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ASSESSING THE EFFECTIVENESS OF BUSINESS INTELLIGENCE IN MONITORING PERFORMANCE OF PALM OIL PLANTATION

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Abstract

The business intelligence plantation performance system starts with the stages of data integration, data analysis, making reports, creating a web dashboard and then integrating the web dashboard with the web portal. Data analysis is processed with OLAP and data mining to extract information from data stored in the data warehouse. The results of the data analysis process are represented in the form of statistical reports and dashboards, then used as supporting decisions for oil palm plantations. This study is focus on design palm plantation business intelligence systems for decision support oil palm plantation at PT DSN Group web based OLAP. This research produces a system framework and web portal for business intelligence systems that are accessed through an intranet browser. Business Intelligence can be used as a solution to consider the decision-making process in the management of oil palm plantations and solutions in increasing plantation productivity to achieve Target Plantation Performance.

Keywords: Business Intelligence, Tableau, Data Warehouse, OLAP, Data Mining

INTRODUCTION

Business Intelligence is a concept that uses a variety of methods and technologies, so that a business intelligence system in general can cover a wide range of fields ranging from processes, software and manufacturing techniques, starting from retrieving data from a data source to sending data and information business value to users or users (Rajagukguk, 2008).

In business intelligence the method of data analysis approach is known as On-Line Analytical Processing or abbreviated as OLAP which is a method of approach to present answers to requests for analytical processes that are dimensionally fast, in the form of graphics, applications and technology that can collect, store, manipulate data into multidimensional data for analysis purposes. OLAP is the key to business intelligence and is used to analyze data and information which will then be used as a basis for decision making or decision support systems in an organization or company.

Plantation Production Performance to be one measure of the success of oil palm plantations in determining management and maintenance policies taken in his plantation management, the quality of the success obtained from the amount of crop yield obtained from managed plantations. Although the yield from plantation own standards prescribed but periodic monitoring is also needed. Varieties of oil palm seeds such as Marihat, Lonsum etc. which are planted are also diverse, so it is necessary to analyze the annual production of planting, per tree type, type of land and so on. From the data collected, it can be obtained an analysis of the impact of current and future production, so that repairs and treatments can be carried out in accordance with the need to improve the quality of the production of these oil palm plants.

LITERATURE REVIEW

System Design

System design can be divided into two parts, namely system design in general and detailed system design. System design in general is also called macro design while detailed system design is also called system design physically or internal design (Jogiyanto, 2001). From the above understanding, it can be concluded that the system design is a procedure or process stage that is carried out after system analysis that defines functional requirements, prepares system implementation, describes a system formed in the form of drawing, planning and making sketches or arrangement of several separate elements into one intact and functioning unit and configuring the software and hardware components of a system, and then implementing the drawing, planning and making of the sketch into the program code that has been determined or prepared.

Business Intelligence

Business Intelligence is a conceptual framework to support business decisions, business intelligence combines architecture, databases or data warehouses, analysis tools and applications (Turban, 2007).Business Intelligence is used for applications and technology in collecting, storing, analyzing, and providing access to data so that it can help users from companies or organizations to make better and more appropriate decisions (Brannon, 2010).

Business Intelligence in terms of management support for structured data and unstructured data, is a process of integrating and uniting components to handle data in the business intelligence framework. This approach will be carried out with three types of approaches, namely integrating structured and unstructured data, analyzing data collections and distributing the results of the analysis into a form that fits the needs. The above approach can utilize the three layers of the business intelligence framework in the form of data layer, logic layer and access layer as shown in Figure 1 business intelligence architecture with several layers (Baars and Kemper, 2006).

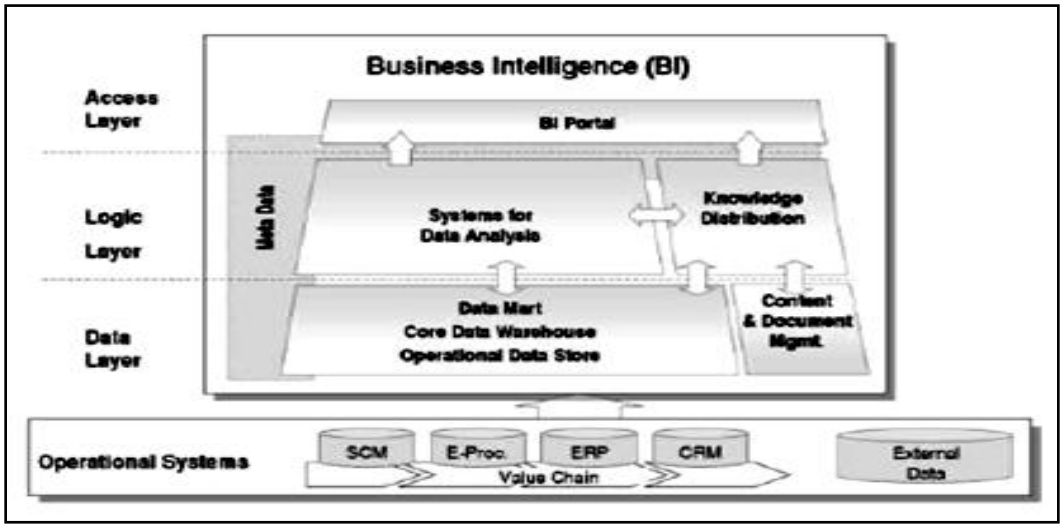

Figure 1 Architecture of Business Intelligence (Baars and Kemper, 2006)

Figure 1 presents a basic understanding of the business intelligence system. A system of business intelligence in other words is a combination of a data warehouse and a decision support system. This explains how data from different sources can be extracted and stored and then taken to be analyzed. The main business intelligence activities include collecting, preparing and analyzing data. In the process of business intelligence data used must be of high quality, by the way get it from various sources of data collected, then altered, then cleaned, then loaded and stored in the data warehouse database.

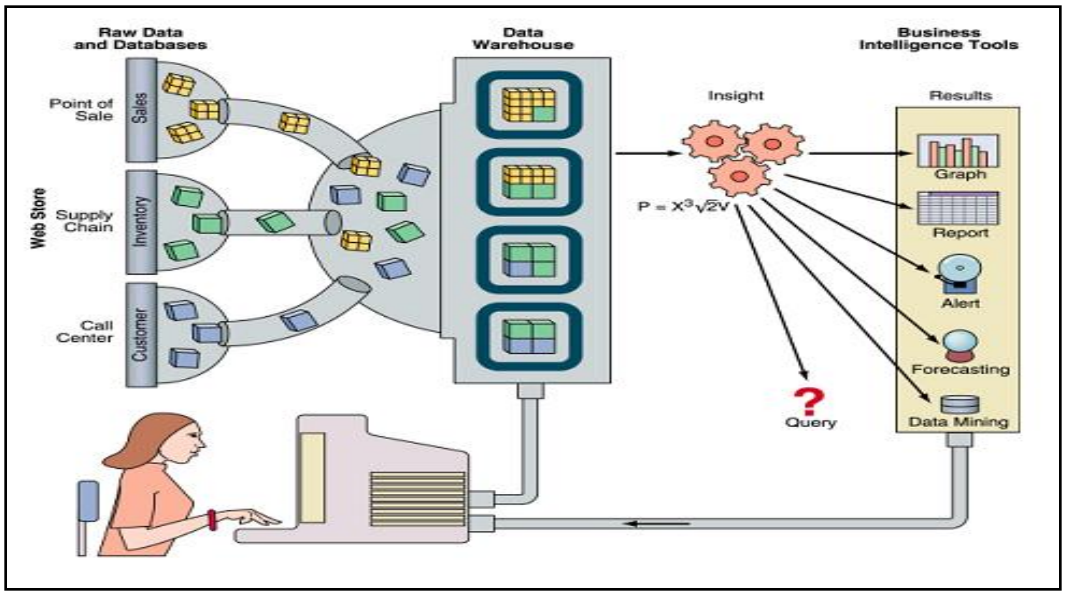

Figure 2 Basic Understanding of Business Intelligence Systems (Ranjan, 2009)

Data Warehouse

Data Warehouse or abbreviated DW is a relational database designed to query and analyze more than the transaction process, and usually contains a history of data from the transaction process and also data from other sources. Data Warehouse can also be said as a place to store summaries of historical data that are often taken from a separate database of departments, organizations or companies (Kimball and Caserta, 2004).

According to Inmon (2002) that the data warehouse is a collection of data that has subject-oriented, integrated, time-variant properties, and is permanent in data collection in supporting management decision-making processes, this subject-oriented, integrated, and time-varying process.

On-Line Analytical Processing

OLAP is a technology that allows an analyst, manager and executive to simultaneously access data quickly, consistently and interactively with various variations and visualization of information reviews where each row of data can be transformed to reflect the dimensions of the company or organization so that it is easily understood by users or users (Ponniah, 2001). OLAP is a computer process that allows users to easily and selectively select and view data from different perspectives. Some of the activities carried out by OLAP include generating query, request an adhoc report, support statistical analysis, interactive analysis, build multimedia applications. To facilitate OLAP, DW is needed with a set of tools that have

multidimensional capabilities. These tools can be in the form of query tools, spreadsheets, data mining tools, and data visualization.

View is closely related to OLAP and data warehouse. OLAP queries are usually a query aggregate. An analyst usually wants quick answers to queries on a very large dataset, and naturally pays attention to the initial calculation of the view. In particular, the cube operator raises several closely related query aggregations. The relationship that exists between many query aggregates that arise from a single cube operation can be exploited to develop a very effective initial computing strategy. The tools for creating the report are the tables themselves, namely by dragging columns and rows. The user or the user can change the form of reports and classify them according to the wishes and needs of the user or the user and OLAP engine will automatically calculate the new data.

Data Mining

Data Mining or abbreviated as DM is a method of data mining or discovery of new data and information by looking for certain patterns or rules from a number of data very large (Davies, 2004). Data Mining is also known as knowledge discovery in database or abbreviated as KDD in the form of activities that include collection, use of data, historical data to find and find order, pattern or relationship in a large data set (Santoso, 2007).

Data Mining can also be referred to as a series of processes or stages to explore and find added value in the form of knowledge that has not been known manually from a data set. Data Mining has links with other scientific fields such as database systems, data warehouses, statistics, machine learning, information retrieval, and high-level computing. In addition, data mining is also supported by other sciences such as neural networks, pattern recognition, spatial data analysis, image databases and signal processing.

From the explanation above it can be concluded that data mining is an activity or process of finding patterns in the data and in finding interesting patterns derived from large amounts of data, the data is stored in a database, data warehouse, or other information storage technology.

METHODOLOGY

At the stage of the needs analysis begins by studying the old information system (manual) that is running at the PT DSN Group to identify problems. The next step is to analyze the data and information needs needed for the proposed information system.

The design of this study uses context diagrams to describe the relationships between systems and data flow diagrams to explain the system in detail, to design the interface using Plantation Performance data to be processed with Tableau's business intelligence.

The system designed and built is then implemented using data available at PT DSN Group by using the SQL Server 2012 Program for database processing, the Tableau Desktop program for processing the system's application metadata.

System testing is carried out after the Business Intelligence Plantation Performance built is implemented. By testing the functionalities in the system by looking at the output produced using the Black Box method. This method is used to find out whether the software is functioning correctly. Black box testing is a method of designing test data based on software specifications. The test data is generated, executed on the software and then the output of the software is checked whether it is in accordance with what is expected or not. Testing is done by giving input from the user to the system that is already walking and observing the resulting output.

The following are indicators that are the reference standards for oil palm plantation performance. As research material, the weight standard / FFB Yield is taken with the following indicators:

Table 1 PPKS Standards according to the Indonesian Oil Palm Research Institute (IOPRI)

Age	Productivity (ton/ha)			Average Bunch Number (bunches/tree)			Average Bunch Weight (kg/bunch)		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
3	6.0	5.0	4.0	10.8	9.4	8.0	4.2	4.0	**3.8**
4	16.0	14.0	12.0	18.1	16.8	15.1	6.7	6.3	**6.0**
5	19.0	17.0	15.0	18.5	17.2	16.0	7.8	7.5	7.1
6	23.0	21.0	19.0	17.1	16.1	15.5	10.2	9.9	9.3
7	28.0	26.0	23.0	16.1	15.4	15.1	13.2	12.8	11.5
8	32.0	28.0	26.0	15.3	14.8	14.3	15.8	14.3	13.8
9	34.0	30.0	27.0	14.1	13.0	12.4	18.2	17.5	16.5
10	35.0	31.0	28.0	13.0	12.5	12.2	20.4	18.8	17.4
11	35.0	32.0	29.0	12.2	11.5	10.8	21.8	21.1	20.4
12	35.0	32.0	30.0	11.4	10.9	10.6	23.2	22.2	21.4
13	34.0	32.0	30.0	10.8	10.6	10.2	23.9	22.9	22.3
14	33.0	31.0	29.5	10.2	9.9	9.6	24.5	23.7	23.3
15	32.0	30.0	28.5	9.1	8.9	8.7	26.6	25.5	24.8
16	30.5	28.5	27.0	8.2	7.9	7.7	28.2	27.3	26.6
17	29.0	27.5	26.0	7.6	7.4	7.2	28.9	28.2	27.4
18	28.0	27.0	25.0	7.1	6.9	6.7	30.0	29.6	28.3
19	27.0	26.0	24.0	6.7	6.5	6.1	30.5	30.3	29.8
20	26.0	25.0	23.0	6.2	6.0	5.6	31.8	31.6	31.1
21	25.5	24.0	22.0	5.9	5.7	5.3	32.8	31.9	31.5
22	25.0	23.0	21.0	5.7	5.4	5.0	33.2	32.3	31.8
23	24.0	22.0	20.0	5.4	5.1	4.7	33.6	32.7	32.2
24	23.0	21.5	19.5	5.0	4.8	4.4	34.8	33.9	33.5
25	22.5	21.0	19.5	4.8	4.5	4.2	35.6	35.4	35.1
Rerata	**27.1**	**25.0**	**23.0**	**10.4**	**9.9**	**9.4**	**23.3**	**22.6**	**22.0**

- Productivity (tons / ha)

Production of tons per hectare / Yield obtained from the amount of production in 1 hectare divided by the total production, in the standard table the calculation of PPKS is based on plant age and crop quality standards. Example for 4 year old plants with S2 plant standards is 14 tons per hectare for 1 year

- Average Bunch Number (bunches / Tree)

Is the average number of Fresh Fruit Bunches (FFB) per Tree for 1 year

- Average Bunch Weight (Kg / bunches)

Average weight of Fresh Fruit Bunches (FFB) per fruit for 1 year

RESULTS

Demographics and characteristics of respondents

To ensure and measure the suitability of the application of Business Intelligence Plantation Performance with user needs, this research also conducts research or surveys consisting of a series of written questions that will be submitted to the Operations Section by testing 30 respondents within the operational scope of the plantation, including Regional Head, Estate Head, Plantation Admin, and Operations Staff with the aim of getting responses from selected groups of people through personal interviews using the questionnaire form.

Discussion

Aspects assessed from the Business Intelligence Monitoring Performance include the ease of use, effectiveness, availability and accuracy of the data displayed.

The results of the questionnaire submitted for 30 respondents, 21% answered strongly agree, 50% answered agreed, 26% answered hesitantly and 2% answered disagree, from the total statement of questionnaires submitted to respondents.

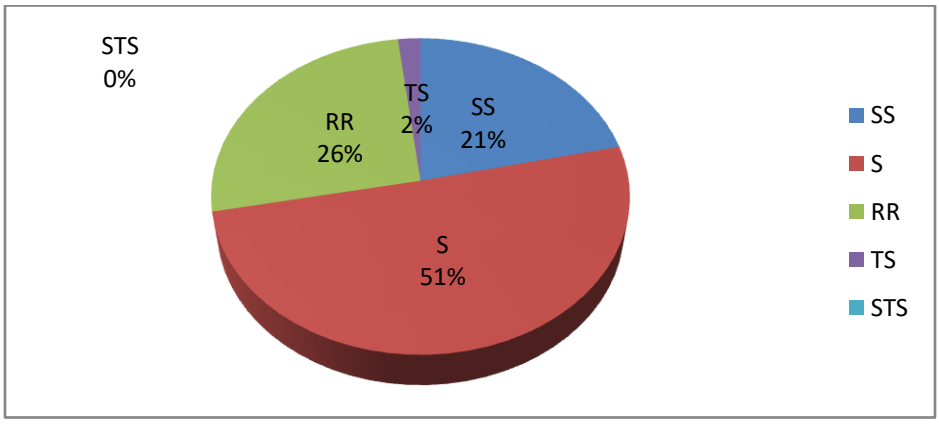

Figure 3 Result Of Questionnaire

From the results of this questionnaire, the authors then evaluated the use of the Business Intelligence Plantation Performance, that there was a decrease in time and costs in all performance analysis processes.

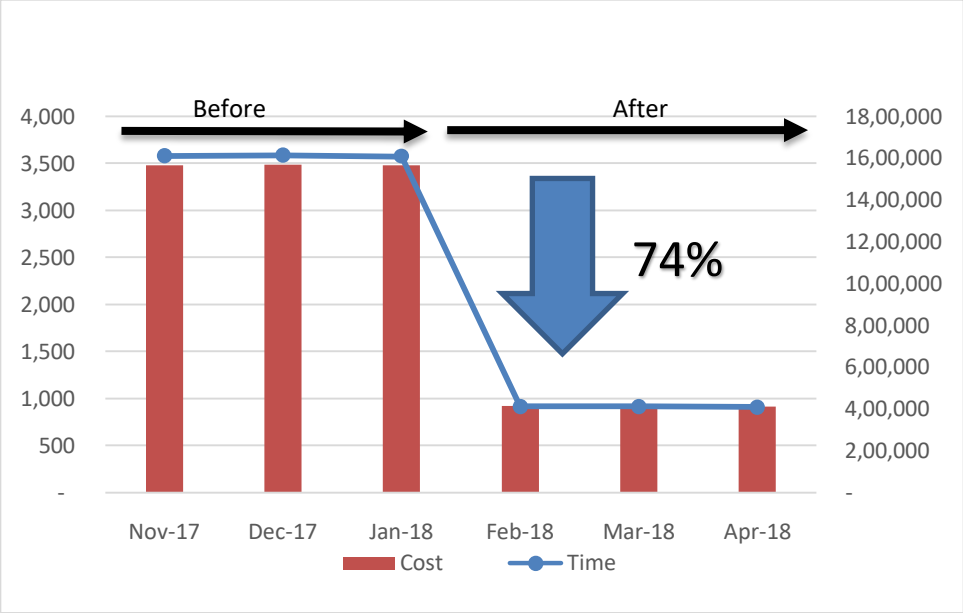

Figure 4 Time and Cost Monitoring Implementing BI Plantation Performance

Based on the results of this study regarding the design of Business Intelligence Plantation Performance it can be concluded that:

1. By using Business Intelligence Plantation Performance a fast analysis process can be carried out, making it easier to make decisions.
2. Based on the results of testing the document control system application using the blackbox method with the UAT (User Acceptance Test) model, that of the functions developed can run in accordance with predetermined scenarios and as expected, namely collaboration between SQL Server databases and Tableau Software's BI program can make the business intelligence web portal built to be powerful.
3. Based on data from the decline, there was a decrease in costs in the Planning & Performance Review section of Rp. 1,154,166 , - per month and as much as 2,660 minutes per month for the process of collecting data to decision making.
4. Because it is Web-based Dashboard so it is very easy to use as reference data when conducting visits to the field with interactive features and can be accessed via a smartphone

5. This Business Intelligence Plantation Performance can be accessed by academics in the future as a valid data source in research and development on oil palm cultivation

In order to improve the development of the Business Intelligent Plantation system Performance against existing shortcomings, the results achieved in this study suggest:

a. Analyzing business intelligence performance features using the Polygon Map, so that the features in the system need to be re-developed to be able to read spatial data and display it for a more comprehensive analysis.
b. To avoid data loss, a back-up schedule should be made so that if an error or data loss occurs, it can be easily fixed.
c. To keep this application running optimally, it requires periodic maintenance of the software used as well as hardware for smooth use.
d. It needs to be further developed so that it can be accessed through the internet, so that the analysis process becomes easier, if the authorized official is unable to access the intranet or is outside the site.

The Indonesian palm oil industry has a market share with growth reaching 9.23% in 2017. In addition, the palm oil industry is also the largest contributor of foreign exchange from the non-oil and gas sector which reached up to 34.33% in 2017.

In order to increase the productivity and efficiency of oil palm optimally, the technology supporting Indonesian industrial revolution 4.0 is absolutely immediately implemented, including the application of the Internet of Things (IoT), Advance Robotic (AR), Artificial Intelligence (AI), Digitalized Infrastructure (DI) and Business Intelligence (BI).

In the future, business intelligence software is expected to improve the performance of palm oil not only by bona fide oil palm plantation companies such as DSN Group, but can also be used by new oil palm companies to grow and develop as Cloud services are so rapid, thereby reducing investment costs on IT infrastructure and business intelligence software licenses that can be rented without having to buy in full.

FURTHER STUDIES

For further studies, the Design of Business Intelligence performance shall be developed to more in-depth modules including cost performance modules, cost forecasting modules, productivity forecasting modules and module sensitivity analysis on the development of CPO sales prices.

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