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IMPLEMENTATION OF BUSINESS INTELLIGENCE TO ANALYZE DISTRIBUTION OF COVID-19 CASES IN INDONESIA

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Abstract: Covid-19 cases started showing up in Indonesia in early March 2020, and they have since spread to several other areas. The number of corona virus infections from different Indonesian provinces plays a significant role in the decision-making process based on this data visualization. By creating a Business Intelligence system to display the results of the number of confirmed cases, deaths, and recoveries from various provinces in Indonesia, the goal of this project is to visualize data on corona virus cases. The Corona Virus Dataset in Indonesia from www.kaggle.com is processed using Grafana in this article. The findings of this article are presented as dashboard reports that include data on confirmed cases, fatalities, and recoveries in different Indonesian provinces. These reports can be utilized to help make decisions. With Grafana's interactive dashboard features, the data display resulting from routine analysis results can be engaging.

Keywords: Business Intelligence, OLAP, Covid 19

Abstrak: Kasus Covid-19 mulai muncul di Indonesia pada awal Maret 2020, dan sejak itu menyebar ke beberapa daerah lain. Keputusan berdasarkan visualisasi data sering kali mencakup statistik jumlah kasus virus corona dari berbagai provinsi di Indonesia. Dengan membuat sistem Business Intelligence untuk menampilkan temuan jumlah kasus terkonfirmasi, kematian, dan pemulihan dari berbagai provinsi di Indonesia, tujuan penelitian ini adalah untuk memvisualisasikan data kasus virus corona. Postingan ini menggunakan Grafana untuk menangani dataset virus corona Indonesia dari www.kaggle.com. Temuan artikel ini disajikan sebagai laporan dalam bentuk dasbor yang mencakup data jumlah kasus terkonfirmasi, kematian, dan pemulihan di berbagai provinsi di Indonesia. Dengan pengaturan dashboard interaktif Grafana, mungkin akan menarik untuk melihat data yang dihasilkan dari hasil analisis standar yang ditampilkan.

Kata kunci: Business Intelligence, OLAP, Covid 19

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INTRODUCTION

Covid-19 cases began to appear in Indonesia in early March 2020 and have since spread to several other regions. The fact that this pandemic can spread through individuals and cause symptoms such as fever, ba-tuk, and respiratory problems has alarmed the Indonesian population [1]. In addition to having a direct impact on a person's health, the pandemic also affects their social and economic well-being. Socially restrictive laws prevent people from engaging in certain activities. The long-term effects of these conditions lead to slower economic growth, higher unemployment, and an increase in the distribution of poverty, while the effect on social elements is also visible [2]. Through the mouth or through breathing infected air, the coronavirus can enter the body through organs such as the nose. Many preventive measures include washing hands with soap or hand sanitizer in hot running water, wearing a mask of at least three layers, maintaining a distance of at least one meter between yourself and others, and strengthening endurance through a nutritious diet, regular exercise, and living a healthy lifestyle.

Business intelligence (BI) is the processes, technology, and strategies that companies use to collect, store, and analyze data from business operations. The collected data will then be displayed in a report format that is easy to understand, comprehensive, and accurate [3]. The Business Intelligence system is intended to be able to visualize data on coronavirus cases in Indonesia, and it is hoped that this capability will help decision-making regarding the number of confirmed cases, deaths, and recoveries from various provinces in Indo-nesia.

Implementation of Business Intelligence to Analyze the Comparison of Covid-19 Case Data in West Java Before the PSBB and After the PSBB shows that the number of positive cases continues to increase during the PSBB and the number of patients who recover during the PSBB in West Java is also still relatively small [4]. The recovery rate of patients during the PSBB reached 17.95 percent and deaths during the PSBB increased compared to before and after the PSBB [5].

Business Intelligence Dashboard Vusialization of School Accreditation Data at SMP Negeri 1 Sembawa, this research produced a monitoring dashboard to support accreditation at SMP Negeri 1 Sembawa using business-intelligence technology, This intelligence dashboard provides detailed information about the process to support accreditation at SMP Negeri 1 Sembawa [6].

Research on the implementation of business intelligence, this study resulted in the following data visualization in the last semester of 2015 to 2016, the highest total child births occurred in semester 2 in 2015, with a total of 88 child births. While the lowest birth rate occurred in the first semester of 2015 with a total of 54 births, and based on the time of delivery, in 2015 and 2016 the most child births occurred in the morning [7].

Research on the implementation of business intelligence to visualize internet signal strength in Indonesia using the tableau platform conducted shows the results that there are 78938 Villages/Villages in Indonesia, and those that have been covered by 4G signals reach 78.45%, with the province that receives the most 4G signals is Central Java, as many as 7765 De-sa/Kelurahan, and Villages/Villages that have not received 4G

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signals reaching 21.55%, with the province that has not received the most internet signal is Papua, as many as 938 Desa/Kelurahan [8].

Research on Business Intelligence Implementation to Analyze Corona Virus Case Data in Indonesia Using the Tableau Platform. The results of this article are in the form of reports in the form of dashboards such as the number of confirmed cases, deaths and recoveries in various provinces in Indo-nesia that can be used to support decision making. The display of data generated from the usual analysis results can be interesting, with the choice of inter-active dashboards provided by Tableau [9].

Implementation of Business Intelligence for Analysis and Visualization of Data on the Cause of Death in Indonesia Using the Tableau Platform shows that there were the highest number of deaths in 2012-2021 caused by the highest number of deaths due to natural disasters caused by earthquakes and Tsu-nami amounted to 2,615 deaths. Furthermore, the most cases of deaths due to non-natural disasters and diseases caused by Covid-19 amounted to 144,094 deaths. And the most cases of deaths due to social disasters caused by Social Conflict or Social Unrest amounted to 69 deaths [10].

In order to display the findings of the number of confirmed cases, deaths, and recoveries from various provinces in Indonesia, this study examines the visualization of co-rona virus case data using the Business Intelligence (BI) system. The results of data visualization are anticipated to be one of the methods used to deal with coronavirus-related problems.

METHOD

The datasets from www.kaggle.com are collected using the methods described in this article, which are then processed using the Tableau platform so that they can be taken into account when making assessments based on data visualizations.

Image 1. Research steps

The first step in the research phase is to gather a literature review on BI system deployment, and the next step is to prepare the necessary data. The data source then moves on to the data validation stage after completing the ETL stage. If the data matches the user's needs, create data visualizations and dash-board stages.

RESULT AND DISCUSSION

This section describes the results of the extraction process from the datasource and its processing related to corona virus cases in Indonesia, so that later output will be found in the form of the number of confirmed cases, the number of death cases, and the number of additional recovered cases in Indonesian provinces.

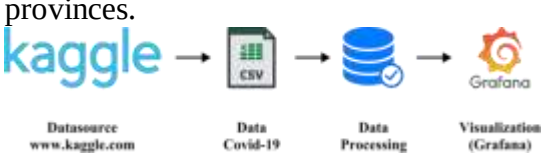

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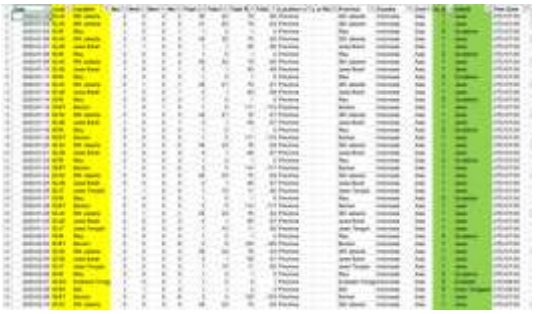
Image 2. Datasource Extraction Process

1. Data Preparation

The source of the research data is open information related to COVID-19 cases that occurred in Indonesia between 2021 and 2022, obtained from kaggle.com. There are 30,893 rows and 28 ko-loms in the data. Contains the following information: Date, Location, New Cases, New Deaths, Recently Recovered, New Active Cases, Total Cases, Total Deaths, To-tal Recovered, New Active Cases, Location Level, Regency City, Province, Nega-ra, Island, Time Zone, Special Status, Total District, Total City, Total District, Total Village, Total Village Area, Population, Logitude Population Density, Latitude, Case Fatali-ty Rate, and Recovered Cases. The csv data that will be processed with Pentaho is as follows.



Gambar 3. CSV data before processing

In addition, processing and analysis can be carried out using certain variations; in this example, the alternatives chosen are Date, Provin-si Id, New example, New Deaths, New Recov-ered, New Active Case, Island Id, Pop-ulation Id, Id, and Coordinate.

2. Eksekusi Data

Pentaho is a tool used during the data execution stage. The data was initially entered and processed at Pen-taho to create 4 dimensions of OLAP data so that the value of the transaction facts of 19 Covid cases in Indonesia could be determined. Other averages use the following di-mensi data: province, coordinates, land, and population.

Table 1. Location dimention

No.	id_location	location
1	ID-JK	DKI Jakarta
2	ID-RI	Riau
3	ID-JB	Jawa Barat
4	ID-BT	Banten
5	ID-JT	Jawa Tengah
6	ID-SG	Sulawesi Tenggara
…	…	…
34	ID-NT	Nusa Tenggara Timur
35	ID-GO	Gorontalo

Table 2. Island dimention

No.	id_island	island
1	1	Jawa
2	2	Sumatera
3	3	Sulawesi
4	4	Nusa Tenggara
5	5	Kalimantan
6	6	Maluku
7	7	Papua

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Tabel 3 Population dimention

id_fact_population	id_province	popula-tion	popula-tion_density	start_year_periode	end_year_periode
1	1	10846145	16334.31	2020	2022
2	2	6074100	69.8	2020	2022
3	3	45161325	1276.55	2020	2022
4	4	10722374	1109.64	2020	2022
5	5	36364072	1108.64	2020	2022
6	6	2635461	69.23	2020	2022
…	…	…	…	…	…
33	33	5411321	111.07	2020	2022
34	34	1180651	104.88	2020	2022

Tabel 4. Coordinat dimention

id_dimensi_coordinat	id_provinsi	coordinat_longitude	coordinat_latitude
1	1	1.068.361.183	-6.204.698.991
2	2	1.018.051.092	511.647.851
3	3	1.076.037.083	-6.920.432.083
4	4	1.061.090.043	-6.456.736.388
5	5	1.102.011.149	-7.259.097.177
6	6	122.070.311	-4.124.688.793
…	…	…	…
33	33	121.592.271	-8.682.205
34	34	1.223.760.581	687.002.604

The next step is to perform the ETL process by importing data into the Pentaho application after selecting the dimensions to use.

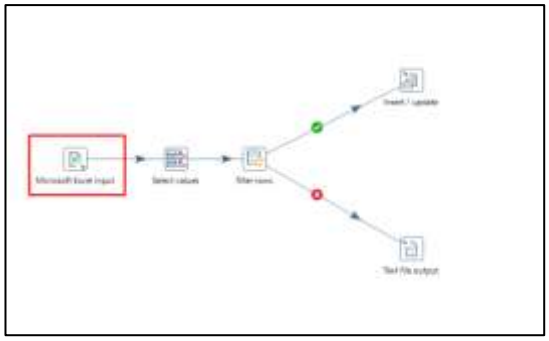

Image 4. ETL process

The database must be connected next to process data for OLAP. The previously imported data will be the data source for later processing, including the process of connecting the data to Pentaho by connecting the data to the Sche-ma Workbench application. Gam-bar 9 indicates the source of the data to be processed.

Image 5. Data connection process in Insert/Update process

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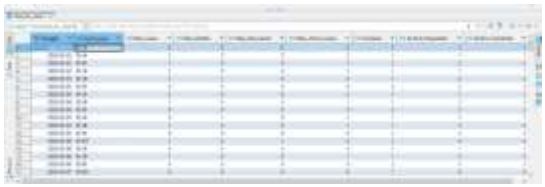
The ETL process consists of a number of steps, such as selecting values to select columns to use and avoiding unnecessary columns, and filtering rows to remove unwanted rows (rec-ord). The fact-ta tables can be combined after the ETL procedure is completed.

Image 6. Fact table running process

The cube OLAP creation procedure now relies on the previously created data model. Data that has been collected and optimized for quick inspection will be stored in this cube.



Gambar 7. Tabel fakta case transaction

To enter data into Mi-crosoft Excel, we use the EXCEL data source for Covid19 ETL. Select Values, showing which columns from the source data to use and deleting existing columns. Filter rows, filter used and unused info. Data must be entered and updated in the database. The Output Text File creates a file to store data.

Image 8. Schema creation process

1. New Case total OLAP result

Figure 11 illustrates how provincial areas function as the basis for the OLAP form of the new Covid19 case. The provinces that experienced the most Covid 19 cases were DKI Jakarta and West Java.

Provinsi	Measures fact_new_case
All dim_provinsi.Provinsi	6,397,309
Aceh	44,038
Bali	166,831
Banten	333,875
Bengkulu	28,173
DKI Jakarta	1,412,474
Daerah Istimewa Yogyakarta	224,307
Gorontalo	13,951
Jambi	38,643
Jawa Barat	1,173,731
Jawa Tengah	636,409
Jawa Timur	601,534
Kalimantan Barat	65,605
Kalimantan Selatan	87,476
Kalimantan Tengah	58,217
Kalimantan Timur	209,017
Kalimantan Utara	45,417
Kepulauan Bangka Belitung	66,144
Kepulauan Riau	70,883
Lampung	75,485
Maluku	18,736
Maluku Utara	14,595
Nusa Tenggara Barat	36,247
Nusa Tenggara Timur	94,415
Papua	49,927
Papua Barat	32,170
Riau	152,648
Sulawesi Barat	15,601
Sulawesi Selatan	144,494
Sulawesi Tengah	61,099
Sulawesi Tenggara	25,693
Sulawesi Utara	52,770
Sumatera Barat	104,640
Sumatera Selatan	82,198
Sumatera Utara	158,866

Image 9. Total New Case

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2. Death OLAP result

The OLAP for cases from the previous day is shown in figure 12 with Covid 19. The picture illustrates how deaths due to Covid 19 cases are more prevalent in the provinces of Central Java and East Java.

Provinsi	Measures · fact_deaths
All dim_provinsi.Provinsis	157,819
Aceh	2,223
Bali	4,731
Banten	2,945
Bengkulu	522
DKI Jakarta	15,493
Daerah Istimewa Yogyakarta	5,928
Gorontalo	487
Jambi	889
Jawa Barat	15,937
Jawa Tengah	33,480
Jawa Timur	31,732
Kalimantan Barat	1,130
Kalimantan Selatan	2,583
Kalimantan Tengah	1,563
Kalimantan Timur	5,726
Kalimantan Utara	860
Kepulauan Bangka Belitung	1,616
Kepulauan Riau	1,888
Lampung	4,186
Maluku	294
Maluku Utara	334
Nusa Tenggara Barat	902
Nusa Tenggara Timur	1,527
Papua	579
Papua Barat	384
Riau	4,452
Sulawesi Barat	394
Sulawesi Selatan	2,485
Sulawesi Tengah	1,733
Sulawesi Tenggara	569
Sulawesi Utara	1,212
Sumatera Barat	2,371
Sumatera Selatan	3,376
Sumatera Utara	3,288

Slicer:

Image 10. Total Death

3. Visualisasi Data

In addition, information on the number of confirmed cases, deaths, and recoveries is obtained as a result of data processing procedures, along with the analysis of data that has been carried out.

Creating a dashboard is the ultimate step. By creating a dashboard, which presents data in the form of graphic visualizations in the form of bar tables, tables, etc. that can compare the number of cases in each province in Indonesia, it is possible to make decisions about the regions most exposed to COVID cases 19.

Image 11. Visualisasi data yang diolah dengan Grafana

CONCLUSION

Based on the processing of Grafana, the source of coronavirus case data used from www.kaggle.com for 2020 to 2021 can be visualized systematically and effectively. A well-designed dashboard can speed up the exchange of information and facilitate decision-making by being beautifully designed, systematic, and organized.

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