(RESEARCH ARTICLE)

Implementation of editorial television data warehouse: Health and business news will keep high since pandemic Covid-19

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Abstract

Data warehouse technology in the world of informatics can be applied in television editors to predict events in the future. The results of implementing a data warehouse in television editors since the Covid-19 pandemic shows that in the future, television coverage will still be dominated by health news 80.64 percent and economic news 65.61 percent. In Indonesia, legal and criminal news reports have also become a news trend as a result of these health and economic problems. The television editorial data warehouse was designed using Kimball's Nine-Step method and implementation using Microsoft SQL Server and Tableau. And to predict the news in the future analyzed using the Markov model. Apart from analyzing television news, this data warehouse is also capable know the performance of the television editorial team, namely the performance of news producers, reporters, and cameramen. The results of this data warehouse can be used by television management and chief editors to make informed strategic decisions.

1. Introduction

Data warehouse technology is used to manage large amounts of data collection to assist management in creating data warehouse strategy decisions [1]. The strength of a data warehouse lies in a large amount of data and statistical analysis [2]. Huge data sets are extracted, formatted, and stored in a data center to produce output in the form of analysis results [3]. So far, the data warehouse has been applied in the business of sales [4], finance and banking [5], agriculture [6], and also in the medical world [7].

This paper raises the application of data warehouse technology in the field of mass communication, especially in television reporting. This is possible because the news on television is always new and becomes news data that can be collected every day in large numbers very much [8]. Television news data sets can be further analyzed to determine the current news trend up to predictions for the future. The television editorial office is also handled by professionals who become a working team in presenting news to viewers, namely reporters, cameramen, and news producers. Analysis of the performance of the editorial team is also possible because of high work routines to present various news to the audience [8].

All the time, news in television editors has become a piece of passing information after the news was broadcast. Several television editors in Indonesia repackaged the broadcast in the form of an informational video clip which was republished on YouTube [9]. But the rest become information impressions that are fleeting and even forgotten. Moreover, news television broadcasts 24 hours per day. If the duration of each television news item is 3 minutes, so in one hour there are at least 20 news broadcasts on television [10]. It means in one day for television news 480 news stories are broadcast. If it is reduced by dialogue programs and news that are replayed, there will be approximately 400

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news stories television is broadcast every day, and within a month about 12 thousand news stories are broadcast [11]. This is potential data that can be processed further for various interests of analysis include understanding the news trends for strategic decision making. In various literature studies, so far there is no instrument specifically built to manage the news that has been broadcast.

This television editorial data warehouse can also be used to help decision-making in television editors. Because all this time the only decision-making in television editors is through editorial meetings [12]. Television editorial meetings are usually held at least two times before a television program is aired, namely a pre-production meeting which contains the preparation of a coverage plan, and a post-production meeting which contains an examination of the production results or the results of the coverage team [13]. In particular, on television news programs, the news agenda discussed in a projection meeting (pre-production meeting) which took place at night to discuss the news agenda the next day. This meeting also discussed coverage plans related to news issues currently developing in the community. Furthermore, at the stage of frequent production meetings, there is a long discussion because it determines the end of a television program broadcast [14]. Here the results of the coverage that have been obtained will be was decided which news should be broadcast on a program with a limited duration. [15]. Data warehouse technology this development can support television editorial meetings so that decision-making related to reporting is more accurate and successful.

Previous research that became a reference in the continuation of this study discussed the analysis and design of a data warehouse to support television editorial decisions use the Nine-step Kimball method [16]. Then there is also a data warehouse to produce information systems required in filling out accreditation forms and producing analytical information for decision making in Informatics Study Program, Universitas Mercu Buana [17].

In this research, what is being done is to create a data warehouse to support decisions television, editorial staff. The data warehouse produced this time knows what news is the top issue and who the editorial team is most productive work on coverage and work on television news programs. The output of this data warehouse will be can be used to support the decisions of television editors in terms of determining newsworthy of broadcast and worthy of coverage, as well as to determine career advancement and promotion of the television editorial team. More than that, the news trend generated by this data warehouse can be used more continued by various parties in making other strategic decisions. Implementation of the data warehouse in the television editorial is the one first done and still needs to be further developed. Researchers built this data warehouse using the Nine-Steps method Kimball in the analysis and design stages [18], then the application implementation using SQL Server [19], and Tableau [20]. Next using the Markov Model in the analysis and prediction of future trends. The main data processing in the data warehouse about television news, then also the performance data of the television editorial team who routinely compile and present news to the audience. Editorial team television is meant here, namely cameraman, reporter, and news producer. To observe the accumulation of an event, as news collection, and employee performance, here using the Markov Process Model mathematical model that can predict events things to come [21], [22].

2. Research Methods

2.1. Literature Study

In conducting this research, the literature study is the first step taken to understand the object under study. Sekunder data collected are theories about data warehouse, data warehouse characteristics, including studying literature about Tableau and Microsoft SQL Server which will be used when implementing the data warehouse. Various theories and concepts are gathered from books, research journals, articles, and internet literature that have reputable reputations and trusted criteria. Several studies related to the object being studied also studied to determine the extent of the development of research on the object under study.

2.2. Field Study

This field study was conducted to collect primary data related to the object being studied. Researchers collect data about news television both in the television editorial office and real-time television news broadcasts. This field study is also to map the current problem faced and at the same time collect data and information to be used as material for implementing a data warehouse. The data that will be collected during this field study are television news data, reporter data and television cameramen, producer data television, and television editorial team performance data.

2.3. Implementation Of Data Warehouse With Tableau Dan Sql Server

Furthermore, the implementation of the data warehouse uses Microsoft SQL Server and Tableau. Tableau is used to create data visualizations, data analysis, and reporting by combining data from various sources into the data warehouse. The implementation also uses the Microsoft SQL Server application where the exported data from various sources is processed using the Microsoft SQL Server analysis manager as a data warehouse.

The data needed to create a data warehouse is in the form of news data covered and broadcast news, as well as employee data. In the News Dimension, the attributes are News Code, News Headline, News Content, and News Status whether broadcast or not. Because usually a lot of news is covered, but little is shown. While in the Employee Dimension, the attribute consists of Number Main Employee, Name, Address, Phone Number, and Position whether as a reporter, cameraman, or producer. Because in the news television editorial at least these three positions are the main supporters of television editorial operations which really need attention in terms of improved capacity and career path.

2.4. Prediction Of Future Trends With The Model Markov

To calculate future predictions regarding news trends and employee performance, the Markov model takes into account every change from time to time to produce predictions of the future. Data changes in each dimension in the data warehouse recorded to be calculated using the Markov formula. The results of calculations using the Markov model will provide options for making strategic decisions to achieve success in the future.
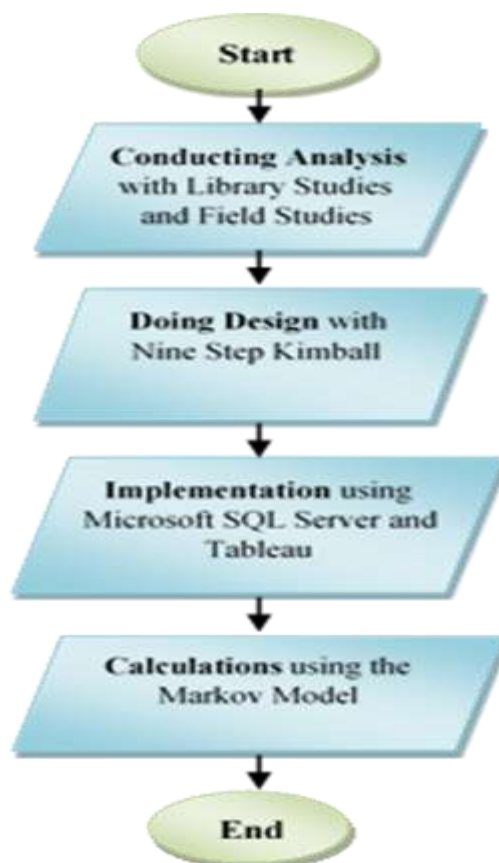

Figure 1 Research Stages Flowchart

3. Results and discussion

3.1. Data Analysis

The data collected during field studies and interviews are the editorial data of Kompas TV, consisting of television news data starting from television news, news data covered and broadcast, television news programs, and data on decision-making processes through meetings television editorial staff. Meanwhile, to measure performance, the data collected is

related to reporter data, cameraman, and news producer data. Data retrieval is also carried out through the Kompas TV digital library and streaming television shows through the Kompas Tv site.

3.2. System Requirements Analysis

By studying the data and problems that exist in television editors, the system needs in making this television editorial data warehouse is as follows:

Table 1 Needs of Television Editorial Data Warehouse System

No.	System Requirements	Actor
1	Covering the News, Submitting Video Coverage, and Writing Script Television News.	Reporter and Cameraman
2	Reading News Coverage and Editing Television News Script as well Broadcast Television News.	Producer
3	Seeing Periodically the Trend of Coverage and Reporter Performance, Cameraman, and Producer and Print Report.	Admin and Editor Chief

3.3. Data Warehouse Design

This Data Warehouse design uses the 9-step Kimball method or the Kimball nine-step method with the following steps:

1. Determining the business process (Choosing the process). According to the results of observations and analysis, the business process established in relation to this study is the Television News Process.

Table 2 Choosing the Process

Business Process	Description	The Function Involved
Television News	Gather all information television news broadcast nor they are not showing, however, has been covered	Coverage Division (News Gathering) and Division News Production

2. Determining the granularity (Choosing the grain). In this section decide exactly what a fact table represented or represents. Here the level of detail of the data is determined which can be obtained from the dimensional model. So that the specified granularity is Television News Information.

Table 3 Choosing The Grain

Grain	Description	The Business Process Involved
Television News Information and Performance	Television news information consists of News and News Category. News is news that has been covered by reporters and cameramen and processed until displayed by the producer. Here beside the news, it is also related to coverage and broadcast team performance tv news.	Decision Editors Television.

3. Identifying and conforming the dimensions. The third step in designing a Data Warehouse is identifying dimensions associated with fact tables. From the identification results then can be determined the dimensions involved include: News Dimension, News Category Dimension, Producer Dimension, Reporter Dimension, Cameraman Dimension.

Table 4 Identifying and Conforming The Dimensions.

Dimension Table	Description	Grain
News_ Dimension	News_ Dimension equipped attributes: News_Code, News_Title, News_Content, Category_Code, Duration	Television News Information
News_Category_Dimension	News_Category_ Dimension equipped attributes: Category_Code, Category_Name	Television News Information
Producer_ Dimension	Producer_ Dimension equipped attributes: Producer_Id, Producer_Name, Address, and Phone	Television News Information
Reporter_ Dimension	Reporter_ Dimension equipped attributes: Reporter_Id, Reporter_Name, Address, and Phone	Television News Information
Cameraman_ Dimension	Cameraman_ Dimension equipped attributes: Cameraman_Id, Cameraman_Name, Address, and Phone	Television News Information

4. Choosing the fact. In the fact-sorting stage, a fact table is established which can implement all the grains used. In this case that fact specified are: Facts News, Fact Performance.
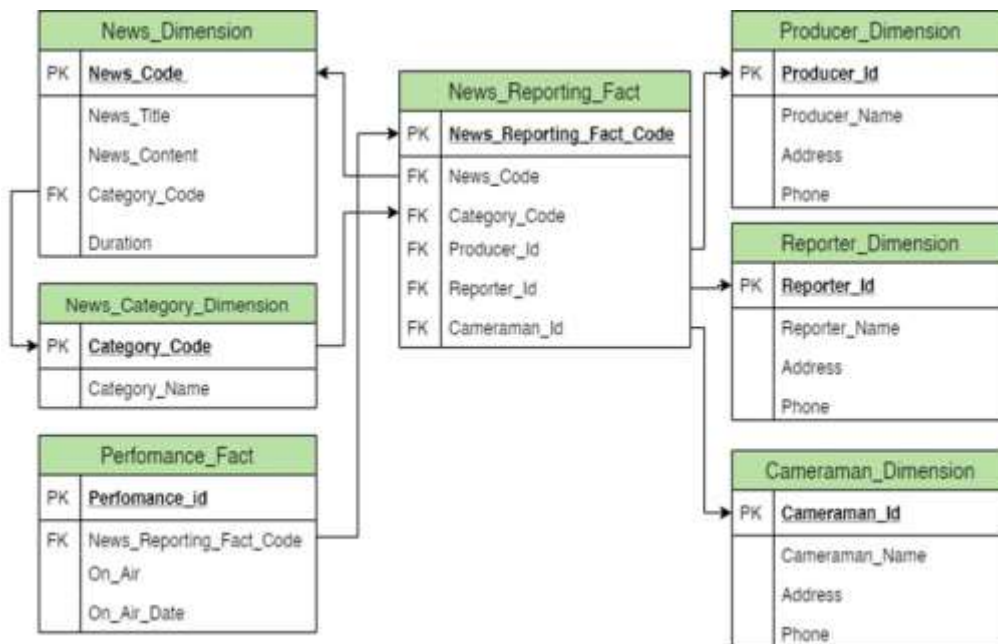
Figure 2 Schematic of Coverage Facts and Performance Facts

Table 5 Choosing the fact

Fact	Description	Dimension
News Reporting Fact	News_Reporting_Fact contains information television news that is covered and broadcast along with the team that worked on it.	News Dimension News Category Dimension Producer Dimension Reporter Dimension Cameraman Dimension
Performance Fact	Performance Fact contains a reporter, cameraman, and producer are able to cover and broadcast the news.	News Dimension Producer Dimension Reporter Dimension Cameraman Dimension

 5. Storing pre-calculations in the fact table (Storing pre-calculations in the fact table). At this stage, the calculation process is carried out against the fact table, and stores the pre-calculation results, as follows: In Facts, the duration and number of news broadcasts need to be calculated and stored temporarily. Then in the Fact table, the performance of the number of news covered and aired needs to be taken into account as an important indicator of the performance of producers, reporters, and cameramen. Here each table is calculated and stored in advance where the recap of the data will become the data of a data warehouse, that is later in a certain period of time the results of a dynamic and varied report will be generated.

6. Complete the dimension tables (Rounding-out the dimension tables). This stage completes the dimension table with attributes and a commentary of the description.

**Table 6** Rounding-out the dimension tables.

Dimension/ Fact	Attribute	Data Type (Length)
News_ Dimension	News_Code	Varchar(15)
	News_Title	Varchar(300)
	News_Content	Longtext
	Category_Code	Int(11)
	Duration	Time
News_Category_ Dimension	Category_Code	Int(11)
	Category_Name	Varchar(100)
Producer_ Dimension	Producer_Id	Varchar(15)
	Producer_Name	Varchar(100)
	Address	Varchar(300)
	Phone	Varchar(100)
Reporter_ Dimension	Reporter_Id	Varchar(15)
	Reporter_Name	Varchar(100)
	Address	Varchar(300)
	Phone	Varchar(100)
Cameraman_ Dimension	Cameraman_Id	Varchar(15)
	Cameraman_Name	Varchar(100)
	Address	Varchar(300)
	Phone	Varchar(100)
News_Reporting_Fact	News_Code	Varchar(15)
	Category_Code	Int(11)
	Producer_Id	Varchar(15)
	Cameraman_Id	Varchar(15)
	Reporter_Id	Varchar(15)
Performance_Fact	Performance_Id	Int(11)
	News_Code	Varchar(15)
	On_Air	Boolean
	On_Air_Date	Date

7. Determine the duration of the dimension (Choosing the duration of the dimension). This stage determines the duration of the database. For the manufacture of this data warehouse, it is determined that the duration of the data collected is 3 last years. The data is taken from the digital library of news recapitulation and employee recapitulation data of Kompas TV, especially producers, reporters, and cameraman and impressions on the Kompas Tv streaming site.

8. Tracing the dimensions including slowly changing dimension (Tracking slowly changing dimension). This stage takes into account slow, traceable dimensional changes. In the Kompas TV editorial staff, the employee data are producers, as well as reporters, and cameramen can always change slowly because of a promotion, assignment, or job change (resign).

9. Deciding the query priorities and the query modes (Deciding the query priorities and the query modes). This stage uses physical design to produce a data warehouse that is ready to be implemented. Here also the query specifies-query or report (reporting) to be able to display the data desired by the user. In this design, a data warehouse is built to display the most covered and broadcast news information, Reporter and Cameraman who cover the most news, The producer who works on and broadcasts the most news. The amount of news that is covered and broadcast will show the most issues strong and attractive and is in the public's attention, and the trend will be seen in a certain period of time. While reporters, cameramen, and producers with the amount of news covered and worked on and broadcast as indicators of determining performance. Query results or reporting like this can be used by policymakers or leaders in making strategic decisions.

3.4. Implementation of Data Warehouse
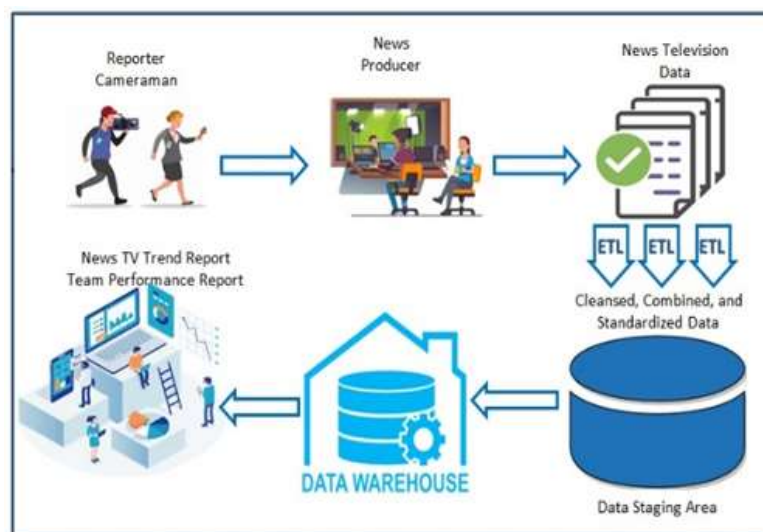
Figure 3 Data Warehouse News Television

Figure 3 above shows the television editorial data warehouse that was built, where the data stored is in the form of coverage by reporters and cameraman. This coverage was further processed by a news producer who edited the narrative along with video images and broadcast it on broadcast television news. The television news data is then stored as news coverage data as well as broadcast news data. The news data stored with data from the television editorial team, namely data from cameramen, reporters, and producers. This is where the data is grouped and processed further into the tables including the ETL process. ETL hassle data is entered into the data staging area to be stored in an editorial data warehouse television. The results of this data warehouse can be retrieved periodically in the form of news trend reports within a certain period of time, and report on the performance of the television editorial team in a certain period of time. The output of this data warehouse is in the form of data visualization in the form of graphs, diagrams, and an easy-to-understand format for periodic reports.

3.5. Database Implementation With Sql Server

In this data warehouse implementation, the database is built using MySQL and SQL Server. Starting with creating tables as a dimension in the data warehouse. For example, the Create Table NewsDimension can be seen in the source code below.

```
CREATE TABLE `NewsDimension`
(
`News_code` varchar (15) NOT NULL,
`News_Title` varchar (100) NOT NULL,
`News_Content` Longtext NOT NULL,
`Category_Code` varchar (15) NOT NULL,
`Duration` time NOT NULL,
`Coverage_Date` date NOT NULL,
`Nik_Producer` varchar (15) NOT NULL,
`Nik_Cameramen` varchar (15) NOT NULL,
`Nik_Reporter` varchar (15) NOT NULL
)
```

The process of creating a table is carried out on all dimensions and facts which will be linked to each other in a data warehouse database.

3.6. Implementation Of Data Warehouse System Applications

To make it easier for the editorial team and admin to input data, a data warehouse application was built, so that the input process data can be done by each admin or authorized user. The secretariat team in the television editorial team can register as a given user the right of access to perform the data input process of news summaries and news coverage every day. Even reporters and producers are given access rights as users to type news and edit news script that will be broadcast on television, directly in the data warehouse system. The application is built using Code Igniter an open-source PHP framework and uses the view model controller (MVC). Code igniter makes it very easy to help website-based systems with the structured and easy syntax used and the level of safety is guaranteed. Code igniter is superior in managing the backend while managing the frontend using a bootstrap which is known to be reliable to give an attractive website frontend appearance. As a trial, this data warehouse system application can be accessed online through the website https://datawarehouse.ranselpro.com/ and will produce a login display like the image below.

Figure 4 Login Data Input in the Data Warehouse System

In the Figure above, each user who is granted access rights must have a user ID and password to be able to log into the data warehouse system.

If the login is successful, the user can immediately enter the data which will be stored in the database. For example, in the television news input process, it will be shown as shown below.

Figure 5 Display of News Data

Here an admin can add news data that is covered by clicking the Add Data button and then inputting the data news ranging from News Code, News Title, News Content, News Category, Duration, Date Coverage, Producer who worked on it, including reporters and cameramen who cover it. This data input process can be carried out by an admin appointed in the television editorial or carried out by an executive producer so that the data entered is under the actual data while avoiding adding data incorrectly for the purpose to improve one's performance.

After clicking the Add Data button a display interface will appear as shown below to be able to input data-television news data.

Figure 6 Add News Data Display

In addition to news data, the image above is also shown on the dashboard, where an admin can add data from reporters, cameramen, producer, and news categories, as well as updating the performance of the editorial team. Every superior, rather than a reporter, cameraman, and producer can update data to find out exactly the development of the team's performance, including updating the news that has been covered and aired.

Figure 7 Display Add News Data

Figure 7 above shows a summary of reporter's data on Kompas TV which can be updated for any changes such as adding reporter data or change reporter data. The data recap above will be stored in a SQL Server database for a certain period of time as more and more can be moved into the data warehouse by a data warehouse manager through the Extraction process, Transformation, and Load (ETL).

3.7. ETL Implementation

In this Extraction, Transformation, and Load (ETL) process using SQL Server Integration Services (SSIS) tools, and for the Editor using Microsoft Visual Studio 2017. SSIS is used to integrate data on the ETL process which is also automatic perform database updates and maintenance of SQL Server. SSIS uses Microsoft Visual Studio 2017 which is implemented here also allows the ETL process to be carried out free of charge, especially in the trial activities of developing a data warehouse.
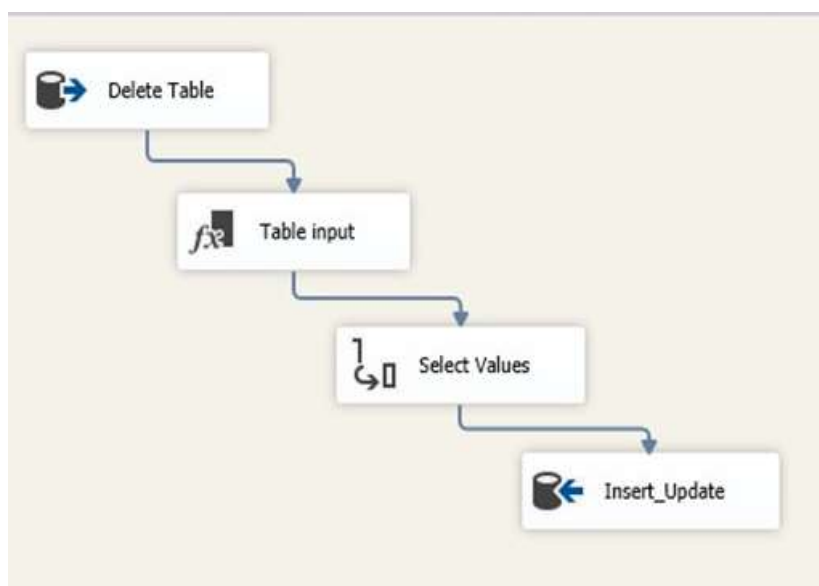

Figure 8 ETL Process View with SSIS Tools

Figure 8 above shows the ETL process with SSIS tools, where in the process of storing data into the data warehouse, it begins with Delete Table to first empty the existing data. Next, the Input Table is in the form of data retrieval from

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MySQL, followed by Select Values, which is selecting the part or fields to be filled in to be displayed, and then Insert_Update as input to the system data warehouse storage.

3.8. Data Warehouse Visualization Results With Tableau

To make a report (reporting) as one of the outputs of the data warehouse, a more interesting and easy data visualization is needed understood by decision makers. Data visualization here uses tableau.
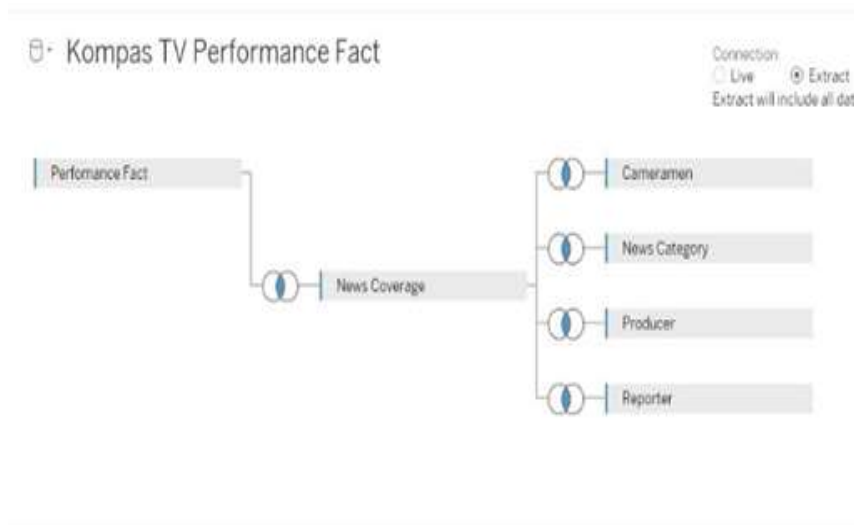
Figure 9 Dimensional and Fact Data Process Using Tableau

The figure 9 above shows the tableau software processing data on dimensions and facts that will produce data visualization interesting and varied. Furthermore, the results of data visualization on the performance of the television editorial team and news trends.
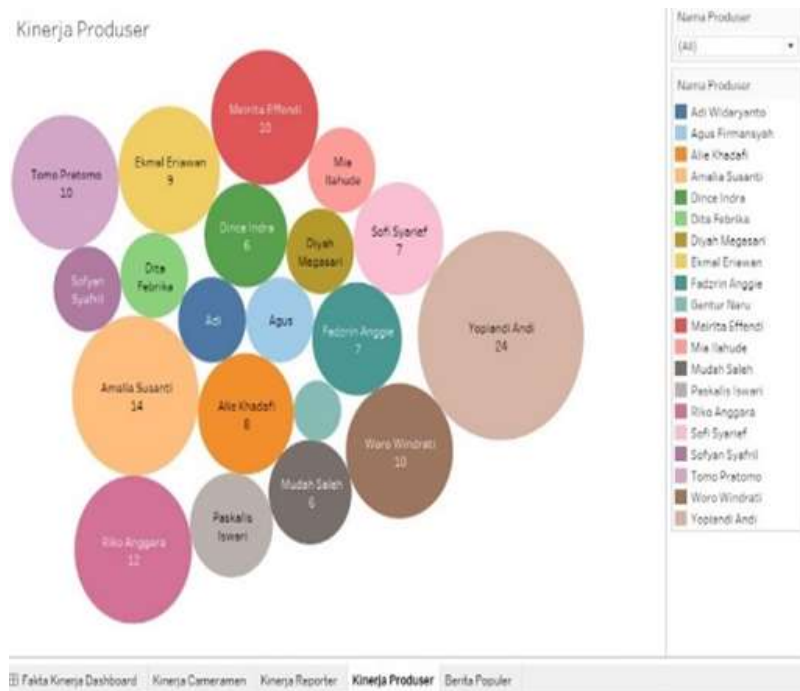
Figure 10 Producer Performance Data Visualization

The figure 10 above shows the producer with the best performance on behalf of Yopiandi Andi, followed by Amalia Susanti, and Riko Anggara. This result can provide input for television editorial management to make further decisions related to promotions and career paths.

Figure 11 Cameraman's Performance Data Visualization

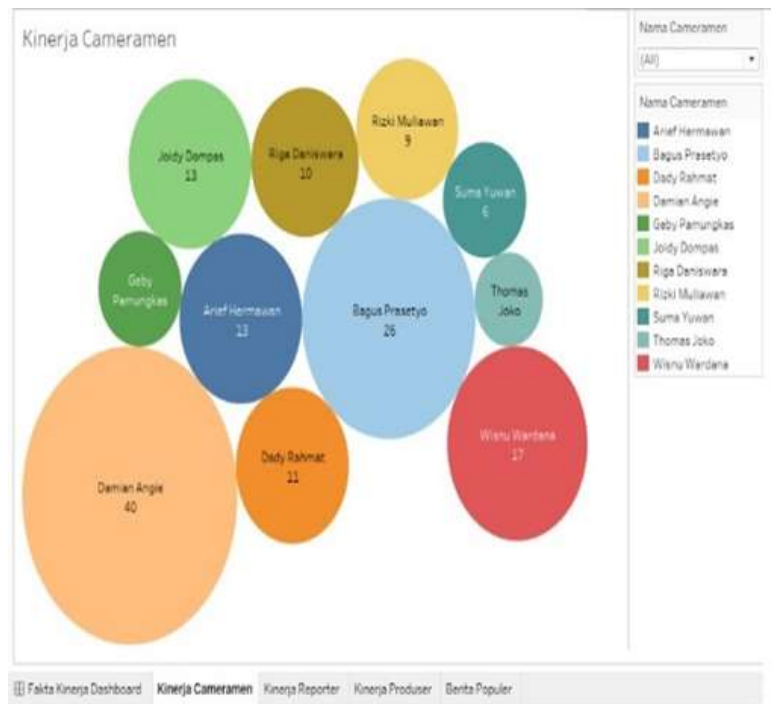The results of the data warehouse visualization of the cameraman's performance show that the cameraman on behalf of Damian Angie is in the performance position the best, followed by Bagus Prasetyo, and Wisnu Wardana.
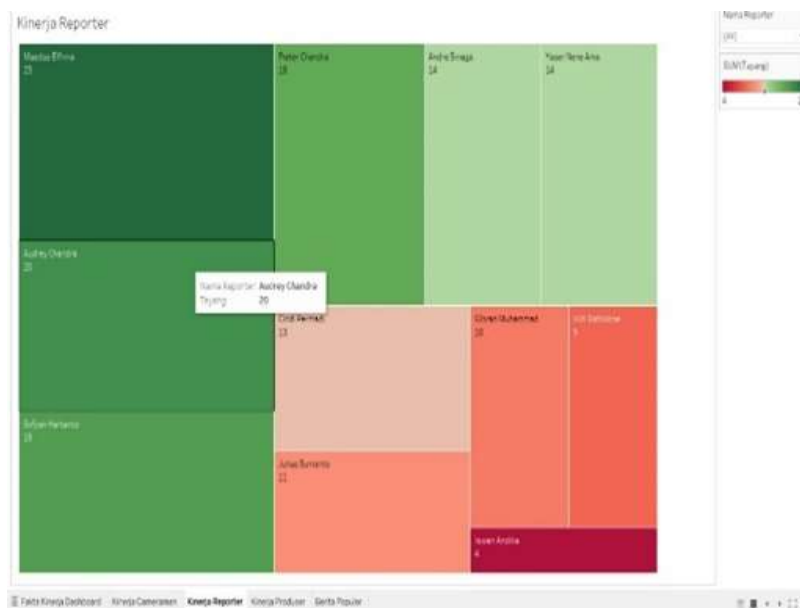
Figure 12 Reporter Performance Data Visualization

The figure 12 above shows the performance of reporter Maedop Elfrina in the highest position, followed by Audre Chandra, and Sofyan Hartanto. Furthermore, the results of the visualization of the news data in the television editorial.
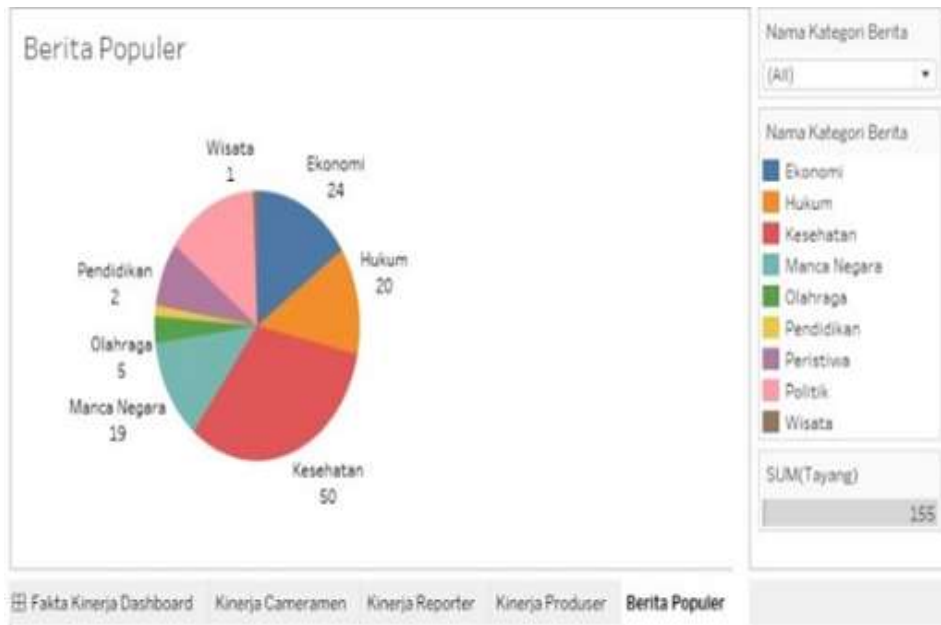
Figure 13 Visualization of News Trend Data

The figure 13 above shows that the news that is most covered and aired on television is about health issues, followed by Economic news, and the third position is Legal news. If we look deeper into the health news which ranks the highest is news about the corona virus or covid-19 which is of national concern and world attention. The second position is where the economic news governments and the world community face economic constraints as a direct result of these health problems. And in Indonesia Legal news especially the increase in crime received a high portion of the coverage. Criminal cases that occur also related to economic difficulties due to the impact of the corona virus or covid-19.

After seeing the data warehouse results above, then predict future trends with the Markov model. Data analyzed on data warehouse is taken from the main news data in period I and period II, about news categories, performance of producers, reporters, to cameramen. In the first period, 86 stories were taken and published by producers, reporters and cameramen. And then on period second also taken 86 news to be able to calculate the transition probability as a trend of news and performance.

Table 7 Illustrates the news data in period I and the changes in period II

News Category	Period I	Increas From					Decrease To					Period II
		Health	Business	Politics	Law and Crime	World News	Health	Business	Politics	Law and Crime	World News	
Health	26	0	2	7	2	2	0	2	1	0	0	36
Business	19	2	0	4	1	1	2	0	2	0	0	23
Politics	17	1	2	0	3	3	7	4	0	6	0	9
Law and Crime	12	0	0	6	0	2	2	1	3	0	5	9
World News	12	0	0	0	5	0	2	1	3	2	0	9
Total	86											86

The table 7 illustrates the news data in period I and the changes in period II, where each news category in period I experienced increase and also decrease in period II. Here it is also very clear that the increase in news in a news category increases from any category and reduced to another news category. Changes in data for period I and period II will be used to perform the analysis Furthermore.

Table 8 Depicts the producer performance data in period I, the news has changed in period II.

Producer	Period I	Increas From					Dercrease To					Period II
		Yopiandi	Amalia	Riko	Merita	Woro	Yopiandi	Amalia	Riko	Merita	Woro	
Yopiandi	24	0	4	4	4	0	0	4	3	2	1	26
Amalia	19	4	0	2	5	0	4	0	2	2	2	20
Riko	13	3	2	0	3	1	4	2	0	0	0	16
Merita	18	2	2	0	0	2	4	5	3	0	2	10
Woro	12	1	2	0	2	0	0	0	1	2	0	14
Total	86											86

The table 8 depicts the producer performance data in period I, the news has changed in period II. There are producers whose performance increased but there was a decline in terms of quantity of work handled. This data change can be used to perform analysis probability in the future.

Table 9 Shows the performance data of reporters in period I experienced changes in period II.

Reporter	Period I	Increas From					Dercrease To					Period II
		Maedop	Audrey	Sofyan	Pieter	Cindi	Maedop	Audrey	Sofyan	Pieter	Cindi	
Maedop	22	0	4	2	4	1	0	5	2	3	1	22
Audrey	20	5	0	1	2	4	4	0	5	2	4	17
Sofyan	15	2	5	0	0	1	2	1	0	0	0	20
Pieter	16	3	2	0	0	1	4	2	0	0	1	15
Cindi	13	1	4	0	1	0	1	4	1	1	0	12
Total	86											86

The table 9 shows the performance data of reporters in period I experienced changes in period II, where the amount of coverage for 86 headlines in period I was spread over the five reporters above and in period II experienced changes in the distribution of data. Because there are reporters whose coverage increases and some are reduced because the coverage has been handled by other reporters.

Table 10 Shows the amount of coverage handled by cameramen in period I and the amount of coverage handled by cameramen in period II

Cameraman	Period I	Increas From					Dercrease To					Period II
		Damian	Bagus	Wisnu	Joidy	Arief	Damian	Bagus	Wisnu	Joidy	Arief	
Damian	27	0	4	3	4	1	0	10	4	3	2	20
Bagus	17	10	0	2	1	0	4	0	3	3	1	19
Wisnu	15	4	3	0	1	0	3	2	0	0	1	17
Joidy	15	3	3	0	0	0	4	1	1	0	0	15
Arief	12	2	1	1	0	0	1	0	0	0	0	15
Total	86											86

The table 10 shows the amount of coverage handled by cameramen in period I and the amount of coverage handled by cameramen in period II. There is an increase or decrease in the amount of coverage by a cameraman who will be further analyzed to obtain trend results the performance of the aforementioned cameraman.

Furthermore, by observing the initial condition data and its changes in the condition of period II, the probability value of the news trend can be obtained calculated with the results as shown in the following table.

Table 11 Observing the initial condition data and its changes in the condition of period II.

News Category	Period II				
Period I	Health	Business	Politics	Law and Crime	World News
Health	0.884615	0.076923	0.038462	0	0
Business	0.105263	0.789474	0.105263	0	0
Politics	0.411765	0.235294	0	0.352941	0
Law and Crime	0.166667	0.083333	0.25	0.083333	0.416667
World News	0.166667	0.083333	0.25	0.166667	0.333333

From the calculation results in the table above, it is known that the probability of surviving news on health news is 88.46 percent, economic news78.94 percent, political news 0 percent, legal and criminal news 8.33 percent, and world news 33.33 percent. The results of the table above can be rewritten in the form of a matrix P1 for the news trend are as follows.

$$
P^1 = \begin{bmatrix}
0.884615 & 0.076923 & 0.038462 & 0 & 0 \\
0.105263 & 0.789474 & 0.105263 & 0 & 0 \\
0.411765 & 0.235294 & 0 & 0.352941 & 0 \\
0.166667 & 0.083333 & 0.25 & 0.083333 & 0.416667 \\
0.166667 & 0.083333 & 0.25 & 0.166667 & 0.333333
\end{bmatrix}
$$

And to determine the news trend in the future, calculations are made to determine the value from P2 as follows:

$$
P^2 = P^1 \times P^1 = \begin{bmatrix}
0.884615 & 0.076923 & 0.038462 & 0 & 0 \\
0.105263 & 0.789474 & 0.105263 & 0 & 0 \\
0.411765 & 0.235294 & 0 & 0.352941 & 0 \\
0.166667 & 0.083333 & 0.25 & 0.083333 & 0.416667 \\
0.166667 & 0.083333 & 0.25 & 0.166667 & 0.333333
\end{bmatrix}
\begin{bmatrix}
0.884615 & 0.076923 & 0.038462 & 0 & 0 \\
0.105263 & 0.789474 & 0.105263 & 0 & 0 \\
0.411765 & 0.235294 & 0 & 0.352941 & 0 \\
0.166667 & 0.083333 & 0.25 & 0.083333 & 0.416667 \\
0.166667 & 0.083333 & 0.25 & 0.166667 & 0.333333
\end{bmatrix}
$$

$$
P^2 = \begin{bmatrix}
0.806478 & 0.137826 & 0.042121 & 0.013575 & 0 \\
0.219563 & 0.656134 & 0.087151 & 0.037152 & 0 \\
0.447845 & 0.246844 & 0.12884 & 0.029412 & 0.147059 \\
0.342483 & 0.1791 & 0.140182 & 0.164624 & 0.173611 \\
0.342483 & 0.1791 & 0.140182 & 0.15768 & 0.180556
\end{bmatrix}
$$

The results of the matrix calculation above P2 show that in the future health news is still the highest with an estimated 80.64 percent, followed by economic news at 65.61 percent, while other news is relatively low. During the Covid-19 pandemic, the news was still dominated by health and economic news.

The next analysis and calculation are carried out on the performance data of producers in the news television editorial, where the data in the period I and period II are used to calculate the probability value, with the results as in the following table 12.

Table 12 Calculate the probability value.

Producer	Period II				
Period I	**Yopiandi**	**Amalia**	**Riko**	**Meirita**	**Woro**
Yopiandi	0.583333	0.166667	0.125	0.083333	0.041667
Amalia	0.210526	0.473684	0.105263	0.105263	0.105263
Riko	0.307692	0.153846	0.538462	0	0
Meirita	0.222222	0.277778	0.166667	0.222222	0.111111
Woro	0	0	0.083333	0.166667	0.75

The results of the table 12 above can be rewritten in the form of the P1 matrix for the producer performance trends as follows:

$$p^1 = \begin{bmatrix} 0.583333 & 0.166667 & 0.125 & 0.083333 & 0.041667 \\ 0.210526 & 0.473684 & 0.105263 & 0.105263 & 0.105263 \\ 0.307692 & 0.153846 & 0.538462 & 0 & 0 \\ 0.222222 & 0.277778 & 0.166667 & 0.222222 & 0.111111 \\ 0 & 0 & 0.083333 & 0.166667 & 0.75 \end{bmatrix}$$

And to determine the performance trend of producers in the future, calculations are made to find out the value of P2 is as follows:

$$p^2 = p^1 \times p^1 = \begin{bmatrix} 0.583333 & 0.166667 & 0.125 & 0.083333 & 0.041667 \\ 0.210526 & 0.473684 & 0.105263 & 0.105263 & 0.105263 \\ 0.307692 & 0.153846 & 0.538462 & 0 & 0 \\ 0.222222 & 0.277778 & 0.166667 & 0.222222 & 0.111111 \\ 0 & 0 & 0.083333 & 0.166667 & 0.75 \end{bmatrix} \begin{bmatrix} 0.583333 & 0.166667 & 0.125 & 0.083333 & 0.041667 \\ 0.210526 & 0.473684 & 0.105263 & 0.105263 & 0.105263 \\ 0.307692 & 0.153846 & 0.538462 & 0 & 0 \\ 0.222222 & 0.277778 & 0.166667 & 0.222222 & 0.111111 \\ 0 & 0 & 0.083333 & 0.166667 & 0.75 \end{bmatrix}$$

$$p^2 = \begin{bmatrix} 0.432345 & 0.218549 & 0.175129 & 0.091618 & 0.082359 \\ 0.27831 & 0.304898 & 0.159173 & 0.108341 & 0.149277 \\ 0.377556 & 0.206997 & 0.344597 & 0.041835 & 0.029015 \\ 0.288774 & 0.255986 & 0.193058 & 0.115659 & 0.146524 \\ 0.062678 & 0.059117 & 0.135149 & 0.162037 & 0.581019 \end{bmatrix}$$

The results of the calculation of the P2 matrix show that in the future the performance of Yopiandi producers will be maintained at 43.23 percent, followed by producer Riko with 34.45 percent for fixed performance, and Amalia with 30.48 percent for stability.

The next analysis and calculation are carried out on the performance data of television news reporters, where the data is in the period I and period II is used to calculate the probability value, with the results as shown in the following table.

Table 13 The performance data of television news reporters.

Reporter	Period II				
Period I	**Maedop**	**Audrey**	**Sofyan**	**Pieter**	**Cindi**
Maedop	0.5	0.227273	0.090909	0.136364	0.045455
Audrey	0.2	0.25	0.25	0.1	0.2
Sofyan	0.133333	0.066667	0.8	0	0
Pieter	0.25	0.125	0	0.5625	0.0625
Cindi	0.076923	0.307692	0.076923	0.076923	0.461538

The results of the table 13 above can be rewritten in the form of a P1 matrix for the trend of reporter performance as follows.

$$p^1 = \begin{bmatrix} 0.5 & 0.227273 & 0.090909 & 0.136364 & 0.045455 \\ 0.2 & 0.25 & 0.25 & 0.1 & 0.2 \\ 0.133333 & 0.066667 & 0.8 & 0 & 0 \\ 0.25 & 0.125 & 0 & 0.5625 & 0.0625 \\ 0.076923 & 0.307692 & 0.076923 & 0.076923 & 0.461538 \end{bmatrix}$$

And to determine the trend of the reporter's performance in the future, calculations are made to determine the value from P2 as follows:

$$p^2 = p^1 \times p^1 = \begin{bmatrix} 0.5 & 0.227273 & 0.090909 & 0.136364 & 0.045455 \\ 0.2 & 0.25 & 0.25 & 0.1 & 0.2 \\ 0.133333 & 0.066667 & 0.8 & 0 & 0 \\ 0.25 & 0.125 & 0 & 0.5625 & 0.0625 \\ 0.076923 & 0.307692 & 0.076923 & 0.076923 & 0.461538 \end{bmatrix} \begin{bmatrix} 0.5 & 0.227273 & 0.090909 & 0.136364 & 0.045455 \\ 0.2 & 0.25 & 0.25 & 0.1 & 0.2 \\ 0.133333 & 0.066667 & 0.8 & 0 & 0 \\ 0.25 & 0.125 & 0 & 0.5625 & 0.0625 \\ 0.076923 & 0.307692 & 0.076923 & 0.076923 & 0.461538 \end{bmatrix}$$

$$P^2 = \begin{bmatrix} 0.345163 & 0.207547 & 0.178496 & 0.171111 & 0.097684 \\ 0.223718 & 0.19866 & 0.296066 & 0.123907 & 0.157649 \\ 0.186666 & 0.100303 & 0.668788 & 0.024849 & 0.019394 \\ 0.295433 & 0.177612 & 0.058785 & 0.367805 & 0.100366 \\ 0.16499 & 0.251161 & 0.180957 & 0.120031 & 0.28286 \end{bmatrix}$$

The results of the calculation of the matrix P2 above show that in the future the performance of the reporter Sofyan maintained the highest at 66.87 percent, followed by Pieter 36.78, and Maedop 34.51 percent.

The next analysis and calculation are carried out on the cameraman performance data, which is the data for the period I and period II is used to calculate the probability value, with the results as in the following table.

Table 14 Analysis and calculation are carried out on the cameraman performance data.

Cameraman	Period II				
Period I	Damian	Bagus	Wisnu	Joidy	Arief
Damian	0.296296	0.37037	0.148148	0.111111	0.074074
Bagus	0.235294	0.352941	0.176471	0.176471	0.058824
Wisnu	0.2	0.133333	0.6	0	0.066667
Joidy	0.266667	0.066667	0.066667	0.6	0
Arief	0.083333	0	0	0	0.916667

The results of the table above can be rewritten in the form of a matrix P1 for the trend of cameraman performance as follows.

$$p^1 = \begin{bmatrix} 0.296296 & 0.37037 & 0.148148 & 0.111111 & 0.074074 \\ 0.235294 & 0.352941 & 0.176471 & 0.176471 & 0.058824 \\ 0.2 & 0.133333 & 0.6 & 0 & 0.066667 \\ 0.266667 & 0.066667 & 0.066667 & 0.6 & 0 \\ 0.083333 & 0 & 0 & 0 & 0.916667 \end{bmatrix}$$

And to determine the trend of cameraman performance in the future, calculations are made to find out the value of P2 is as follows:

$$P^2 = P^1_T P^1 = \begin{pmatrix} \ldots \end{pmatrix} \begin{pmatrix} \ldots \end{pmatrix} \qquad P^2 = \begin{pmatrix} 0.240369 & 0.267618 & 0.205551 & 0.164948 & 0.121512 \\ 0.240017 & 0.247007 & 0.21479 & 0.19431 & 0.103877 \\ 0.216187 & 0.201132 & 0.413159 & 0.045752 & 0.12377 \\ 0.268032 & 0.171184 & 0.131271 & 0.401394 & 0.028119 \\ 0.10108 & 0.030864 & 0.012346 & 0.009259 & 0.846451 \end{pmatrix}$$

The results of the calculation of the P2 matrix above show that in the future the performance of Arief's cameraman the highest was 84.64 percent, followed by Wisnu with 41.31 percent, and Joidy at 40.13 percent.

4. Conclusion

Based on the results of this data warehouse research, the following conclusions can be drawn: 1. Initial implementation of a data warehouse to support television editorial decisions in Indonesia has been completed well, where Initial implementation this time was carried out at the Kompas TV editorial team, specifically collecting and processing performance data and news Kompas TV. 2. The results of the completed data warehouse can show the news trend in television editors where health news in particular the problem of the coronavirus or covid-19 occupies the highest position in the news, followed by economic and legal news which is if traced further still in the unity with health news. This result can be used by the chief editor of television to make strategic decisions regarding television coverage. 3. The output from the television editorial data warehouse is also able to show the editorial team the best performance, starting from the best reporters, the best cameraman, to the best performing producer. These results can be input for the management or the chief editor of television to make decisions regarding career development and promotion.

This research can still be continued by developing data visualization related to television news coverage, especially the application of machine learning that reads and classifies news texts and also the application of business intelligence in television editors. Study and testing The initial implementation of this data warehouse also needs to be done to ensure that the data warehouse that is built is more appropriate with the needs and challenges faced by television editors.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declares that there is no conflict of interest in their research study.

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