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Analysis and Identification of International Tourist Visits to Indonesia Based on Data Warehouse Implementation

Indira Septianita Larasati[1], Valian Yoga Pudya Ardhana[2,*], Alika Oktaviani[3], Yulita Sirinti Pongtambing[1], Eliyah A M Sampetoding[1], Lopinta Sarungallo[1], Rahmi[1]

[1] Information System, Hasanuddin University, Makassar, Indonesia
[2] Information Technology, Universitas Qamarul Huda Badaruddin, Lombok, Indonesia
[3] Health Administration, Universitas Negeri Makassar, Makassar, Indonesia
Email: [1]indiraseptianita269@gmail.com, [2,*]valianypa81@gmail.com, [3]alikaoktaviani25@gmail.com, [4]yulitasirinti@gmail.com, [5]eacantha@gmail.com, [6]lopintasarungallo@gmail.com, [7]rahmyrahmy81@gmail.com
Coressponding Author: valianypa81@gmail.com
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Abstract−Foreign tourist visits to Indonesia play an important role in the economic growth of the tourism sector. In increasing the interest of visitors, development resources are needed as a tourism sector. The development carried out must be carried out optimally with the growth trend of tourist visits so that development is right on target, effective and efficient. This study aims to visit foreign tourists to Indonesia using the implementation of a data warehouse. The dataset used is data on foreign tourist arrivals by nationality in 2021 sourced from the Central Statistics Agency (BPS). This is done to determine the interest and potential of tourism to support the country's economy. The steps taken in this analysis and identification are Choosing the Process, Choosing the Grain, Identifying and confirming the dimension, Choosing The Facts, Rounding out the dimension table, Choosing the duration of database, Tracking Slowly changing Dimensions, Deciding the query priorities and the query mode, and the last Storing pre-calculation in the fact information. The result can be seen Foreign Tourism Visits in Indonesia using the Application of OLAP Data Warehouse for analysis. So that in 2021 it can be analyzed that monthly tourist visits tend to be stable with the periods of July-August and January-December increasing. These results in the future can be used as a policy reference in increasing tourist visits to foreign tourist targets in certain countries. This is done to determine the interest and potential of tourism to support the country's economy through the tourism sector.

Keywords: Data Warehouse; Economic; Identification; Tourist

1. INTRODUCTION

Tourism is used as a driving industry and the main mainstay in increasing a country's foreign exchange [1]. The existence of tourist visits carried out by foreign tourist actors from year to year makes an increase or decrease in visits according to the state of a country [2]. *The United Nations World Tourism Organization* (UNWTO) predicts the number of international tourist arrivals will reach 1.8 billion in 2030 with an annual growth rate of 3.3 percent [3].

Tourism also plays an important role in the Indonesian economy, this is in accordance with the role of tourism in the world economy [4]. In general, the economic impact can be measured by the contribution of the economic value of the sector to the value of the national economy [5]. Based on BPS data, the contribution of tourism to national output/production reached 4.32 percent and contributed 4.13 percent of the total national GDP. In addition, the role of wages and salaries on the value of national labor compensation in 2016 reached 3.86 percent of the national wage. And the tax on net production generated contributes to the tax on national net production of 3.84 percent [6].

The number of foreign tourist visits (tourists) continues to increase from year to year. Cumulatively during 2018, the number of foreign tourist visits to Indonesia rose 12.58 percent compared to the number of foreign tourists visiting in the same period the previous year. The number of foreign tourists visiting Indonesia in December 2017 increased by around 22.54 percent. Likewise, when compared to the data from the previous month in November 2018, the number of foreign tourist visits in December 2018 increased by 21.43 percent [7].

The process of recording tourist behavior patterns as consumers during the Covid-19 pandemic is carried out using content analysis sourced from several relevant documents [8]. Visits of foreign tourists based on data from the Ministry of Tourism and Creative Economy, to Indonesia in August 2020 decreased by -89.22% compared to August 2019. There are three strategies to restore tourism sector efforts to accelerate tourism recovery. Innovation is the main thing and must exist. fundamental change today [9] [10].

Cellular technology research in tourism can be divided into three phases and to some extent synchronized with the development of cellular technology. Second, in the field of social sciences, mobile technology research in tourism needs to be explored further, which should refer to related research in the field of Transport and IT to broaden the research perspective [11] [12] .

There are studies that try to produce a tourism recommendation system based on Decision Trees for the purposes of the tourism sector. The results show that the decision tree-based recommendation system is able to analyze various kinds of problems and use the concept of data mining [13]. The tourism recommendation system can also be designed by adapting the step waterfall system development life cycle (SDLC) model with the Decision Support System method [14].

This study tries the OLAP (Online Analytical Processing) method on the Data Warehouse in managing tourist visit data. OLAP is a database technology that has been optimized for querying and reporting, rather than processing transactions. The source data for OLAP is an online Transactional Processing (OLTP) database which is generally stored in a data warehouse [15].

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2. RESEARCH METHODOLOGY

The research was carried out through several stages, namely, learning about OLAP, studying and implementing the Nine-Step Kimball Approach which at this stage carried out data collection and processing, then analyzed and identified, and finally drew conclusions. The stages of this research flow can be seen in Figure 1.

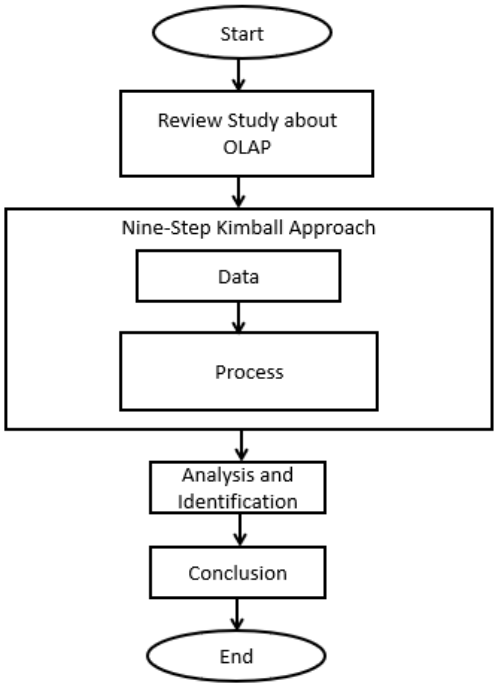

Figure 1. Flow Research

The methodology used in designing this data warehouse is the Nine-Step Kimball approach proposed by Ralph. The explanation of the stages carried out in the Nine-Step Kimball method in this study [16], as follows:

1. Choosing the Process (Choosing The Process): The selected process is foreign tourist visits
2. Selecting the Grain (Choosing The Grain): Grain is data from a fact table that can be analyzed. Selecting grain means determining what the records in the fact table actually represent. The grain used to design this data warehouse is visit data. Analysis of the visit data in the form of the number of visits based on the time (month) of visits in each category.
3. Identifying and conforming the dimension: The third step in designing a data warehouse for International Tourist Visits is the identification of dimensions related to the fact table. From the identification results, it can be determined the dimensions involved include:
   a. Time Dimension
   b. Type Dimension
4. Choosing the Facts (Choosing The Facts): The next step is to select a fact table based on grain selection. The fact table obtained from the analysis is

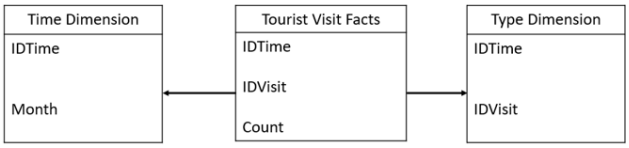

Figure 2. The fact table

5. Complete the Dimension Table (Rounding out the dimension table 1):

Table 1. Time Dimension

Field	Type(Length)	Description
IDTime	*Varchar(9)*	
Month	*Date*	*MonthVisits*

6. Selecting the Duration of the Database (Choosing the duration of the database): In designing the data warehouse on tourist visits by nationality, the duration of time used is 2021. The data stored in this data warehouse is the visit data for the last 1 year.

7. Tracking Slowly Changing Dimensions:

Table 2. Tracking Slowly Changing Dimensions

Time Dimension	Possible Attributes Changed
Time	Month

8. Deciding the query priorities and the query mode (Deciding the query priorities and the query mode): In this stage, what is done is to consider the effect on the physical design. In designing a data warehouse, the capacity of storage media is one aspect that needs to be considered.
9. Storing pre-calculation in the fact table, namely the aggregation in the fact table of visit data is the sum of visit data of all nationalities between countries based on time (months).

3. RESULT AND DISCUSSION

3.1 Data Presentation and Application of OLAP Method

After the Data Warehouse has been designed, the presentation of the data is presented in the form of a table as follows.

Kebangsaan	Januari	Februari	Maret	April	Mei	Juni	Juli	Agustus	Septemb	Oktober	Novembe	Desember
Brunei Darussalam	4	9	6	46	3	13	6	7	11	11	17	11
Malaysia	44001	34425	37095	35871	45322	34345	41913	37530	37946	44113	39434	48728
Philippines	779	679	1014	995	972	670	483	438	511	831	1148	855
Singapore	2107	1864	2396	2541	2293	1049	980	946	729	1142	1462	1195
Thailand	258	301	327	418	423	299	225	225	265	389	427	435
Vietnam	141	167	155	196	164	131	147	134	122	160	214	277
Laos	1	0	0	3	0	1	0	0	0	0	1	1
Kamboja	2	5	13	36	18	25	22	19	14	33	17	24
Myanmar/Burma	368	293	259	291	259	233	186	183	168	254	283	316
Indonesia	935	664	1214	263	927	779	709	571	571	647	1185	1487
A S E A N	48596	38407	42479	40660	50381	37545	44671	40053	40337	47580	44188	53329
Hong Kong	198	232	212	172	190	187	186	188	170	211	236	250
India	349	558	539	826	244	211	176	165	184	949	1301	1168
Japan	79	422	284	628	929	731	88	37	288	737	821	908
South Korea	207	676	842	1119	799	813	280	164	364	1281	1681	1271
Pakistan	27	71	51	101	69	98	67	15	53	113	146	163
Bangladesh	88	87	79	62	80	98	50	69	53	138	93	104
Srilanka	26	34	52	57	79	56	27	15	42	63	100	69
Taiwan	67	117	126	147	159	149	63	28	36	124	184	198
China	1353	2703	8272	9639	4961	6421	2941	897	2119	6005	4889	4513
Other Asia	68488	54323	59497	48624	70449	68694	69623	70246	69158	76342	80816	85324
Afganistan	0	3	4	3	4	0	3	0	0	0	2	1
Bhutan	0	0	0	0	0	1	0	0	0	0	2	3
British Indian Ocean Terit	0	0	0	0	0	0	0	0	0	0	0	0
Kazakhstan	0	32	22	30	42	55	30	4	8	21	36	98
Kirgistan	0	1	4	3	3	9	15	0	5	76	61	69
Korea Utara	0	0	0	0	0	2	0	0	0	0	1	0
Macao	4	3	2	1	4	6	7	7	3	6	10	8
Mongolia	0	0	1	0	2	0	0	0	0	4	2	3
Maladewa	5	6	5	12	11	2	6	1	1	9	14	8
Nepal	0	2	5	15	5	5	1	0	2	11	7	8
Stateless	0	0	0	0	0	0	0	0	0	0	0	0
Tajikhistan	1	0	0	1	2	7	2	0	1	2	5	0
Tibet	0	0	0	0	0	0	0	0	0	0	0	0
Timor Leste	68451	54211	59389	48447	70265	68475	69516	70216	69080	76086	80377	84975
Turki	27	63	62	101	107	117	40	17	55	122	278	133
Turkmenistan	0	0	0	0	3	0	0	0	0	3	4	2

Figure 3. Foreign Tourist Visits

On-Line Analytical Processing (OLAP) uses the concept of multi-dimensional data and allows users to analyze data in detail, without typing a single SQL command. The facilities in OLAP are roll-up or drill-up and roll-down or drill-down facilities. Drilling means moving from one level of the hierarchy to another. Drilling on Microsoft Power BI as shown in Figure 3 Drilling

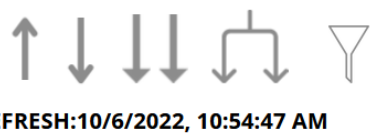

Figure 4. Drilling Concept

3.2 Multidimensional Analysis

Because Covid-19 Pandemic, We propose analysis only three region for multidimensional Analysis, Asia Region, Africa Region and America Region. Analysis of tourist visits based on the ASEAN category in January-December 2021 where this visualization shows the number of tourist visits, the result is that Timor Leste has the highest visit while for others it is the total visit from ASEAN (Figure 5). Analysis of tourist visits based on the Africa category in January - December 2021 where this visualization shows the number of visits, the result is that the highest month of visits is in June in Other Africa as many as 311 visits (Figure 6).

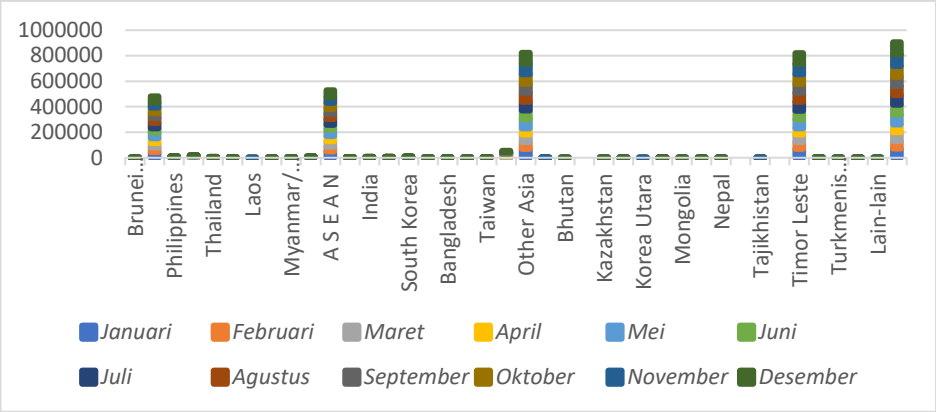

Figure 5. Tourist Visits by Asia Region

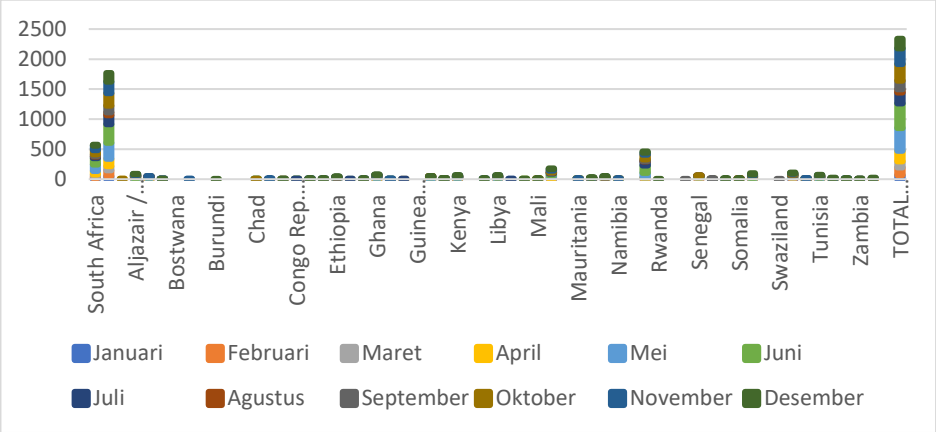

Figure 6. Tourist Visits by Africa Region

Analysis of tourist visits based on the Americas category in January-December 2021 where this visualization shows the number of tourist visits, the result is that the United States of America which has the highest visit in July is 2508 while for others it is the total visit from America (Figure. 7).

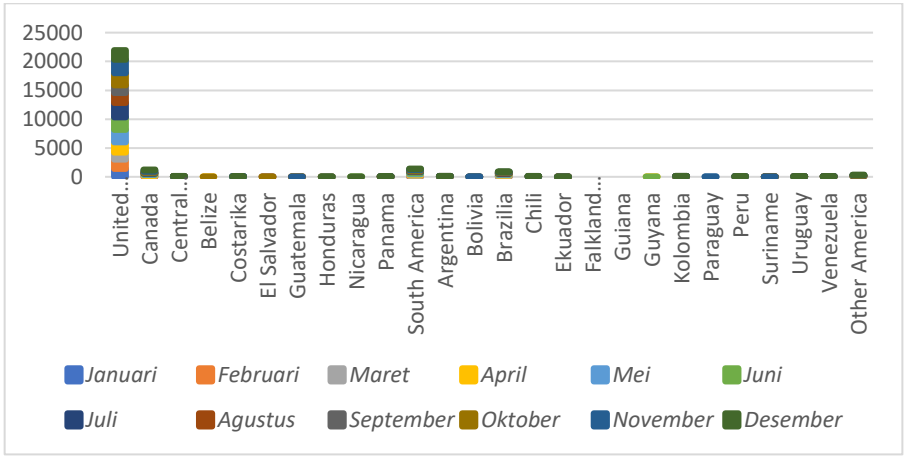

Figure 7. Tourist Visits by America Region

3.3 Multidimensional Analysis at Another Country

On the occasion of this analysis, we tried to take samples from four countries for OLAP analysis. The four countries are Malaysia, Germany, Russia and Australia (Figure 8 – 11). In the graph, it can be concluded that the country visited by the most tourists in the Covid era in 2021 is Malaysia (Figure 8). Meanwhile, other countries tend to accept fewer tourists who come to their country. This is because their country tends to tighten access to their country so that tourists must also complete the requirements to access the country's visits. When compared to before covid, in 2019 the most visited country was Australia (Figure 10). Malaysia is a neighboring country with Indonesia, so Indonesian stakeholders should be able to prepare well in 2022 and the coming year. Moreover, at this time Covid has been able to be controlled and all Indonesian domestic tourism actors are required to get a vaccine booster.

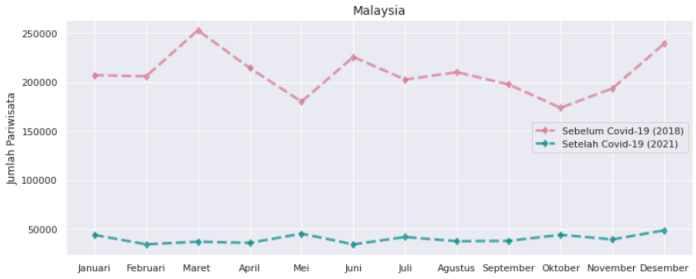

Figure 8. Tourist Visits at Malaysia

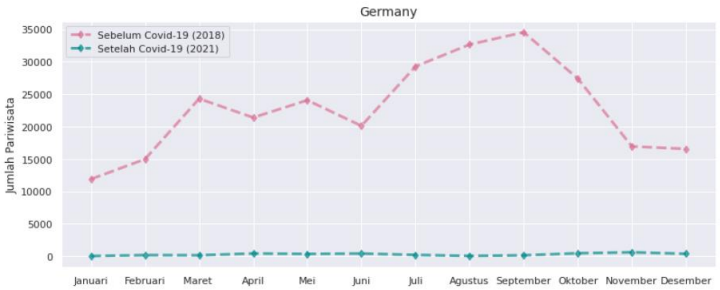

Figure 9. Tourist Visits at Germany

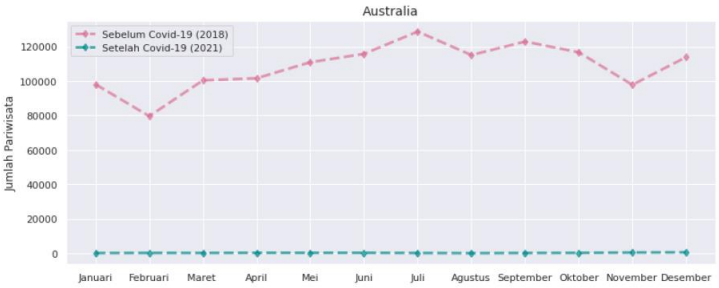

Figure 10. Tourist Visits at Australia

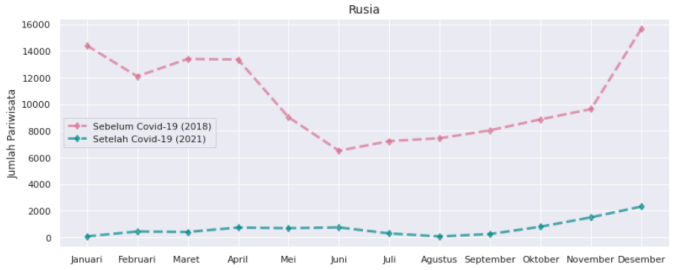

Figure 11. Tourist Visits at Germany

4. CONCLUSION

The visualization used is in the form of charts / graphs as an identification of the visits of each tourist based on nationality. This is done to determine the interests and potential of tourism to support the country's economy through the tourism sector. If we look at the graph, the dominant tourist visits to Indonesia come from neighboring countries on the Asian continent. Currently the Covid-19 pandemic has begun to be controlled, so it is time for tourism actors and the tourism ministry to push for more vigorous promotion. Through OLAP, in 2021 it can be analyzed that monthly tourist visits tend to be stable with the periods of July-August and January-December increasing.

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