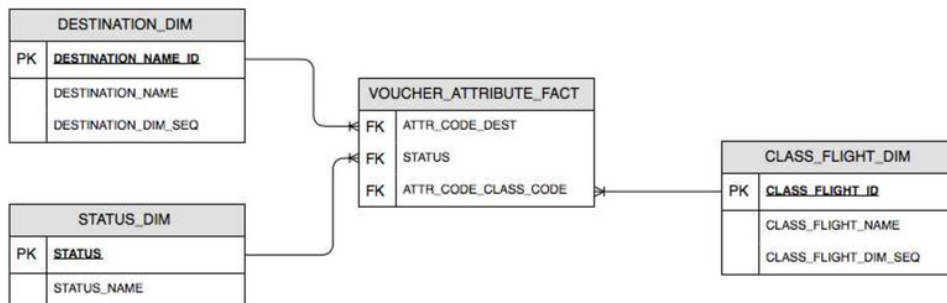


Figure 2. Star Schema of e-Voucher

4. ANALYSIS AND DISCUSSION

4.1. Extract, Transform and Load

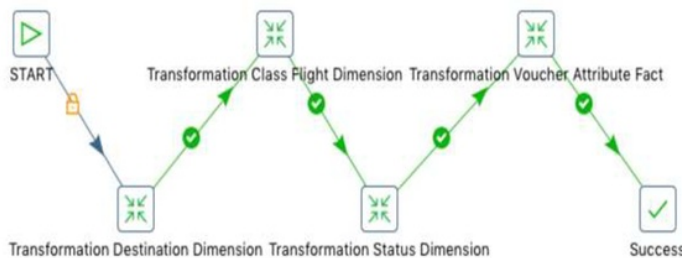


Figure 3. ETL Process of Airline's E-voucher

The ETL performed on three-dimension table and one fact table. Figure. 3 shows the retrieving of destination code, class code, and status attribute that are taken from the e-voucher field to the Voucher Attribute Fact table.

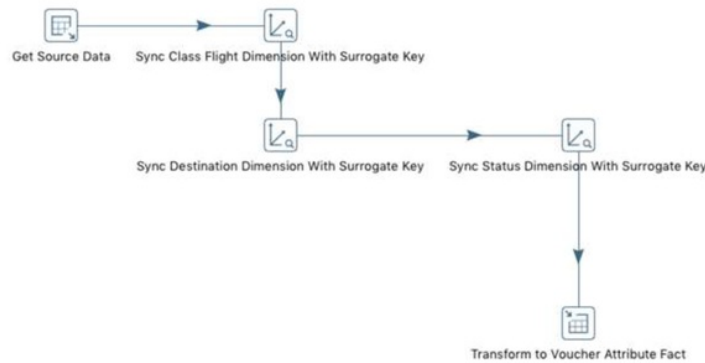


Figure 4. ETL Process of Fact Table

On the Figure. 5 describe about ETL process of destination dimension. The first is get the source data by querying on OLTP database. Then continuing to value map process that mapping the airport destination code to destination name. This process also adding surrogate key by sequence number as primary key replacement. And the last step is transform all the OLTP data to destination dimension table by table maps.



Figure 5. ETL Process of Destination Dimension

In Figure. 6 describe about ETL process for class flight dimension. The first is get the source data by querying on OLTP database. Then continuing to value map process that mapping the class code to be class name. This process also adding surrogate key by sequence number as primary key replacement. The last step is transform all the OLTP data to class flight dimension by table maps.



Figure 6. ETL Process of Class Flight

In Figure. 7 describe about ETL process for status dimension. The first is get source data by querying to OLTP database. Then continuing to value map process that mapping the status number to status name. This process also adding surrogate key by sequence number as primary key replacement. Then transform all the OLTP data to status dimension by table maps.



Figure 7. ETL Process of Status Dimension

4.2. OLAP Cube Design

The OLAP Analysis step is performed to determine the quantity of e-voucher usage. First, define the architecture that contain all measurement and dimension as shown in Figure. 8. This architecture has been designed using Mondrian OLAP Cube based on Star Schema before development on dashboard. The schema consists of cube and dimension that will be used to analysis. The cube contains all the measurement value, dimension usage that already define on outer cube, and fact table. Whereas the dimension contains of hierarchy and the hierarchy consist of level and dimension table. After the architecture designed, it will have generated xml file that will be import to Pentaho BI Server.

4.3. Report and Dashboard Design

After creating architecture of analysis in the form of xml file, the process is continuing to design analysis on Pentaho BI Server. Before creating dashboard, the architecture of analysis should be imported and also create source data connection on Pentaho BI Server.

After that, creating summary data before taking to dashboard. It uses pivot4j plugin to create the summary data for validity on Pentaho BI Server. Pivot4j is an external Pentaho BI Server plugin that must be imported to Pentaho BI Server. It allows user to view summary data based on imported analysis in the form of xml file that has been generated from OLAP Cube. For this case, there are three summaries based on the dimensions. The summary shown as Figure. 9, Figure. 10, and Figure. 11.

Measures	
Destination_Name	Destination Count
ALL	664,955
SUB	61,664

Figure 8. Destination Dimension Summary Using Pivot4j

Measures	
Class_Flight_Name	Class Flight Amount
X:U	10,206
X:E	6,400
U:X	5,792
O:U:X:E:G:V:T:Q:N:M:L:K:H:B:W:S:Y:I:D	742,075
O:U:X:E:G:V:T:Q:N:M:L:K:H:B:W:S:Y:I:D:C	15,584
X:E:G:V:T:Q:N:M:L:K:H:B	25,600

Figure 9. Class Flight Summary Using Pivot4j

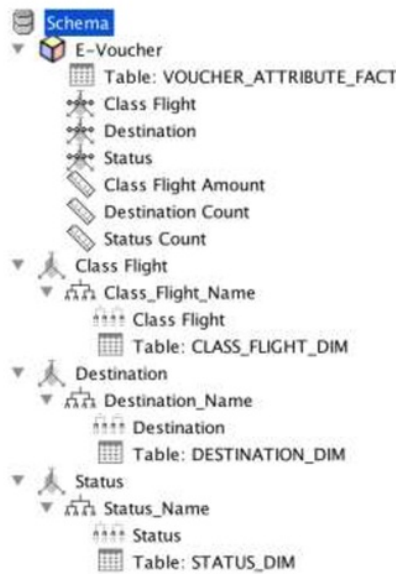


Figure 10. OLAP Cube Schema Workbench

Measures	
Status_Name	Status Count
0	14,336
2	8,882
7	783,915
9	5,376
12	

Figure 12. Status Dimension Summary Using Pivot4j

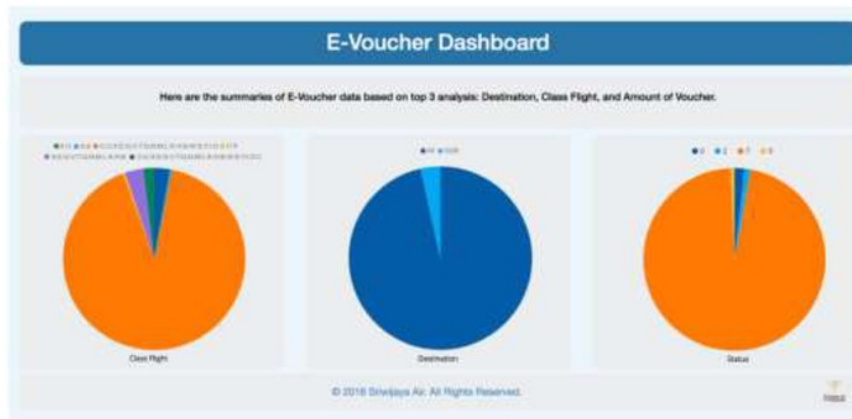


Figure 11. Dashboard of E-voucher

The amount of all e-voucher is 812,509 which is divided based on 6 class flight category, 2 destination, and 4 e-voucher statuses. After creating summary view, then continuing to process creating dashboard. Dashboard is a summary of analysis that visualized in the form of graph, so that it will help user easily to look up the report. Pentaho BI Server has many dashboard templates that can be used or customized as company needs. View of dashboard shown as Figure. 12.

From this dashboard, it can be concluded that the dashboard gives an useful information for airlines manager about how the manager maintained e-voucher based on e-voucher usages as a gift for Customer. Dashboard can be customized on the style, requirement, and others as the company desire.

5. CONCLUSIONS

This paper presented an OLAP analysis using Pentaho. Main idea of this method is the way to build data warehouse using nine step methodologies by Kimball for airlines industry. This proposed methodology demonstrates how significant the improvement for a company using business intelligence and data warehouse. Nine steps by Kimball can be implemented by using different kind of open source solutions for data warehouse and business intelligence will be future work.

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