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DATA MART DESIGN IN BKPP BANDUNG USING FROM ENTERPRISE MODELS TO DIMENSIONAL MODELS METHOD

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Abstract— The data warehouse is a single data storage that is complete and consistent with subject-oriented, integrated, non-volatile, and time-variant characteristics that can be used to support decisions. While Data mart is a subset of a data warehouse that supports the information needs of certain departments or business process functions. Badan Kepegawaian, Pendidikan Pelatihan (BKPP) of Bandung Municipality has a history of employee mutation transactions that have not been optimally utilized so it will be very useful if the data can be made into a data mart. This data mart development method uses the From Enterprise Models to Dimensional Models method as its design method and the Bottom-Up Approach as an approach in developing a data mart. This data mart developed using the PostgreSQL database and the PHP language. The purpose of this research is to develop human resource data mart by optimizing the utilization of historical data from employee mutation transactions. The results of this research are human resources data mart that accommodates historical data on employee mutation transactions and produces information that is useful for the Top Management to support the making decision.

Keywords: BKPP, Bottom-Up Approach, Data Mart, Data Warehouse, Human Resources.

Intisari—*Data warehouse merupakan tempat penyimpanan data tunggal yang lengkap dan konsisten dengan karakteristik berorientasi subjek, terintegrasi, tidak volatil, dan bervariasi waktu yang dapat digunakan untuk mendukung keputusan, sedangkan Data mart adalah subset dari data warehouse yang mendukung kebutuhan informasi dari departemen atau fungsi bisnis tertentu. Badan Kepegawaian, Pendidikan dan Pelatihan (BKPP) Kota Bandung memiliki histori transaksi mutasi pegawai yang belum dimanfaatkan secara optimal sehingga akan sangat berguna jika data tersebut dapat dibuat menjadi suatu data mart. Metode pengembangan data mart ini menggunakan metode From Enterprise Models to Dimensional Models sebagai metode perancangannya dan Bottom Up Approach sebagai pendekatan dalam pengembangan data mart. Data mart ini dibangun dengan menggunakan PostgreSQL database dan menggunakan bahasa pemrograman PHP dalam membuat user interface. Tujuan dari penelitian ini adalah untuk mengembangkan suatu data mart kepegawaian dengan mengoptimalkan pemanfaatan data histori dari transaksi mutasi pegawai. Hasil dari penelitian ini adalah sebuah data mart kepegawaian yang menampung data histori transaksi mutasi pegawai dan menghasilkan suatu informasi yang berguna bagi pihak Top Management untuk mendukung proses pengambilan keputusan.*

***Kata Kunci**: BKPP, Bottom-Up Approach, Data Mart, Data Warehouse, Kepegawaian.*

INTRODUCTION

Information technology is growing rapidly lately, encouraging the government to utilize a business process by using information technology. BKPP as a business unit that organizes and develops employees also has the responsibility of implementing e-Government within the scope of staffing, its main purpose is to improve Bandung Smart City.

One of the BKPP responsibilities is to determine the placement of employees in accordance with the capabilities and skill of employees to the appropriate business unit. The placement of employees will go through the process of analyzing the ability and skill of the employee. This process is commonly referred to as Talent Mapping which will produce Talent Pool (LPKM Fakultas Psikologi Universitas Gadjah Mada, 2018). This process will affect employee mutation transactions that produce dynamic staffing data. Employee mutation divided into 3 classifications, i.e:

1. Promotion, positioning employees to a higher rank and position.
2. Rotation, positioning employee to the same rank and position;

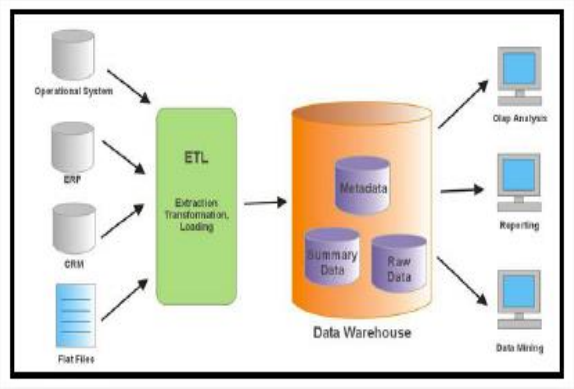
3. Demotion, positioning employee to a lower rank and position.

All three classification above can be in the same business unit or different business unit. Analyzing staffing data by observing employee mutation transactions, is one step that can be done by the BKPP. The results can be used to determine strategic policy in allocating employee needs in the business unit to improve public service..

According to (Inmon, 2005) "data warehouse is a collection of data that has the nature of subject-oriented, integrated, has a certain time vulnerable and does not experience changes from data collection in support of the decision making process in management". "Data warehouse is a database specifically designed with a structure for conducting queries and analysis" (Dejan Sarka, Matija Lah, 2012). The characteristics of data warehouse according to (Inmon, 2005) are:

1. *Subject Oriented*
   Data warehouse designed to analyze data based on certain subjects in the organization, not on certain processes or application functions.
2. *Integrated*
   Data warehouse can store data that comes from separate sources into a format that is consistent and integrated with one another.
3. *Time Variant*
   Data is stored to present information from the past (eg 5-10 years ago).
4. *Nonvolatile*
   Data in the data warehouse is not updated in real time but is refreshed from the operational system regularly.

Data warehouse architecture is a set of rules or structures that provide a framework for the overall design of a particular system (Rodero, Toval, & Piattini, 1999). A data architecture provides a framework that can identify and understand how data will move through systems and needs within the company (Vidette Poe, Patricia Klauer, 1997).



Source: (Dyah Paramita P1, Firdaus2, 2012)
Fig.1. Data Warehouse Architecture

According Poole et al (Vidette Poe, Patricia Klauer, 1997), a data mart basically is a smaller version of a data warehouse, which serves the analytical needs of a particular department or division in an organization, whereas according to (Connolly & Begg, 2005), a data mart is a subset of a data warehouse that supports the information needs of certain departments or business functions. The difference between data warehouse and data mart is very slight, but both of them has the same goal and purpose.

The characteristics that distinguish between a data mart and a data warehouse are as follows (Dyah Paramita P1, Firdaus2, 2012):

- Data marts focus only on the needs of users involved in a department or business function;
- Data marts usually did not contain detailed operational data as in the data warehouse;

Data marts contain less information compared to data warehouses. Data mart is easier to understand.

MATERIALS AND METHODS

The method used in this study are :

A. Analysis Method

The analysis method is carried out through the following stages:

- Survey of the current system by conducting interviews;
- Analysis of data obtained from surveys;
- Identify information needed by BKPP in the data mart.

B. Data mart design method

The method used in the research is according to D. Moody and M. Kortink, who proposed a methodology for designing data warehouse and data mart from a corporate enterprise system model, with the following steps:

1. Classify Entities
   Group each entity into three categories: transaction entities, component entities and classification entities;
2. Identify Hierarchy
   A hierarchy in the ER Diagram is sequences of entities that join one-to-many relations, and all are aligned in the same direction.
3. Create a dimensional model
   Creating a dimensional model using two operators: collapse hierarchy and aggregation;
4. Evaluation and Refinement
   It is an final step to produce data mart design.

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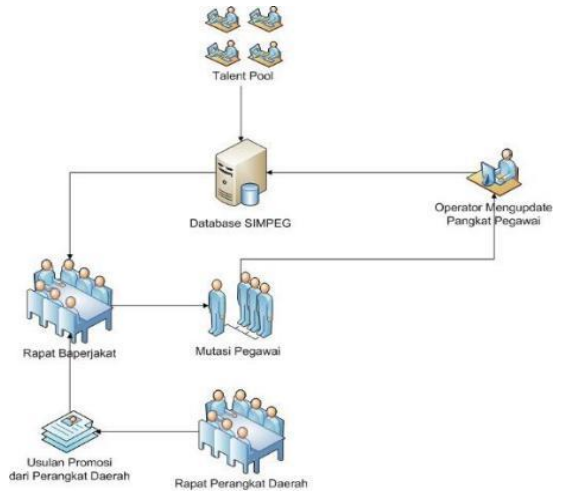
RESULTS AND DISCUSSION

System Analysis

A. *Existing System Anlysis*

Rich picture below describe employee mutation process in BKPP of Bandung City.

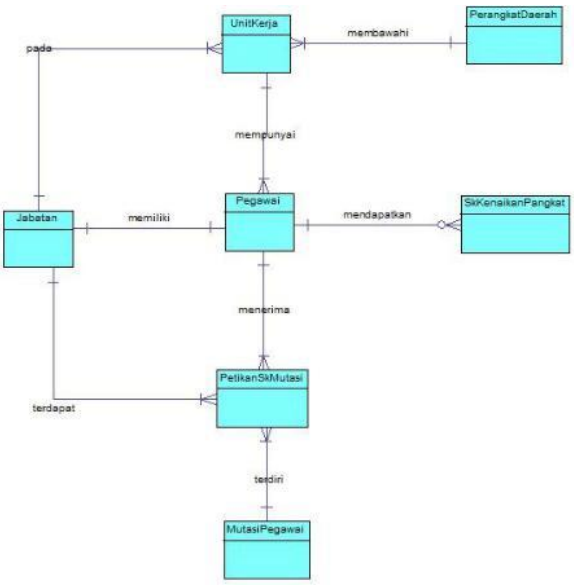


Source: (Utami, Pratama, & Widianto, 2019)

Fig.2. Rich Picture of existing system

B. *Database Analysis*

Based on a survey of the current system by conducting interviews with employee of the BKPP that have responsibilities to maintain information system, we obtained data that related to the employee system database at BKPP especially the employee mutation transaction.



Source: (Utami et al., 2019)

Fig.3. ERD of employee mutation at BKPP of Bandung Ciy

C. *Opportunity Analysis*

BKPP has a history of employee mutations stored in the Employee Management Information System database and has not been optimally utilized to display employee mutation transactions. So the authors see an opportunity to utilize the data into a data mart that will be more easily understood for decision making about employee mutations by the Top Management

Benefit that can be obtained from employee mutation data mart is:

1. The employee's mutation history data can be utilized optimally by Top Management as analysis material in determining the policy and decision making;
2. All historical data on employee mutation transactions can easy to understand;
3. Report that generated by data mart can be multidimensional which means it can be seen from various point of view.

D. *Analysis of Information Systems Requirements*

Data and information needed by Top Management in analyzing and making decisions related to determining the placement of employees are:

1. Reports of employee mutation fluctuations that can be illustrated by the number of employees available with certain positions and ranks;
2. Reports on average employee mutations as seen from the average availability of employees with certain positions and ranks;
3. Reports on the number of employees of each business unit include the number of employee mutation transactions, rank and position of employees;
4. Report on the average mutation of employees from each business unit in Bandung City within a certain period

Data Mart Design

A. *Classify Entities*

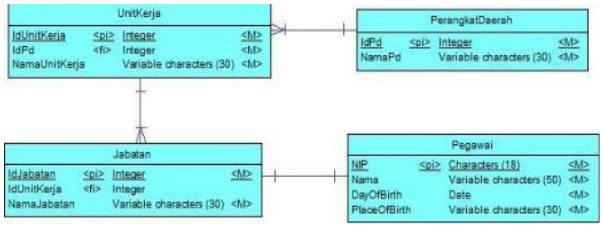
Grouping the entities into 3 categories.

- Transaction Entities : MutasiPegawai entity, and PetikanSKMutasi entity
- Component Entities : Jabatan entity, Pegawai entity and SkKenaikanPangkat entity
- Classification Entities : UnitKerja entity, and PerangkatDaerah entity

B. *Identify Hierarchy*

Based on the MutasiPegawai entity relationship model in BKPP of Bandung City, we can be made several hierarchies:

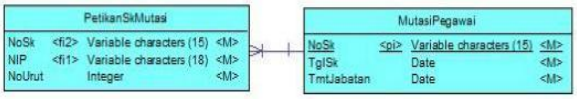
1. Hierarchy with PerangkatDaerah entity at the top and Pegawai entity at the bottom



Source: (Utami et al., 2019)

Fig.4. Hierarchy Pegawai entity

2. Hierarchy with MutasiPegawai entity at the top and PetikanSK entity at the bottom



Source: (Utami et al., 2019)

Fig.5. Hierarchy MutasiPegawai entity

C. Create Model Dimensional

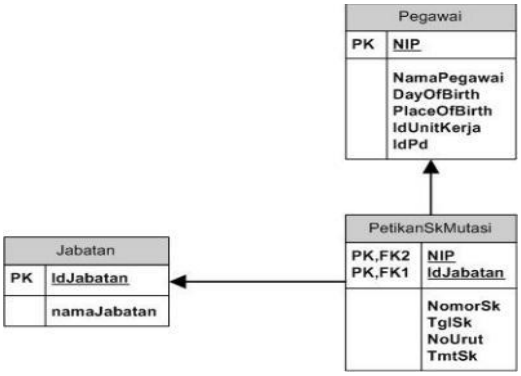
- Collapse Hierarchy

is the fusion of the highest level entity to the lower level entity in the hierarchy. For example, a PerangkatDaerah entity is merged into UnitKerja entity, then the UnitKerja entity will contain the original attributes plus the attributes derived from the merged table. This fusion takes place until the lowest entity is in a hierarchy, leaving one entity which will then become a dimension table

- Aggregation

Aggregation can be applied to a transaction entity to create a new entity that contains summarized data. A subset of attributes is selected from the source entity for aggregation (the aggregation attributes).

Star scheme at data mart employee mutation in BKPP an be seen in figure below.

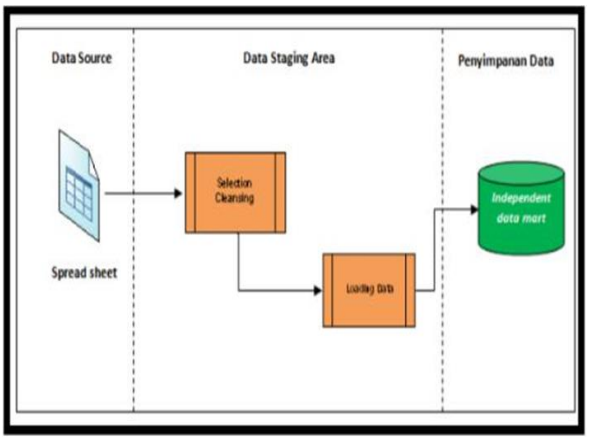


Source: (Utami et al., 2019)

Fig.6. Star scheme of employee mutation at BKPP

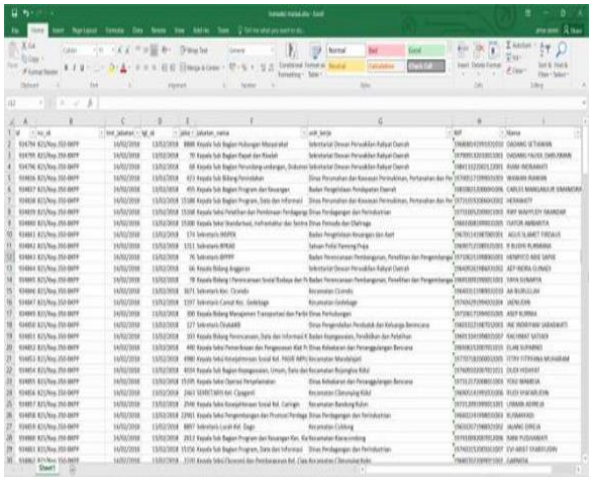
There is a fact table in the star scheme, which is a table of PetikanSKMutasi with two dimension tables, consist of Jabatan and Pegawai Dimension tables.

The following figure shows the architecture of the data mart that will be built from the history of employee mutation transactions within a year in a spreadsheet format.



Source: (Dyah Paramita P1, Firdaus2, 2012)

Fig.7. Independent data mart architecture to be built



Source: (Utami et al., 2019)

Fig.8. Data transaction per employee mutation phase

Source data obtained is in the form of excel or *.xls extension, but the authors decide to convert it into *.csv extension first, for minimize the time spent when loading data into the database.

Implementation

In the implementation of the design of this data mart, the data that has been processed is displayed in the form of diagrams and tables based on user needs. Some of the implementations are:

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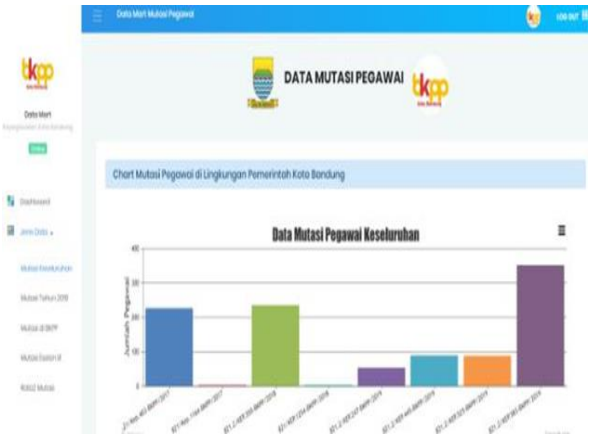
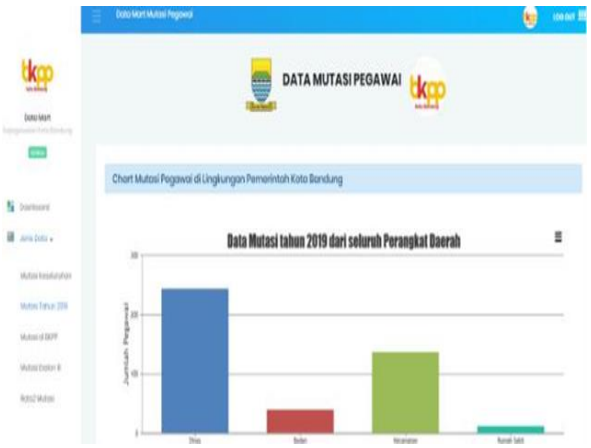
- Overall employee mutation data



Source: (Utami et al., 2019)

Fig.9. Overall employee mutation data

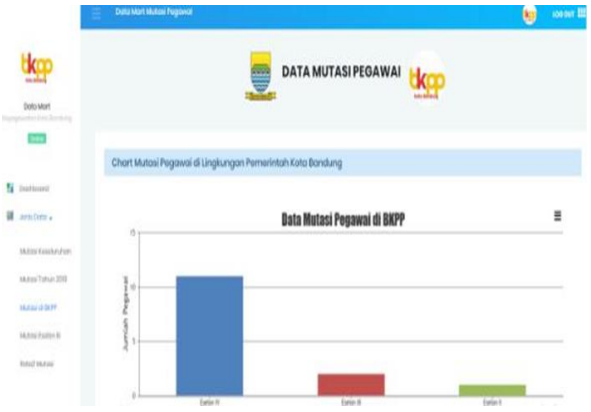
- Employee mutation data in 2019 from all business unit



Source: (Utami et al., 2019)

Fig.10. Employee mutation data in 2019 from all business unit

- Employee mutation data at BKPP



Source: (Utami et al., 2019)

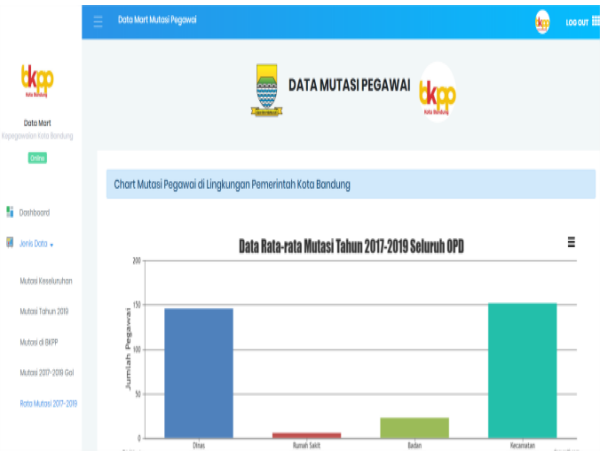
Fig.11. Employee mutation data at BKPP

- Employee mutation data in 2017-2019 based on grade

Source: (Utami et al., 2019)

Fig.12 Mutation data in 2017-2019 based on grade

- Average employee mutations data in 2017 - 2019 at all Business unit



Source: (Utami et al., 2019)

Fig.2. Average employee mutations data in 2017 – 2019

CONCLUSIONS

Based on the data that the authors have collected during the research and have been described in previous chapters, the conclusions are: BKPP has a history of employee mutation transactions that have not been optimally utilized. Even though the current system has been able to handle the operational activities of BKPP Bandung City, the optimal use of employee mutation transaction history data can certainly provide a great benefit for BKPP. History of employee mutation transaction data can be stored into the employee data mart, so as to produce information that is useful for top management who support the decision-making process. The information generated by data mart is concise, with a graphical

form that facilitates understanding and analysis in the decision making process. From the conclusions that have been described, the authors provide suggestions that can be useful in overcoming weaknesses. Things that need to be considered are: For further development, it is expected that the scope of the data mart is greater, covering the data of all staffing transactions. Perform routine maintenance of employee mutations data mart, so that the data processed and produced has good performance. It is expected that the data mart that has been built can be developed into a data warehouse that covers all areas of the business unit at BKPP that is used for staffing information service needs..

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