

Data Visualization of Research Publications of IIB Darmajaya Lecturers

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Abstract—Data visualization is now very important to understand data and can be used for decision making. Effective visualization assists users in analyzing and reasoning about data and makes complex data accessible, understandable and useful. Users can perform analysis, such as making comparisons or understanding causality. The Indonesian government has upgraded the status of the IIB Darmajaya Research Institute so that it must increase its publications. IIB Darmajaya currently requires a system to determine the achievements of lecturers' research publications in data visualization. Visualization tools are increasingly being used, such as Microsoft Power BI, Google Chart, Tableau, Zoho Analytics, Datawrapper, Infogram, Google Data Studio, and others. Currently, Google Data Studio is increasingly being used since its release in 2016. Google Data Studio allows developers to easily visualize data without having to be a data scientist. IIB Darmajaya currently does not have a system to visualize published research publication data. This study uses Google Data Studio in developing a data visualization system for lecturer research publications that have been published on Scopus, Google Scholar, and Web of Science (WOS). The steps taken in this research are requirements analysis, collecting data, preparing data, and implementation. This study succeeded in developing a data visualization system for lecturer research publications for IIB Darmajaya and is expected to be a source of information on current achievements and a reference for future decision making.

Keywords— data visualization, google data studio, research publications

I. INTRODUCTION

Institut Informatika dan Bisnis (IIB) Darmajaya is a private university in Lampung Province, Indonesia, founded in 1995 under the Alfian Husin Education Foundation. Currently IIB Darmajaya has two faculties, Computer Science and Business Economics, with nine departments.

Research publication is very important for a university. Until now, all lecturers and students of IIB Darmajaya have been encouraged to increase research publications. Moreover, with the increase in the status of LP4M IIB Darmajaya as the first in the middle cluster region II in 2015,

of course it must be balanced with an increase in research activities.

Currently, data is needed to be processed into information so that it can be used for decision making. Data visualization can help to understand the data and gain insight from the data[1]. Visualization tools are increasingly being used, such as Microsoft Power BI, Google Chart, Tableau, Zoho Analytics, Datawrapper, Infogram, Google Data Studio, and others. Currently, Google Data Studio is increasingly being used since its release in 2016. Google Data Studio allows developers to easily visualize data without having to be a data scientist. IIB Darmajaya currently does not have a place to visualize published lecturer research publication data. In this study, it is proposed to design a data visualization system for lecturer research publications, so that it is expected to be a reference by IIB Darmajaya. The data visualization used in this study must be used interactively, making it easier for readers to understand the visualization and obtain new information from the data visualization [2]. Lecturer research publication data collected is lecturer research publication data published on Scopus, Google Scholar, and Web of Science (WOS).

II. METHODOLOGY

The methodology in this study is as follows:

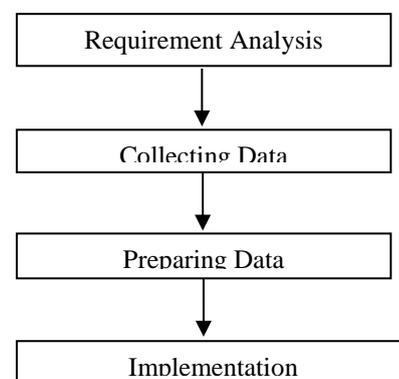


Fig. 1 Research methodology

A. Requirement Analysis

The first stage in this research is to analyze the needs of IIB Darmajaya for the data visualization system that will be created. At this stage, a review of some of the literature is also carried out to support the research.

B. Collecting Data

At this stage, data collection can be carried out from several sources, from Scopus Author searches, Google Scholar profiles, and Author searches on the Sinta RISTEK-BRIN website [3]. However, in this study, data was collected from the Sinta portal only, because this portal became a reference for the achievement of lecturer publications. The data collected is the number of research publications by IIB Darmajaya lecturers in the last 5 years at Scopus, Google Scholar, and Web of Science (WOS).

Then data was collected on the educational history of IIB Darmajaya lecturers from the university database website of the Indonesian Ministry of Education and Culture. The educational history of IIB Darmajaya lecturers collected is Bachelor, Master, and Doctor Education.

C. Preparing Data

Data preparation is carried out to facilitate the implementation of the data source needed for the development of data visualization reports on Google Data Studio. Many data sources are supported by Google Data Studio, CSV files, Google Sheets, and from other data sources with connector support. In this study, the data that has been obtained is immediately recorded in Google Sheets.

D. Implementation

After the data has been prepared in Google Sheets, it is then retrieved as a data source in Google Data Studio. At this stage, a dashboard is developed that contains reports on data visualization of lecturers' research publications and educational history of IIB Darmajaya lecturers. The dashboard is developed with the appropriate selection of graphs and also features filters to make reports more interactive.

III. RESULTS

The results of this study are several visualizations with Google Data Studio from the research publication data of IIB Darmajaya lecturers. Several types of charts used in Google Data Studio are scorecards, pie charts, bar charts, bubble maps, and tables, plus filter controls.

A. Dashboard Page

The dashboard page first displays filters and a scorecard that displays documents indexed by Scopus, Google Scholar, and Web of Science (Fig. 2). In data visualization published online, it should be used interactively, so that users can explore a lot of data visualization data information[2].



Fig. 2. Scorecard Scopus, Google Scholar, and Web of Science

The scorecard displays the total number of documents indexed by Scopus, Google Scholar, and Web of Science.

The scorecard also displays a breakdown based on the number of journals and conferences indexed.

Furthermore, the dashboard page displays a donut chart of publications by lecturers after the scorecard. Pie charts are used to make it easier for users to compare data in each cluster [4]. Donut chart is a modern form of pie chart that is used to display comparisons [5]. On this page the donut chart is used to display a comparison of total publications.

The first donut chart only shows 9 lecturers and 1 combination of other lecturers, so there are 10 slices on this donut chart. The second donut chart shows a comparison of publications per department.

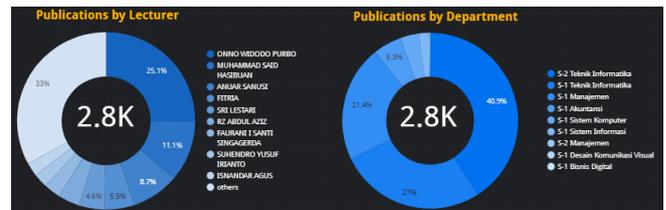


Fig. 3 Publication by Lecturer

In the donut chart above, a sequential color palette is applied. This sequential color palette is suitable for describing the range of sequential data from low to high or vice versa, by applying bright colors for low values and dark ones for high values [6].

The dashboard also displays a bar chart with a column chart type in Google Data Studio. This bar chart displays data on 10 lecturers with the number of publications with details of journals and conferences. The following is a data visualization for documents indexed by Scopus, Google Scholar, and Web of Science in Fig. 4 with a horizontal bar chart.

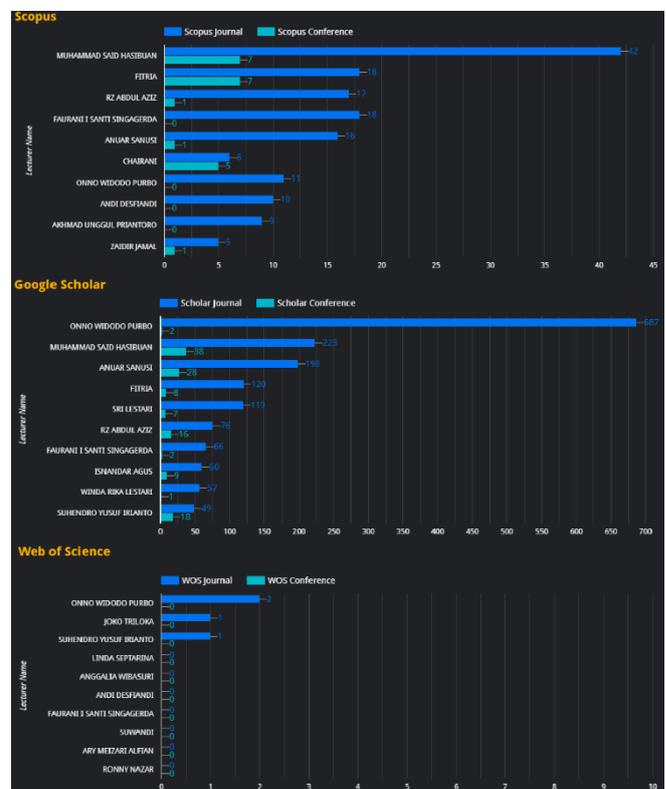


Fig. 4 Scopus, Google Scholar, and Web of Science (Horizontal Bar Chart)

The three bar charts above visualize the comparison between journal documents and conference documents for each lecturer. Vertical bar charts are usually used to display distribution by category[7]. In this study, a comparison was made with the vertical bar chart in Fig. 5 below.

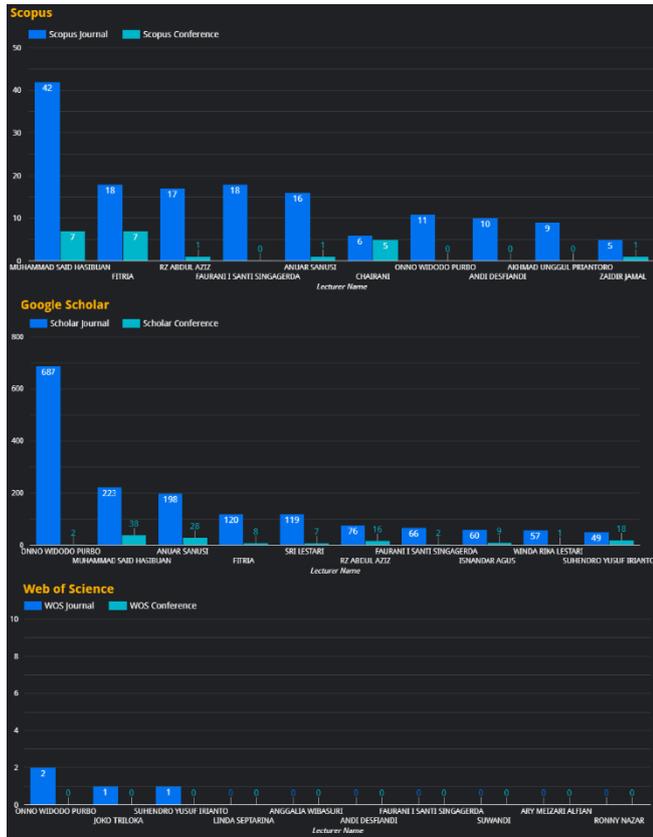


Fig. 5. Scopus, Google Scholar, and Web of Science (Vertical Bar Chart)

In this study finally implemented a vertical bar chart, because vertical bar charts look easy to understand when showing comparisons, while horizontal bar charts are more difficult to understand in displaying comparisons, because the bars look small.

The last part of the dashboard page displays a table that displays detailed data by type, journal and conference, for each document.

| Lecturer Name | Scholar Journal | Scholar Confer... | Scopus Journal | Scopus Confer... | WOS Journal | WOS Conference |
|--------------------------|-----------------|-------------------|----------------|------------------|-------------|----------------|
| 1. MUHAMMAD SAID HASBIAN | 223 | 38 | 42 | 7 | 0 | 0 |
| 2. ANUAR SANUSI | 198 | 28 | 16 | 1 | 0 | 0 |
| 3. SUITEDE | 10 | 19 | 3 | 0 | 0 | 0 |
| 4. NURFANA | 20 | 19 | 0 | 0 | 0 | 0 |
| 5. SUHENDRO YUSUF BRANTO | 49 | 18 | 4 | 0 | 1 | 0 |
| 6. RZ ABDUL AZIZ | 76 | 16 | 17 | 1 | 0 | 0 |
| 7. BELLI MARSA | 16 | 11 | 0 | 0 | 0 | 0 |
| 8. ANIK BRHWATI | 11 | 11 | 11 | 0 | 0 | 0 |
| 9. ISMAANDAR AGUS | 60 | 9 | 0 | 0 | 0 | 0 |
| 10. SURATNO | 7 | 9 | 0 | 0 | 0 | 0 |
| 11. PEPE FITRA | 0 | 0 | 0 | 0 | 0 | 0 |

Fig. 6. Publication type by lecturer

Unlike the bar chart used previously, this table is combined with a bar chart so that all data can be displayed. To summarize the view, pagination and scrollbars can be applied.

B. Scopus Page

On the Scopus page, it begins by displaying filters and bar charts for distribution of the top 10 lecturers' publications, detailed for journals and conferences.

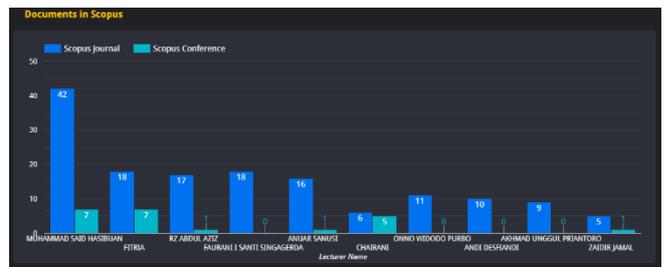


Fig. 7. Document by Scopus

Then display document publications per year: <= 2017, 2018, 2019, 2020, and 2021, using a bar chart.

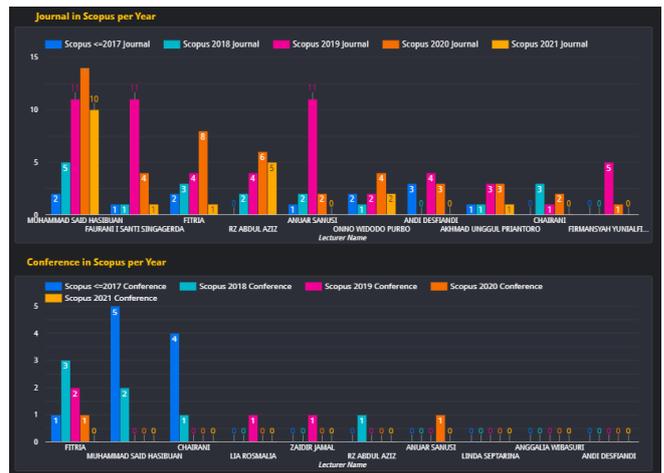


Fig. 8. Scopus per year

Then the last part of the Scopus page displays a table for the total number of Scopus documents by department and lecturer.



Fig. 9. Scopus by department and lecturer

In this section, we do not use a horizontal bar chart, because this table can display all data with the pagination feature, while the bar chart does not have a pagination feature.

C. Google Scholar Page

On the Google Scholar page, it is the same as on the Scopus page, which begins with a filter and a bar chart of the total documents published on Google Scholar. The filters on this page are filters based on department and lecturer name.



Fig. 10. Documents in Google Scholar

Furthermore, the publication of documents on Google Scholar per year is displayed.

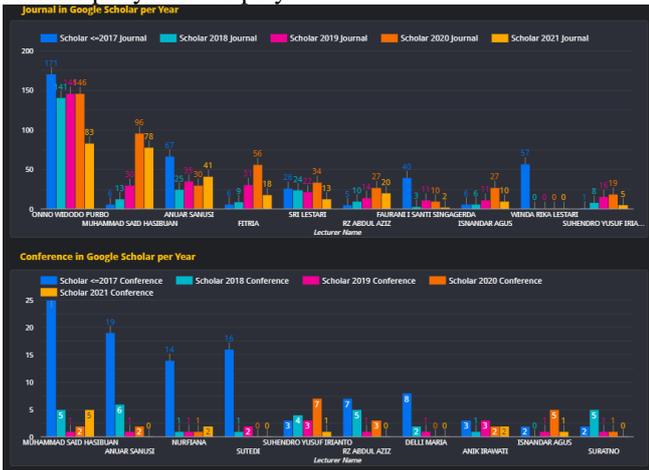


Fig. 11. Google Scholar per year

The final section of the Google Scholar page displays a table with a bar chart to display total Google Scholar documents by department and faculty.



Fig. 12. Google Scholar by department and lecturer

D. Web of Science Page

The Web of Science page displays the same visualization as on the Scopus page and the Google Scholar page. However, in this study only 4 documents were found, so there is no need to display further.

E. Education History

On the education history page, it begins with the filter and scorecard features displayed. The filter features applied to this page are department, bachelor, master, and doctoral. The scorecard displays the number of lecturers and departments displayed on this page.

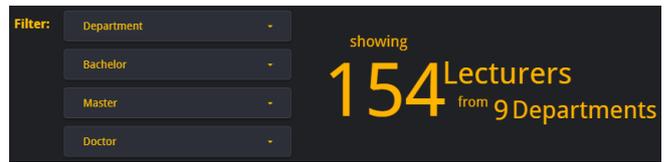


Fig. 13. Filters on Education History Page

Then below it displays the names of lecturers along with the name of the bachelor level university and can be scrolled to see other lecturer data.

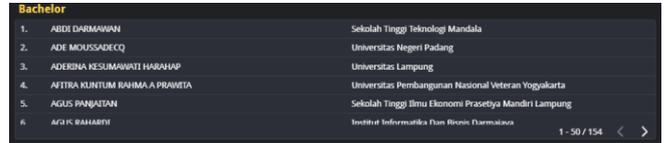


Fig. 14. Bachelor table

Then below it displays a bubble map and a bar chart table below it.

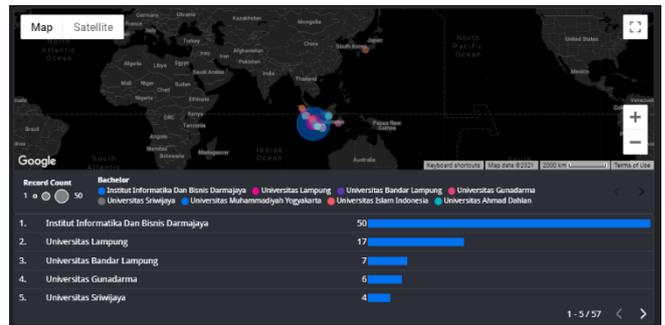


Fig. 15. Bubble map bachelor

Then below it is continued by displaying the same visualization for Master and Doctor as in Bachelor.

IV. CONCLUSIONS

In this study, a data visualization system for research publications by IIB Darmajaya lecturers has been successfully designed using Google Data Studio. This data visualization system with Google Data Studio uses data sources stored in Google Sheets. Data is collected from SINTA, Scopus, and Google Scholar sites.

A visualization system has been successfully designed using filters with dropdown list and chart controls, namely tables, bar chart tables, bar charts, pie charts, and bubble maps. Tables and table bar charts to display data and add the number of document data, bar charts to display the distribution of document data, pie charts to display comparisons of total documents, and bubble maps to display university locations.

However, in this study there are still some shortcomings that are expected to be considered in future research. In this study, we have not used other types of visualization, either other visualizations from Google or visualizations made by the community. This research also does not include data visualization for document citation. Visualization with a bubble map found deficiencies in determining geo location, namely the name of the university is used as the geolocation specified as the address, some do not show the appropriate location. So it is necessary to consider adding the name of the city or coordinates.

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