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Visualization Of Tourist Visit Time Series Data Using Google Data Studio

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ABSTRACT

Data presentation techniques in the development of information technology are essential in processing data and producing information. The process of processing data into information can be one of the considerations in determining decisions. Time series data containing data with detailed time sequence frequencies within a certain period can be processed into information showing changes in a data variable within a specific period that can be analyzed according to needs, for example, on data on domestic tourist visits in an area. If the data can be adequately visualized, it can provide easy to digest information. Data analysis is carried out on the Google Data Studio interface because combining visualization methods can help people quickly understand the data. This study uses Google Data Studio for data analysis and visualization through scoreboards, line graphs, and pie charts. The results of the research are in the form of data visualization, which shows a decrease in the number of domestic tourist visits to Bali from 2019-2021, which is around 500 thousand domestic tourists from 2019 to 2020, and a decrease of about 30 thousand domestic tourists from 2020 to 2021. In addition, visualization data with pie charts show a decrease in domestic tourist arrivals of 54.2% in 2019. The percentage decreased to 23.6% in 2020 and 22.1% of visits in 2021.

1. Introduction

Information technology greatly influences the development of the industrial era 4.0 because of the role of information technology in all fields, including tourism, economy, education, health, government, and others [1]. The development of information technology supports the ease of producing and processing data into information [2]. The process of processing data into information can be one of the considerations in determining decisions. The information in various forms requires a detailed understanding of the data, data sources, and the form of information generated[3].

The pattern of data presentation is also essential in generating information. Generally, data is displayed in tabular form, but now data presentation and visualization are adjusted to the needs[4]. The visualization technique is to convert data into a visual format so that the characteristics of the data and the relationship between the data can be analyzed. With data that has been visualized, knowing patterns and trends from a data set over a certain period will be more accessible because the data processed in this visual format is easier to understand[5]. One example of a platform that can be used in data visualization easily, practically, and can be accessed online is Google Data Studio. Alternative forms of visualization are very diverse and can use file extensions of various types, making Google Data Studio a platform that is often used in data visualization[6]. Time series data which contains data with precise time sequence frequencies within a specific timeframe such as yearly, monthly, daily, and even milli-seconds[7][8]. Time series data can be processed into information that shows changes in a data variable within a certain period so that it can be analyzed according to needs[9].

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In this study, the sample time series data is used for the number of domestic tourist visits each year, taking the location of the island of Bali. The analytics on the data are performed on Google Data Studio interface[10] because the combination of visualization methods can help people understand data faster[11].

The selection of Bali Island as a sample of tourist visit data because Bali is known for its tourist attractions and natural panoramas that can attract tourists to visit, but since the COVID-19 pandemic, of course, the tourism sector on the island of Bali has significantly changed in terms of domestic and international tourist visits [12]. The source of visit data has been provided on the website of the Central Statistics Agency, which the public can access, time series data in a spreadsheet file containing numbers or the number of visits in a table. The information in the table often requires observation of every detail of the data row in each table field. If the tourist visit data can be processed in the form of visualization using Google Data Studio, it will certainly be easier to understand and digest by the people accessed the information. Visual forms that are easier to understand have been studied by [13][14]. The use of data visualization with good graphics and an attractive appearance is not only a demand[15], but integration with data sources and easier sharing of information is now also an option for visualization data[16][17]. This study aims to visualize time series data using Google Data Studio to determine changes in the status of the data on the number of domestic tourists visiting Bali within a specific time so that it can more easily understand the information in the visual form [11] and can be a consideration for stakeholders in determining decisions on the development of tourist arrivals.

2. Method

2.1 Data Time Series

Time series data, or time series data or also called periodic data, is regular data in a time sequence. This data describes an activity in a different period. Time series data analysis determines changes in a variable over time, including years, months, hours, or even milliseconds. Time series data [18] refers to a series of observations arranged chronologically to study changes in the attributes and status of the data over time[19][20].

2.2 Data Visualization

Visualization techniques convert data into a visual format so data characteristics and relationships between data can be analyzed and reported [21]. Visualization can be defined as a function that is the basis of the data point domain to various visuals. Visualization can be defined as a function of the data point domain to multiple forms of graphic visual examples [22] . The primary purpose of visualization is to make people see and approximate the size of the data. In visualization, data, information and knowledge are three terms widely and often interrelated in context. In many cases, data visualization is used to show different levels of abstraction, understanding or truth of an information[23].

2.3 Google Data Studio

Google launched Data Studio 360 in March 2016 , a new data visualization platform for enterprises as part of the Google Analytics 360 Suite[24]. Google Data Studio is a free collaborative data visualization product, tightly integrated with other components of the Google portfolio, including Google Analytics 360 Suite, DoubleClick Campaign Manager, Google AdWords, Google BigQuery, YouTube, Google Sheets, and more[6]. This product leverages Google Cloud Storage (GCS), Google account, or Google Docs authentication and functionality, offering advanced security, authentication, and sharing capabilities. Google Data Studio allows users to: connect to data sources, create calculations, dashboards, and custom reports, and share and collaborate with others. This product offers templates and a gallery of sample reports (developed by the community) that users can take advantage of instead of starting from a blank page. Some of them are quite visually appealing. Based on the observations from various sources[16]there are prominent features of Google Data Studio, namely open source, integrated with Google Platform, Cloud-Based services, and different sample reports for users.

2.4 Research Stages

The stages of the research can be seen in Figure 1 below:

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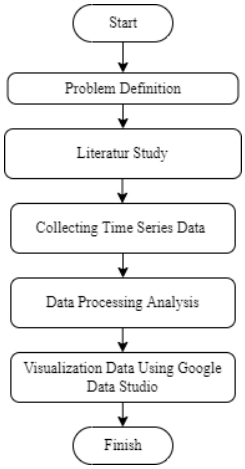

Figure 1. Research Stages

Based on Figure 1, It can be explained by starting with a literature study using time series data visualization. Identification of the problem followed by the number of tourist visits from the Central Bureau of Statistics (BPS) website[25]. The data obtained in the Microsoft excel spreadsheet extension, the following process performs data processing analysis by classifying tourist domestic visit data based on the month and year of arrival. The final process is to create a data visualization of tourist visits using the graphs provided on the Google Data Studio platform to visualize the time series data of tourist visits.

3. Result and Discussion

3.1 Data Analysis

The data used in the analysis is data on the number of monthly domestic tourists to Bali in the last three years (2019-2021) with 12 rows of data, starting from January to December[25]. The Bali tourism area was chosen because it is one of the areas with income from the tourism sector and the area that has the most impact in terms of tourist visits during the pandemic[26]. This 3-month timeframe data was chosen to show a variable change in the number of domestic tourist visits to Bali during the COVID-19 pandemic and after the new normal was enforced so that it can be seen changes in the number of tourist visits from each month to a specific year. Data can be seen in figure 2 below :

Bulan	2013	2014	2015	2016	2017	2018	2019	2020	2021
Januari	426 360	517 500	528 506	597 558	658 308	743 456	793 527	879 702	282 248
Pebruari	369 525	296 581	483 221	513 852	520 462	655 719	692 113	721 105	240 608
Maret	431 393	255 403	503 311	576 438	618 834	762 622	787 616	567 452	305 579
April	403 211	318 800	528 668	534 395	705 710	777 287	795 997	175 120	330 593
Mei	456 491	385 366	651 089	647 790	646 467	682 521	656 082	101 948	363 959
Juni	785 053	667 201	571 646	1 035 563	659 718	1 156 151	1 287 877	137 395	498 852
Juli	474 769	682 941	799 765	1 084 950	890 368	906 347	935 930	229 112	166 718
Agustus	878 278	843 958	641 684	704 662	790 323	770 364	925 360	355 732	202 187
September	473 697	615 429	557 081	725 240	832 026	774 144	812 003	283 349	298 950
Oktober	758 351	549 998	619 599	685 244	732 720	762 124	853 007	337 304	468 826
Nopember	678 748	468 743	529 381	655 962	741 649	806 397	852 626	425 097	513 482
Desember	840 660	792 387	733 149	882 026	939 048	960 859	1 152 901	382 841	629 590
BALI	6 976 536	6 394 307	7 147 100	8 643 680	8 735 633	9 757 991	10 545 039	4 596 157	4 301 592
Pertumbuhan	15,06	-8,35	11,77	20,94	1,06	11,70	8,07	-56,41	-6,41

Figure 2. Domestic Tourist Visit[25]

Based on Figure 2, it can be explained that the data shows that the highest number of domestic tourist visits, namely in 2019, as many as 10,545,039 tourists. In the next two years, there was a decrease in the number of tourist visits by -56.41% in 2020 and -6.41% in 2021.

3.2 Data Preparation and Processing Analysis

At this stage, it can be explained that the data that has been obtained from the BPS website will then be opened via Microsoft Excel, the tourist visit data is grouped by year of arrival. The goal is to group them in

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different spreadsheets to make it easier to setup metric variables on Google Data Studio. Tourist visit spreadsheet data can be seen in Figure 3 below.

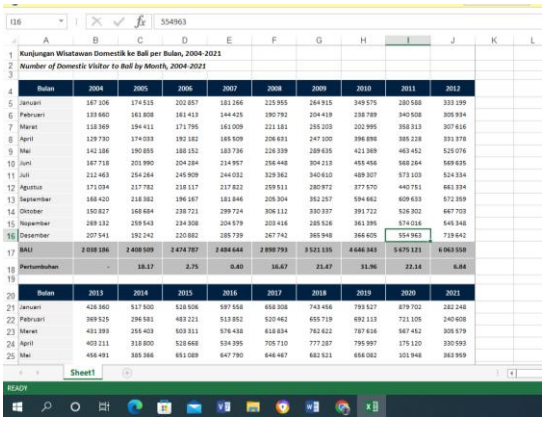

Figure 3. Spreadsheet Data

After the tourist visit, data is differentiated into different spreadsheets based on month and year, then import the spreadsheet data into Google Data Studio.

3.3 Configuring Metrik Data

In this process, a spreadsheet of visit data can be explained that has been uploaded to Google Data Studio, then configured based on the year of a domestic tourist visit. 2019, 2020, and 2021 visits fields are selected in the menu settings. The configuration of the metric data can be seen in Figure 4 below:

Figure 4. Configure Metrik Data

3.4 Selection of Graph Visualization

After the data is added, then the graph is selected for data visualization. On google data studio, you can click add chart, select bar chart to display the number and pie chart to display the number of visits. To display a graph showing the number of visits each year, change the dimensions to years, the breakdown dimensions to counts, and the metrics to counts. How to select a graph can be seen in Figure 5 below:

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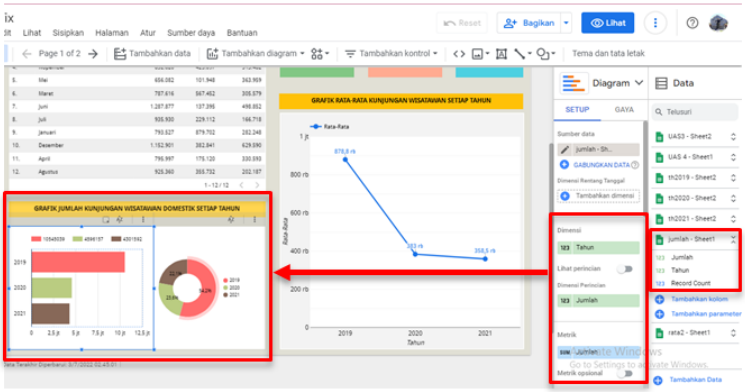

Figure 5. Configure Graph Visualization

3.5 Data Visualization Results

In the final stage, namely the data visualization process, it can be explained that time series data on domestic tourist visits to Bali from 2019 to 2021 are visualized in graphic form to show the average number of visits each year. The average number of visits per year is visualized into a line graph to make it easier to find changes in the amount of data in this study, and there is a decrease in the number of tourists visiting. The percentage of the number of tourist visits is visualized with a pie chart to make it easier to know the percentage of the number of tourist visits each year. The following are the results of data visualization based on the data that has been obtained, which can be seen in Figure 6, namely:

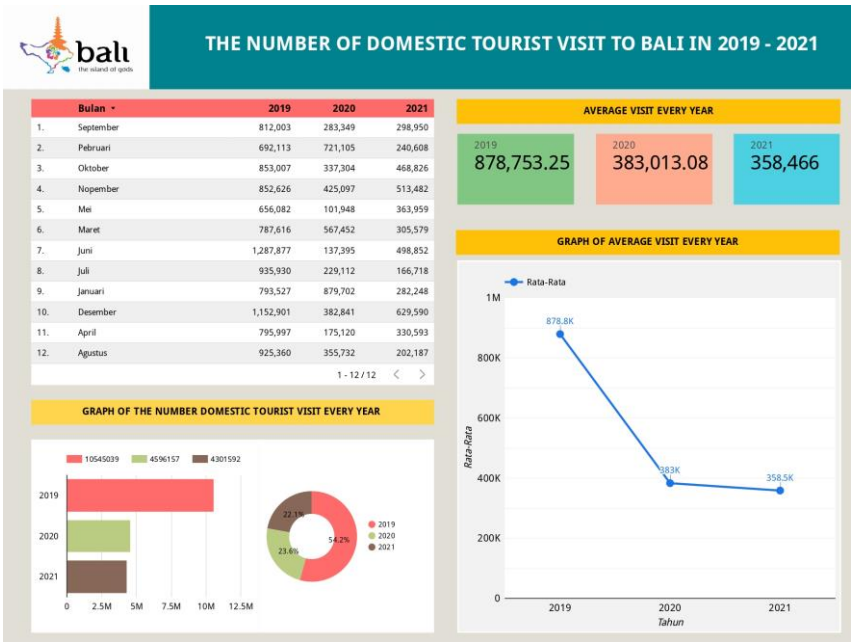

Figure 6. Data Visualization of the Number of Domestic Tourist Visits

From the Figure 6, it can be explained that there are several visualizations of tourist visit data, namely:

a. The Average number of visits per year.
   Data visualization using a scoreboard shows a decrease in tourist visits from 2019 – 2021.
b. Average number of visits per year
   The data visualization uses a line graph showing a decrease in the number of visits, around 500 thousand domestic tourists

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c. from 2019 to 2020, and a reduction of about 30 thousand domestic tourists from 2020 to 2021.Percentage of the average number of visits each yearThe data visualization uses a pie chart to show the percentage decrease in the number of domestic tourist visits, namely 54.2% of domestic tourists visiting the most in 2019, experiencing a reduction in the percentage to 23.6% in 2020 and 22.1% of visits in 2021.

4. Conclusion

In this research, it can be concluded that Google Data Studio can assist in processing time series data on the number of visits by configuring metric data based on the year of visits by domestic tourists to Bali. Google Data Studio is very helpful in presenting data to visualize exciting and easy statistical information and data range. The time series data visualization results can be seen in the development of the number of domestic tourists who come to Bali through graphs and diagrams. In addition, Google data studio can generate charts such as the average number of visitors or domestic tourists each year. The data visualization results show a decrease in the number of domestic tourist visits to Bali from 2019-2021, namely around 500 thousand domestic tourists from 2019 to 2020, and a reduction of about 30 thousand domestic tourists from 2020 to 2021. In addition, data visualization with diagrams circle shows a decrease in domestic tourist visits, 54.2% in 2019. The percentage decreased to 23.6% in 2020 and 22.1% of visits in 2021.

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