International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 6, Issue 5, 2019

Design of the Business Intelligence System at the Co&Co Training Center

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Information systems are required by companies in order for them to quickly and effectively analyse and improve corporate strategies. Information becomes a major requirement in making the right decisions. Designing a data mart for companies is important for companies because data marts contain information companies need especially for Managers in decision-making. Data from the data mart are then analyzed in the dashboard to produce multidimensional data. Method of data collection include surveys, interviews, analysis, and design. The analysis method is in accordance with the needs of the Training Center Manager, while the design method uses a star scheme and dashboard concept. The results achieved are dashboards that can be seen by the Training Center Manager to evaluate the training conducted at the Co&Co Training Center. The dashboard is also displayed with a bar diagram, line diagram, and gauge. The conclusion of this paper is that there is a dashboard that analyzes data in the data mart so that it can be used by the Training Center Manager to make decisions about the quality of training and support the vision and mission of the Co&Co Training Center.

Key words: *Design, data mart, business intelligence, dashboard, star scheme.*

Introduction

In the current era of globalization, the process of making the right decisions is more difficult. In this globalization era, the process to make the right decision has become harder. A business application that can only generate an operational report is not always enough to do the extensive analysis required for more in depth analysis as necessary to make a good decision. This is because an operational report is not designed for analysis purpose and executive need something more to do extensive analysis such as to have the depth of information needed to create a decision. To resolve this issue, we need to develop a kind of

system that can help to generate a report that can help executives in conducting analysis needed for decision making.

Business intelligence (BI) is a system that can help an executive, or a decision maker, to analyze a fact that can become of value from a profit or sales dimension. BI provides a data visualization usually in a form of graphics or charts that can help the decision maker to make a decision. Trends analysis can also help to indicator when a business is off the track. It can help the decision-making process in regards to items like positioning and customer segmentation.

Co&Co Training Center (CCTC) is a business unit engaged in IT training owned by Co&Co Working Space (Co&Co). They have realized that a system is needed to assist in decision making. In this instance, BI is able to help expand the capabilities of this company's products.

BI is a system that integrates the processes and technology that lead to decision making for managers and end users. (Sun and Yearwood, 2014)This system plays an important role in analyzing the business environment and providing decision-making to achieve competitive advantages that arise from frequently changing uncertainties in the environment. (Burton *et al.*, 2006; Isik *et al.*, 2013)

The main purpose of designing this BI dashboard lies in the information and analysis needed to be produced. This requires data that has been stored in the database to be processed so that it displays in according with the needs of the training center manager. In addition, the BI dashboard also facilitates training center managers in accessing the data and information needed to help make decisions, while also facilitating top-level management and low-level management in doing work by saving time and being easy to use. If the BI dashboard is able to fulfill the above, then the company mission and determined strategy is easier to implement and monitor. The design of the BI dashboard relates to training activities that occur on CCTC.

Literature Review

Database

Database are now such an integral part of our day-to-day life that often we are not aware that we are using one. To start our discussion of databases, in this section we examine some applications of database systems. For the purpose of this discussion, we consider a database to be a collection of related data and a database management system (DBMS) to be the software that manages and controls access to the database. A database application is simply a program that interacts with the database at some point in its execution. We also use the more inclusive term database system as a collection of application programs that interact with the database along with the DBMS and the database itself.(Connolly and Begg, 2015)

The database is a single, possibly large, repository of data that can be used simultaneously by many departments and users. Instead of disconnected files with redundant data, all data items are integrated with a minimum amount of duplication. The database is no longer owned by

one department but is a shared corporate resource. The database holds not only the organization's operational data but also a description of this data. For this reason, a database is also defined as a self-describing collection of integrated records. The description of the data is known as the system catalog (or data dictionary or metadata—the "data about data"). It is the self-describing nature of a database that provides program–data independence.(Connolly and Begg, 2015)

The approach is taken with database systems, where the definition of data is separated from the application programs, is similar to the approach taken in modern software development, where an internal definition of an object, and a separate external definition, are provided. The users of an object see only the external definition and are unaware of how the object is defined and how it functions. One advantage of this approach, known as data abstraction, is that we can change the internal definition of an object without affecting the users of the object, provided that the external definition remains the same. In the same way, the database approach separates the structure of the data from the application programs and stores it in the database. If new data structures are added or existing structures are modified, then the application programs are unaffected, provided that they do not directly depend upon what has been modified. For example, if we add a new field to a record or create a new file, existing applications are unaffected. However, if we remove a field from a file that an application program uses, then that application program is affected by this change and must be modified accordingly.(Connolly and Begg, 2015)

Another expression in the definition of a database that we should explain is "logically related." When we analyze the information needs of an organization, we attempt to identify entities, attributes, and relationships. An entity is a distinct object (a person, place, thing, concept, or event) in the organization that is to be represented in the database. An attribute is a property that describes some aspect of the object that we wish to record, and a relationship is an association between entities.(Connolly and Begg, 2015)

Data Warehousing

As its name suggests, a data warehouse is a foremost repository for the data available for developing BI architectures and decision support systems. The term data warehousing indicates the whole set of interrelated activities involved in designing, implementing and using a data warehouse. It is possible to identify three main categories of data feeding into a data warehouse: internal data, external data, and personal data.(Vercellis, 2009)

Internal data are stored for the most part in the databases, referred to as transactional systems or operational systems that are the backbone of an enterprise information system. Internal data are gathered through transactional applications that routinely preside over the operations of a company, such as administration, accounting, production, and logistics. These data usually come from different components of the information system(Vercellis, 2009):

1. Back-office systems that collect basic transactional records such as orders, invoices, inventories, production and logistics data.
2. Front-office systems, that contain data originating from call-center activities, customer assistance, and execution of marketing campaigns.

3. Web-based systems that gather sales transactions on e-commerce websites, visits to websites, data available on forms filled out by existing and prospective customers.

There are several sources of external data that may be used to extend the wealth of information stored in the internal databases. To be concluded, the differences between internal data and external data is, if internal data is retrieving data from the database, then the external data is retrieved data that does not exist in the database.(Vercellis, 2009)

In most cases, decision makers performing a business intelligence analysis also rely on information and personal assessments stored inside worksheets or local databases located in their computers. The retrieval of such information and its integration with structured data from internal and external sources is one of the objectives of knowledge management systems. (Vercellis, 2009)

Data Warehouse Architecture

The reference architecture of a data warehouse, shown in Figure 1, includes the following major functional components.

a. The data warehouse itself, together with additional data marts, that contains the data and the functions that allow the data to be accessed, visualized and perhaps modified.

b. Data acquisition applications, also known as extract, transform and load (ETL) or back-end tools, which allow the data to be extracted, transformed and loaded into the data warehouse.

c. BI and decision support applications, which represent the front-end and allow the knowledge workers to carry out the analyses and visualize the results.

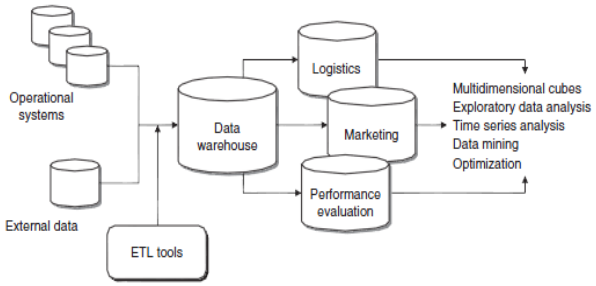
The three-level distinction applies to the architecture shown in Figure 1 even from a technological perspective.

a. The level of the data sources and the related ETL tools that are usually installed on one or more servers.

b. The level of the data warehouse and any data mart, possibly available on one or more servers as well, and separated from those containing the data sources. This second level also includes the metadata documenting the origin and meaning of the records stored in the data warehouse.

c. The level of the analyses that increase the value of the information contained in a data warehouse through query, reporting, and possibly sophisticated decision support tools. The applications for BI and decision support analysis are usually found on separate servers or directly on the client PC used by analysts and knowledge workers.

Figure. 1. Architecture and functions of a data warehouse



Characteristics of Data Warehouse

There are four main characteristics of the data warehouse(Inmon, 2005; Vercellis, 2009), divided into:

Subject-oriented

Subject-oriented means a data warehouse is based on the main subject in the corporate environment and not process-oriented or application functions. Subject areas include the usual customer, product and transaction. Each subject area is physically implemented as a set of related tables in the data warehouse.(Vercellis, 2009)

Integrated

Of all the aspects of a data warehouse, integration is the most important. Data is fed from multiple, disparate sources into the data warehouse. As the data is fed, it is converted, reformatted, resequenced, summarized, and so forth. The result is that data, once it resides in the data warehouse, has a single physical corporate image.

Non-volatile

Data warehouse's data are loaded (usually, but not always, en masse) and accessed, but it is not updated (in the general sense). Instead, when data in the data warehouse are loaded, it is loaded in a snapshot, static format. When subsequent changes occur, a new snapshot record is written. In doing so, a historical record of data are kept in the data warehouse.

Time-variant

Time-variant implies that every unit of data in the data warehouse is accurate as of some moment in time. In some cases, a record is time stamped. In other cases, a record has a date of a transaction. But in every case, there is some form of time marking to show the moment in time during which the record is accurate.

Based on the statements above, it can be concluded that the data warehouse is subject oriented because the data is organized based on the main subject. The second characteristic of the data warehouse is that it is integrated because once the data is residing in a data

warehouse, it has a single physical corporate image even though it came from different sources. It is considered non-volatile because of the data warehouse's ability to keep a historical record of data and it can't be updated. The last salient characteristic is time variant, which implies every unit of data in the data warehouse is accurate as of some moment in time.

ETL (Extract, Transform, Load) Tools

Extract

During the first phase, data are extracted from the available internal and external sources. A logical distinction can be made between the initial extraction, where the available data relative to all past periods are fed into the empty data warehouse and the subsequent incremental extractions that update the data warehouse using new data that become available over time. The selection of data to be imported is based upon the data warehouse design, which in turn depends on the information needed by business intelligence analyses and decision support systems operating in a specific application domain. (Vercellis, 2009)

Transform

The goal of the cleaning and transformation phase is to improve the quality of the data extracted from the different sources, through the correction of inconsistencies, inaccuracies, and missing values. Moreover, during the transformation phase, additional data conversions occur in order to guarantee homogeneity and integration with respect to the different data sources. Furthermore, data aggregation and consolidation are performed in order to obtain the summaries that will reduce the response time required by subsequent queries and analyses for which the data warehouse is intended. (Vercellis, 2009)

Load

Finally, after being extracted and transformed, data are loaded into the tables of the data warehouse to make them available to analysts and decision support applications. (Vercellis, 2009)Applications acquisition, also known as extract, transform and load (ETL) or back-end tools, are an application that allows data to be extracted, transformed and loaded into the data warehouse. Business intelligence and decision support applications are front-end and allow knowledge workers to carry out the analysis and visualize the results.

Dimensionality Modeling

Dimensionality modeling is a logical design technique that aims to present the data in a standard, the intuitive form that allows for high-performance access. Dimensionality modeling uses the concepts of Entity–Relationship (ER) modeling with some important restrictions. Every dimensional model (DM) is composed of one table with a composite primary key, called the fact table, and a set of smaller tables called dimension tables. (Connolly and Begg, 2015)

There are three basic types of dimensional models, one of them is star schema. Star schemas have one fact table and several dimension tables. (Ballard *et al.*, 2006)Star schema is a logical structure that has a fact table containing factual data in the center, surrounded by dimension tables containing reference data (which can be denormalized). The representation of multidimensional star schema contains two types of data tables: dimension tables and fact tables. (Vercellis, 2009)

Based on the statements above, it can be concluded that star schema is the logical structure of the data that enables two types of tables, they are dimension tables and fact tables. Dimension tables contain data that are compatible with the needs of businesses and the facts surrounding the table to obtain the information.

The multi-dimensional representation is based on a star schema that contains two types of data tables: dimension tables and fact tables. A fact table is a table that generally contains something that can be measured and historical, and a collection of a foreign key from the primary key contained in each dimension table. (Vercellis, 2009)Fact tables usually refer to transactions and contain two types of data:

a. Links to dimension tables, that are required to properly reference the information contained in each fact table.

b. Numerical values of the attributes that characterize the corresponding transactions and that represent the actual target of the subsequent OLAP analyses.

Therefore, the fact table contains derived data and connects one or more dimension tables. The dimension table is a table that contains categories with summary details of which can be in the form of reports. In general, dimensions are associated with the entities around which the processes of an organization revolve.

Metadata

In order to document the meaning of the data contained in a data warehouse, it is recommended to set up a specific information structure, known as metadata, i.e. data describing data. The metadata indicate for each attribute of a data warehouse the original source of the data, their meaning and the transformations to which they have been subjected. The documentation provided by metadata should be constantly kept up to date, in order to reflect any modification in the data warehouse structure. The documentation should be directly accessible to the data warehouse users, ideally through a web browser, according to the access rights pertaining to the roles of each analyst. (Connolly and Begg, 2015)

Staging Area

The staging area is the place where the extracted and transformed data is placed in preparation for being loaded into the data warehouse. The purpose of the staging area is for handling data extracted from the source system. There can be data transformations at this point and/or as the data is loaded into the data warehouse. The structure of the staging area depends on the approach and tool used for the extract, transform, and load (ETL) processes. (Ballard *et al.*, 2006)

Based on the statements above, it can be concluded that the staging area is the place where the ETL process runs for consumption by the business users.

Dimension Table

Dimension tables contain attributes that describe fact records in the fact table. Some of these attributes provide descriptive information; others are used to specify how fact table data should be summarized to provide useful information to the business analyst. Dimension tables contain hierarchies of attributes that aid in summarization. (Ballard *et al.*, 2006)

The dimension table contains relevant, yet separate, information (such as the corporate calendar, the corporate pricing tables, the locations of stores, the means of shipment for an order, and so forth). The dimension table defines important, yet ancillary, information that relates to the fact table. (Inmon, 2005)

Based on the statements above, it can be concluded that dimension tables provide attributes with descriptive information that describe fact records in the fact table.

Fact Table

The fact table is a structure that contains many occurrences of data. The fact table and the dimension table are related to the existence of a common unit of data. (Inmon, 2005)Fact tables usually refer to transactions and contain two types of data:

a. Links to dimension tables, that are required to properly reference the information contained in each fact table.

b. Numerical values of the attributes that characterize the corresponding transactions and that represent the actual target of the subsequent OLAP analyses.

Based on the statements above, it can be concluded that a fact table is the primary table in a dimensional model and related to the dimension table by the existence of a common unit of data.

Dashboard

Today's dashboards are direct descendants of the old EIS and DSS systems with greatly improved functionality and appearance. That's because they are linked to today's powerful data systems and utilize a tightly focused Key Performance Indicator. Three types of the dashboard (Scheps, 2018) are:

Tactical Dashboards

Measure short-term productivity and effectiveness. Their output is often used by an individual contributor. As an example, a network engineer might have a tactical dashboard that actively monitors real-time IT infrastructure statistics and trends. And it can help to tip-off when something is wrong immediately.

Operational Dashboards

Quantify the short and medium term effectiveness of a specific business function (or family of business functions) at the team of the business-unit level. This level of the dashboard could potentially be deployed for an individual knowledge worker or a local team manager. The trends and metrics displayed will have an impact on short-term decisions.

Strategic Dashboards

Built for the policy-setting levels of the organization (such as the chief-level executives or business-unit directors). These dashboards display metrics that represent corporate strategy and direction.

Business Intelligence

Business information and business analyses within the context of key business processes that lead to decisions and actions, that result in improved business performance. (Williams and Williams, 2006)

Business intelligence can be defined as the processes, technologies, and tools needed to turn data into information, information into knowledge, and knowledge into plans that drive profitable business action. Business intelligence encompasses data warehousing, business analytical tools, and content/knowledge management.

Business intelligence may be defined as a set of mathematical models and analysis methodologies that exploit the available data to generate information and knowledge useful for complex decision-making processes. (Vercellis, 2009)

Main Purpose of Business Intelligence

The main purpose of business intelligence systems is to provide knowledge workers with tools and methodologies that allow them to make effective and timely decisions. (Vercellis, 2009)

Effective decisions

The application of rigorous analytical methods allows decision makers to rely on information and knowledge that are more dependable. As a result, they are able to make better decisions and devise action plans that allow their objectives to be reached in a more effective way.

Timely decision

Enterprises operate in economic environments characterized by growing levels of competition and high dynamism. As a consequence, the ability to rapidly react to the actions of competitors and to new market conditions is a critical factor in the success or even the survival of a company.

Business Intelligence Architecture

Business intelligence architectures contain three major components(Vercellis, 2009), they are:

Data sources

In the first stage, it is necessary to gather and integrate the data stored in the various primary and secondary sources, which are heterogeneous in origin and type. The sources consist for the most part, of data belonging to operational systems but may also include unstructured documents, such as emails and data received from external providers.

Data warehouses and data marts

Using extraction and transformation tools known as extract, transform, load (ETL), the data originating from the different sources are stored in databases intended to support business intelligence analyses.

Business intelligence methodologies

Data are finally extracted and used to feed mathematical models and analysis methodologies intended to support decision makers. In a business intelligence system, several decision support applications may be implemented. This includes the following decision support application:

1. Multidimensional cube analysis
2. Exploratory data analysis
3. Time series analysis
4. Inductive learning models for data mining
5. Optimization models

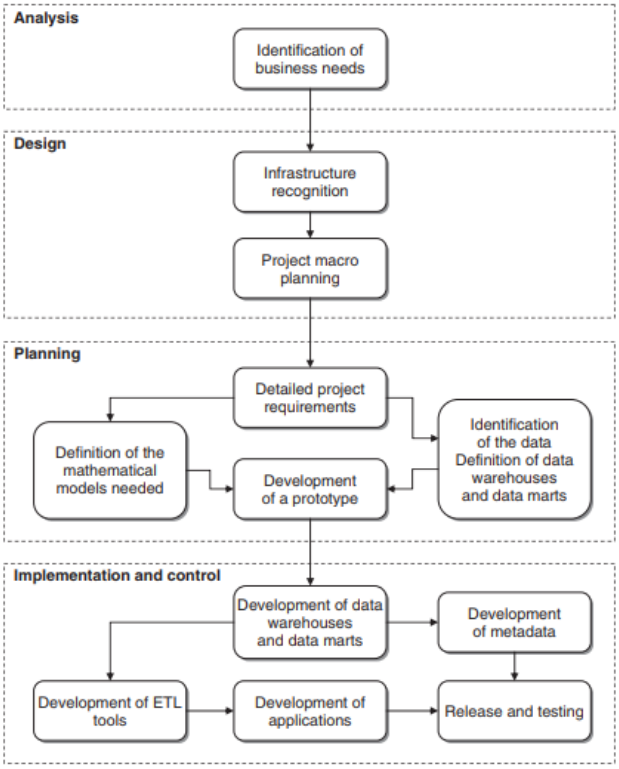
Business Intelligence Opportunity Analysis Overview

The principal methods of BI opportunity analysis are to identify and prioritize opportunities to use business information, business analyses, and structured decisions. The principal objectives are to increase revenue and/or reduce costs, thereby increasing profits and creating business value(Williams and Williams, 2006). To accomplish those objectives, a structured approach that aligns two key factors with each other is needed:

a. Business drivers, business strategies, goals and objectives, and the core business processes that drive provided.
b. BI applications that will improve the effectiveness of those core business processes.

Development of a Business Intelligence

Figure 2. Phases in the development of a business intelligence system



There are 4 main steps in the development of business intelligence(Vercellis, 2009), there are:

Analysis

During this phase, the needs of the organization relative to the development of a BI system should be carefully identified. This preliminary phase is generally conducted through a series of interviews of knowledge workers performing different roles and activities within the organization. It is necessary to clearly describe the general objectives and priorities of the project, as well as to set out the costs and benefits deriving from the development of the BI system.

Design

The second phase includes two sub-phases and is aimed at deriving a provisional plan of the overall architecture, taking into account any development in the near future and the evolution of the system in the mid-term. First, it is necessary to make an assessment of the existing information infrastructures. Moreover, the main decision-making processes that are to be supported by the BI system should be examined, in order to adequately determine the information requirements. Later on, using classical project management methodologies, the project plan will be laid down, identifying development phases, priorities, expected execution times and costs, together with the required roles and resources.

Planning

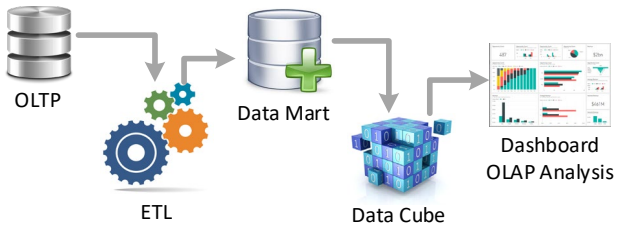
The planning stage includes a sub-phase where the functions of the BI system are defined and described in greater detail. Subsequently, existing data, as well as other data that might be retrieved externally, are assessed. This allows the information structures of the BI architecture, which consist of a central data warehouse and possibly some satellite data marts, to be designed. Simultaneously with the recognition of the available data, the mathematical models to be adopted should be defined, ensuring the availability of the data required to feed each model and verifying that the efficiency of the algorithms to be utilized will be adequate for the magnitude of the resulting problems. Finally, it is appropriate to create a system prototype, at low cost and with limited capabilities, in order to uncover beforehand any discrepancy between actual needs and project specifications.

Implementation and control

Implementation and control are the last phases and consist of five main sub-phases. First, the data warehouse and each specific data mart are developed. These represent the information infrastructures that will feed the business intelligence system. In order to explain the meaning of the data contained in the data warehouse and the transformations applied in advance to the primary data, a metadata archive should be created. ETL procedures are set out to extract and transform the data existing in the primary sources, loading them into the data warehouse and the data marts. The next step is aimed at developing the core business intelligence applications that allow the planned analyses to be carried out. Finally, the system is released for test and usage.

Propose Design
Architecture Model

Figure 3. Architecture Model



The architectural model used is doing the extraction, transformation, and load (ETL) data in OLTP into the data mart. OLTP contains data satisfaction programs, data satisfaction facilities, graduation data, student hours attendance data, and student income data. The data is in ETL into the data mart. This data is data that has been adjusted for management needs in one department. The data mart will be used for the analysis presented in the form of a Dashboard display. The Dashboard system is presented in the form of a user interface such as line charts, bar charts, gauges and other forms that are interesting and easy to understand by management in managing and analyzing and for the decision making the process.

Designing a Data Mart

By referring to the 4 steps methodology, below are 4 steps that are carried out in designing the data mart on CCTC.

Identify the Business Process

The process involved in designing a data mart system are:

Payment Process

This process includes payments from external students served by the registration and payment department. External students will make payments according to the type of training chosen.

Training / Business Event

This process includes training activities to completion. Every internal and external student will attend the scheduled training. Before the training/business event is completed, each unit will provide an evaluation questionnaire to the instructor to give to the student, the evaluation questionnaire is used to evaluate the training system that is useful for improving future improvements. After the training/business event is complete, the instructor also shares the exam questions with the training participants at the end of the meeting, in order to get certification from CCTC. The instructor will provide an evaluation questionnaire filled in by the student and the value of the test results to each related unit. Each unit will provide the results of the evaluation questionnaire and the results of the test scores to the Training Center Manager.

Declaring Grain from Fact Tables

After the process is selected, what needs to be done is to choose the grain from the business process above for each fact table. Below is grain in designing a data mart at the CCTC:

a. The training payment process, the data that can be analyzed is total revenue. The analysis can be carried out based on the period of the year, month, quarter and day.

b. The training process, the data that can be analyzed are training evaluations (programs and facilities), with measures total_very_poor, total_poor, total_normal, total_good, and total_excellent. Graduation data with measure total_passed and total_failed. Student Hours Attendant with measure InStdAttd and ExStdAttd. The analysis can be carried out based on the period of the year, month, quarter and day.

c.

Select Dimension Tables

Following is the dimension table list:

a. Time Dimension

TABLE 1: TIME DIMENSION TABLE

Attribute	Data Type	Length
Time_id	INT	-
Date	DATETIME	-
Day	INT	-
Month	INT	-
Year	INT	-

b. Room Dimension

TABLE 2: ROOM DIMENSION TABLE

Attribute	Data Type	Length
Room_code	INT	-
Room_id	VARCHAR	10
Building_id	VARCHAR	10
Room_name	VARCHAR	10

c. Building Dimension

TABLE 3: BUILDING DIMENSION TABLE

Attribute	Data Type	Length
Building_code	INT	-
Building_id	VARCHAR	10
Building_name	VARCHAR	100

d. Business Event Dimension

TABLE 4: BUSINESS EVENT DIMENSION TABLE

Attribute	Data Type	Length
Business_event_code	INT	-
Business_event_id	VARCHAR	10
Business_event_name	VARCHAR	100
Business_ event_location	VARCHAR	100

e. Student Dimension

TABLE 5: STUDENT DIMENSION TABLE

Attribute	Data Type	Length
Student_code	INT	-
Student_id	VARCHAR	10
Student_name	VARCHAR	100

f. Unit Dimension

TABLE 6: STUDENT DIMENSION TABLE

Attribute	Data Type	Length
Unit_code	INT	-
Unit_id	VARCHAR	10
Unit_name	VARCHAR	100

Choose the Facts

After selecting the dimension table, the fact table will be selected. Below are facts that can be calculated. This data will be displayed on the dashboard:

Fact_ graduation

Includes student_code, business_event_code, saat_id, total_passed, total_failed. Total_passed and total failed is a measure in fact_completion.

Fact_satisfaction_program

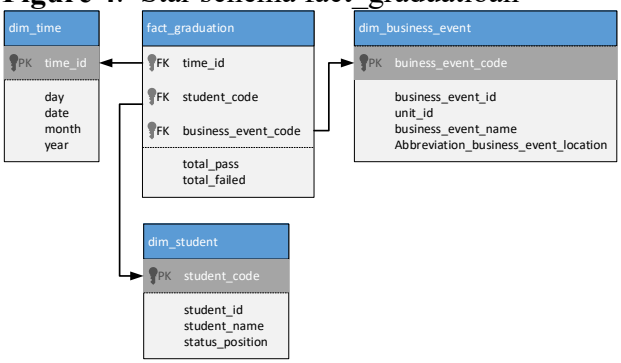
Includes business_event_code, saat_id, total_very_poor, total_poor, total_normal, total_good, total_excellent, total_very_poor, total_poor, total_normal, total_good, total_good, total_excellent is a measure in the table fact_satisfaction_program.

Physical Data Model

In this section, several star schemes are used to design the data mart as a data source for the dashboard system:

Star Schema fact_graduation

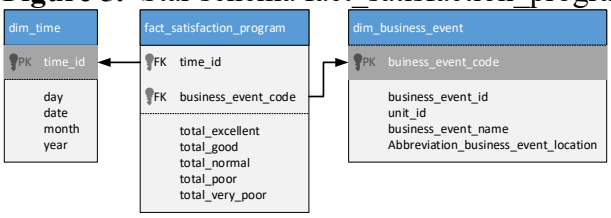
Figure 4. Star schema fact_graduatioan



Star schema fact_graduation explains the fact_graduation relationship that relates to 3 dimension tables, namely dim_business_event, dim_time, and dim_student.

Star Schema fact_ satisfaction _program

Figure 5. Star schema fact_satisfaction_program



Star Schema fact_satisfaction_program this explains the level of satisfaction with the training program. Fact_satisfaction_program related to 2 dimensions, namely dim_time and dim_business_event.

Use case specification

The following are some of the design of use case specifications.

Displays the Graduation Dashboard

TABLE 7: USE CASE SPECIFICATION DISPLAY THE GRADUATION

Use Case Name:	Display the Graduation Dashboard	
Scenario:	Display the Graduation Dashboard	
Triggering Event:	TC Manager sees the Graduation Dashboard	
Brief Description:	When TC Manager looks at the Dashboard about Graduation to find out how the number of trainees	
Brief Description:	who graduated and did not graduate	
Actors:	Training Center Manager	
Related Use Case:	Processing total passed and totally failed information	
Stakeholders:	Graduation Dashboard obtained data about total passed and totally failed	
Preconditions:	TC Manager has been log-in into the system and chooses to display the Dashboard Graduation	
Postconditions:	Graduation Dashboard obtains data about total passed and totally failed	
Flow Of Event:	Actor	System
	• TC Manager has been log-in into s I stem Dashboard • TC Manager chooses the Graduation Dashboard	• The dashboard processes the Total passed and Total failed data, then display it into the user interface • TC Manager logs out from the Graduation Dashboard
Exception Condition:	Training Center Manager failed to enter the Dashboard application	

Displays the Dashboard Satisfaction Program

TABLE 8: USE CASE SPECIFICATION DISPLAY SATISFACTION PROGRAM

Use Case Name:	Display the Dashboard Satisfaction Program	
Scenario:	Display the Dashboard Satisfaction Program	
Triggering Event:	The Quality Assurance (QA) Manager wants to see the Dashboard Satisfaction Program	
Brief Description:	When the TC Manager wants to see a Dashboard about satisfaction programs. The Dashboard Satisfaction Program was obtained from filling out the evaluation questionnaire	
Actors:	Training Center Manager	
Related Use Case:	Total information processing very poor, poor, normal, good and excellent	
Stakeholders:	The relevant TC Manager who wants to see information about Total very poor, Subject-oriented, normal, good and excellent information	
Preconditions:	TC Manager has been log-in into s system and chose to display the Dashboard Satisfaction Program	
Postconditions:	The Dashboard Satisfaction Program obtains satisfaction data on the training program	
Flow Of Event:	Actor	System
	• The Quality Assurance (QA) Manager has logged into the Dashboard application • The TC Manager chooses the Dashboard Satisfaction Program	• Dashboard processes data and displayed to the user with the Dashboard user interface • TC Manager log-out from a Dashboard application
Exception Condition:	TC Manager failed to enter the Dashboard application	

Conclusion

By working on this research, a star schema that includes four dimensions was created for the data warehouse design. Based on this star schema several dashboards were produced in order to support executives in the decision-making process.

With the graduation dashboard, wherein data come from the data mart that displays the comparison of student graduation numbers, namely total_passed and total_failed in a certain period of time, so t it can help improve the quality of training results that are oriented towards developing competitive advantages for HR.

For the dashboard that displays program and facility satisfaction, it can conduct training evaluations for program and facility improvements

Whereas the dashboard to examine income originating from the external student on CCTC, the data come from data mart so as to help in knowing the income in accordance with the

number of external student income targets.

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