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Designing a Lecturer's Performance Data Warehouse Model Using Star Scheme

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***Abstract*— Lecturer performance at Sumatera Institute of Technology is very influential in learning activities. In this situation, a comprehensive control is needed. Further, data of lecturers, research, and so on were massive stored in database due to the number of this institution' lecturers was more than 500 lecturers. Thus, the leader needed a monitoring system to control lecturers' performance in the institution. To solve this problem, it must be something that able to produce information which support monitoring needs.**

Data warehouse is collection databases were stored in a database. It can support the process of making decision based on information was formed from data warehouse. Thus, in this research, warehouse data which contain support information based on tri dharma of university will be formed. Moreover, warehouse data in this research will be formed on 3 schemes. These schemes are Educational Scheme, Research Scheme and Service Scheme will be functionated as data to make leader's monitoring dashboard. *Star Scheme design* was chosen to make these 3 schemes. Those schemes were data basic structures which will be used as a reference for the development of lecturer's performance appraisal data warehouse. Education scheme, Research scheme, and Service scheme were formed from data source which collected from systems. Therefore, these schemes can be used to build a warehouse data in the next research. Star Schema is a model has a small number of tables and clear join path, therefore the query can be done quickly.

Keywords—data warehouse, star scheme design, lecturer performances

I. INTRODUCTION

Education gives knowledge from any fields including technology field. Thus, it is crucial instrument in human' life system. In the crucial needs of education, there were technology universities in Indonesia and Sumatera Institute Technology (ITERA) was one of them which built in 2014 [1].

A huge number of lecturers and college student's effect massive data recorded in ITERA's database system. Thus, data searching and data processing needed a long time.

In addition, data warehouse development is used to process education, research and service data from Sumatera Institute of Technology's system. Therefore, this data warehouse will be a reference and model for lecturer performance measurementIn addition, data warehouse development is used to process education, research and service data from Sumatera Institute of Technology's system. Therefore, this data warehouse will be a reference and model for lecturer performance measurement

Data warehouse formation is the initial stage of initializing the construction of data warehouse. Further, this research used star schema modeling.

II. LITERATURE REVIEW

A. Data Warehouse

Data warehouse is data information collection has *subject-oriented*, *integrated*, *nonvolatile*, and *time-variant* that aim to support the management decision-making process. Mannino found that data warehouse is central data store from basic data operation and others which were integrated, cleaned, and archived to support decision-making. While McLeod said, data warehouse is a large capacity storage system. In this case, data was collected by adding new record rather than updating existing records with new information [2]. In addition, Poniah (2001) found that data warehouse is not a product but an environment which user able to find strategic information in. Data warehouse is a summary and it is a logic data collection that was separated from operational database. Further, Ferdiana (2008) stated that data warehouse is a concept and technology combination facilitated organization to process and look after history data which collected from system of operational application [3]. This kind of data was only used for making decision process rather than company daily operational activities.

Physically, data warehouse is a database. However, in traditional database design using normalization but in data warehouse normalization is not the best way. Data warehouse is storage based on subject but application. While subject is a part of a company. For example, subject of Manufacture Company is a sale, consumer, inventory and other subjects. While operational database was database used in system.

The choice of star scheme in this research is based on the need for fast data to be presented as a monitoring system. The star schema has a small number of tables and a clear join path, able to support data needs with faster queries, fast loading, and good data consistency.

B. Design Schema

Forming database model is on of data warehouse steps which will be used as basic database scheme. User's needs and data effected data warehouse dimensional design. Dimensional model should be designed as user's need and able to survive and adapt from any changes well. Further, the outcome of this model must to be relational database which support OLAP cubes to serve query instant result to analyze:

1. Dimension Tables describe the business entity of an enterprise. Dimension tables generally contain descriptive data, where the data rarely changes.
2. Fact Tables is a table that describes the business transactions of an enterprise is usually called a detail table[4]. Fact tables generally contain data that is directly related to the business process.
3. Dimensional Model Scheme The following are some of the schemas commonly used to design a data warehouse:
   a) Star schema, if all dimension tables are linked directly to the fact table and one fact table must have a relationship with at least one dimension table.
   b) Snowflake schema, if one or more-dimension tables are not directly related to the fact table but must be related through another dimension table.
   c) Constellation schema, if one dimension table is shared by one or more fact tables.

C. Star Schema

A star schema is composed of one or more central fact tables, a set of dimension tables, and the joins that relate the dimension tables to the fact tables. This section describes these components and outlines some of the decisions you need to make before designing a decision-support schema [10].

A Star Schema consist of a table relationship between fact table and a dimension table. There is one fact table and is in the middle between dimension tables, the dimension table will relate to the fact table so it call as Star Schema because it is look like star.

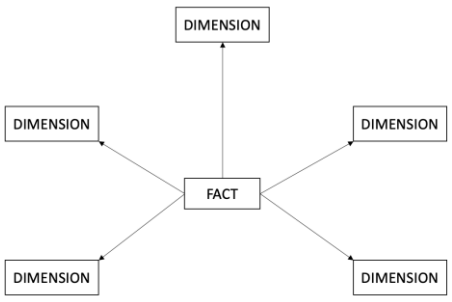

Figure 1. Star Schema

Research previously with title "Research on Extract, Transform and Load (ETL) in Land and Resource Star Schema Data Warehouse" [2]

III. Research Methodology

In this study using a development methodology with several stages.

A. Determining the Subject of the Data Warehouse

In determining the subject of the data warehouse. The main subject in this research is to produce data on education, research, and service.

B. Determining the Data Source

This is the stage of collecting the required data. And determine where the data source will be taken from.

C. Modeling

This is the final stage in this research, which is to form a model in the form of a star schema based on the data sources that have been collected.

Figure 2. Diagram of staging star schema

IV. Implementation

The subject of this research is to build a data warehouse model to be able to produce information about lecturer performance, later. In this case, it refers to three main schemes, namely education, research, and service schemes.

A. Determinatio*n of Data Sources*

The data sources that will be used in the three aforementioned schemes come from various sources that are already available in the institutional database.

1. Education *Data Sources*
   To form educational data, data is needed from the personnel database, the academic database, and the department database.
2. Research *Data Sources*
   To form research data required data from the staffing database, lecturer's workload database, research database.
3. Dedication/Service Data Sources
   To form service data, data is needed from the staffing database, lecturer workload database, community service database

The database that has been mentioned for each data source requirement comes from the existing system in the institution.

a) Staffing Database
b) Siakad *Database*
c) Department Database
d) Lecturer's Workload Database
e) Research Database
f) Public Service Database

B. Star Schema

This stage is the design stage which is the final stage in this research, namely doing data warehouse modeling. Creating a data model as a place to store data that has been

transformed, this refers to the data source that has been provided. The model used is the Star Schema.

1. Education Scheme Model

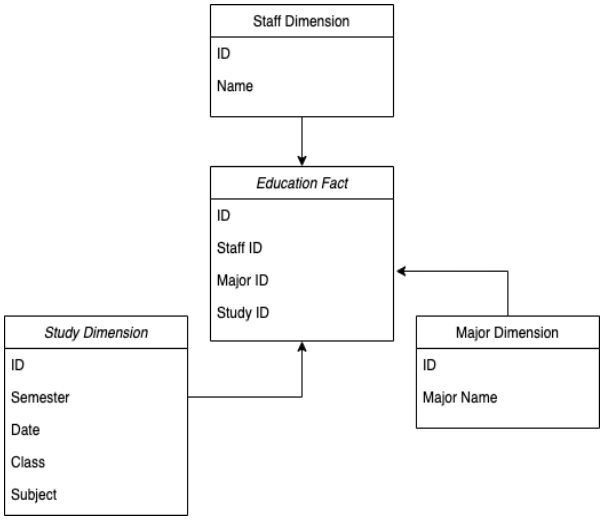

Figure 3 Education Scheme

2. Research Scheme Model

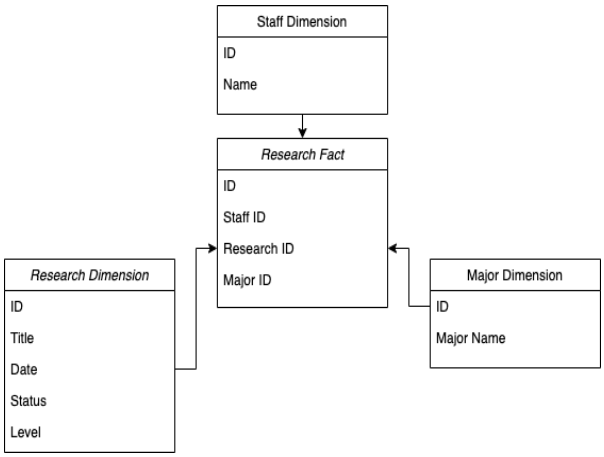

Figure 4 Research Scheme

3. Service Scheme Model

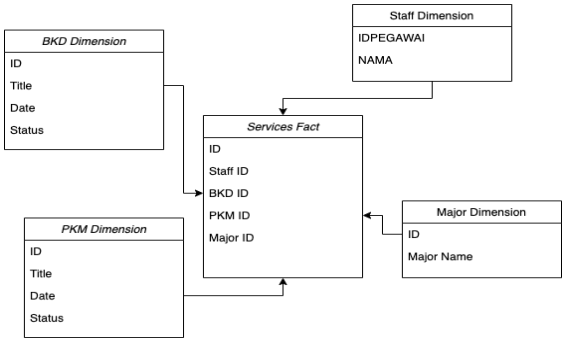

Figure 5 Service Scheme

C. Results

The purpose of this research is to create a model in the form of a star schema that can be used for data warehouse development in the subject of lecturer performances.
Based on the three schemas that have been formed in the star schema model, three fact tables are obtained, namely: the education fact table, the research fact table, and the services fact table. These three schemas will be used as a reference for making the data warehouse structure. As a data repository that can produce accurate information about lecturer performance.

1. Education Fact Table

Table 1 Education Fact Table

No	Field
1	ID
2	Staff ID
3	Major ID
4	Study ID

Based on table above, some information will be formed that can be processed:

- Staff ID
  This field will generate staff data, which will be used as identity data.

- Major ID
  This field will generate major study of the identity owners.

- Study ID
  This field will generate all of lecture data. For example, class, study, semester, etc.

2. Research Fact Table

Table 2 Research Fact Table

No	Field
1	ID
2	Staff ID
3	Major ID
4	Research ID

Based on table above, some information will be formed that can be processed:

- Staff ID
  This field will generate staff data, which will be used as identity data.

- Major ID
  This field will generate major study of the identity owners.

- Research ID
  This field will generate research data. For example, title, date, status, and level.

3. Service Fact Table

Table 3 Service Fact Table

No	Field
1	Staff ID
2	Major ID
3	BKD ID
4	PKM ID

Based on table above, some information will be formed that can be processed:

- Staff ID
  This field will generate staff data, which will be used as identity data.

- Major ID
  This field will generate major study of the identity owners.

- BKD ID
  BKD is a data source of the lecturer workload system. Will generate service data. For example, title, date, and status.

- PKM ID
  PKM is a data source that comes from the community service system. Will generate service data. For example, title, date, and status.

FUTURE WORKS

This research focuses on the formation of a complete model to meet the needs of the formation of lecturer performance analysis. In future research, the model data generated in this study can be used. By going through the data warehouse development process using the model mentioned above.

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