Data Visualization of Lecturer of Digital Business Study Program Darmajaya Institute of Informatics and Business

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Abstract—**Digital Business Study Program is a study program that was born in 2019 from the Faculty of Economics at the Darmajaya Institute of Informatics and Business (IIB Darmajaya). This study program is the most favorite study program at FEB IIB Darmajaya, which of course must be balanced with the many researches carried out by lecturers and students. The efforts of the Darmajaya Institute of Informatics and Business (IIB) to improve the research culture certainly have a very positive impact on the Institute and researchers. Data related to research conducted by lecturers who are currently presented separately on several websites such as Scopus, Web of Science (WOS) and Google Scholar will make it difficult for various parties who want to use data related to these studies for various purposes. . With the development of Digital Business Studies program, the more research done, so there should be a system that can handle them.Data studio is a tool used to create data visualizations. Therefore, it is very important for the digital business study program to have a system that stores data or information about lecturers in the digital business study program which is presented in the form of data visualization so that the information can be understood in a faster and shorter time because the information is packaged in a variety of formats. Diagrams with attractive colors and shapes.**

Keywords-Data Visualization, IIB Darmajaya, Data Processing, Data Analytics.

I. INTRODUCTION

The Darmajaya Institute of Informatics and Business (IIB Darmajaya) is one of the private universities in the city of Bandar Lampung which has a total of 8 study programs. The Digital Business Study Program is a study program that was just born in 2019 from the Faculty of Economics and Business which is expected to be able to answer the challenges of industry 4.0. This Study Program was established based on the Decree of the Minister of Research, Technology and Higher Education of the Republic of Indonesia Number 743/KPT/I/2019. Although this study program is still relatively new, the Digital Business Study Program has now become the favorite study program from the Faculty of Economics and Business, especially after the

pandemic era where digital technology is increasingly being used by the public and industry players.

The popularity of this Digital Business study program must of course be balanced with the large number of research conducted by lecturers and students which is in line with efforts to improve the research culture at the Darmajaya Institute of Informatics and Business (IIB), especially in the Digital Business Study Program. Lecturers are required to be able to conduct research that can be published annually by meeting international standards.

Data related to research conducted by existing lecturers is presented separately on several websites such as Scopus, Web of Science (WOS) and Google Scholar which is very difficult for those who want to use the research data for various purposes. Such as individual and institutional interests, academic and non-academic. With the continued development of the Digital Business study program, there will be a lot of research conducted from time to time, especially research conducted by study program lecturers, thus the research data will continue to grow.

Dealing with large volumes of data, often leads to confusion and misinterpretation, so visually grouping a lot of data together will significantly improve the quality of analytics and provide many convenient ways for various parties to utilize the data, viewing the data visually will be very helpful in understanding the data and it will be faster to make decisions [1].

A picture can say a thousand words especially when we are trying to understand and find insights from a data. Data visualization is very helpful when we are trying to find relationships among hundreds or even thousands of variables to find the information we need [2]. Data visualization is the same as communicating, the success or failure of the communication process is determined by how the speaker conveys the information given to the interlocutor, a good data visualization is certainly focused,

provides clear answers and is not too detailed [3]. To create meaningful data visuals, several techniques must be considered. When selecting and summarizing data, its size and composition play an important role. Analytical data requires adequate graphical representation and using temporal data, multidimensional data, 2D area plots and hierarchical representations, can show how data can be visualized [2].

In this study, the process of making data visualizations uses the Google Data Studio application, which is a product from Google that can classify research data based on the date of implementation, study program, type, and status of the research. Details of the research can also be known quickly and easily without manual calculations. The results of data visualization are expected to be a solution to existing problems. With data visualization, the available information can be understood quickly because it uses responsive graphs and tables and supports colors. This will save time and energy in data processing, both from the officer who inputs the data and the parties who will use the data and minimizes the possibility of human error because almost all calculations are carried out by software.

II. THEORY BASIS

A. *Dashboard*
Dashboard is a collection of informative components that can be in the form of graphs, analytical reports, scorecards or a combination of all of them. Dashboard is a display computer that is rich with indicators, visual reports and announcements mechanisms are combined into a dynamic information display and relevearly and arranged in a layer so that the information can be accessed easily [4].

1) *Benefits of Dashboards*
Dashboards basically monitor the contributions of various departments within the organization. To monitor the performance of the organization as a whole, the dashboard can report and capture certain data points in each department in the organization or provide an overview of previous performance and comparison with performance current. The benefits of dashboards include:

- Visual presentation of performance measures
- Ability to identify and correct trends negative
- Efficiency /measurements inefficiency
- Showing trends new in generating detailed reports
- Accurate in making decisions based on data collection
- Alignment of organizational strategies and objectives
- Total visibility of all systems
- Instant identification outliers and of correlations data
- Save time with comprehensive data visualization display

2) *Types of Dashboards*
According to Utari (2017) dashboards are grouped into three categories, namely strategic dashboards, tactical dashboards and operational dashboards:

- Strategic Dashboards
  On strategic targets, key *Performance Indicators* (KPIs) and related organizational scales Dashboards at the strategic level of the organizational scale are often lowered to the level departmental, while maintaining alignment with company goals. In monitoring and executing strategies for the progress of the managers involved, they often use strategic dashboards, with data usage periods ranging from 5 years to 10 years in advance [5].

- Tactical Dashboard Tactical
  Dashboard to find out trends related to each strategic initiative and monitor results is a function of using tactical dashboards. Tactical dashboards are also used to monitor projects. Strategic initiatives are measured by comparing the goals and current performance that have been previously set (for example, there are problems and goals to be achieved). Manager involved with individual activities to support the achievement of the strategic objectives the organization is baofgiantactical Dashboard.

- Operational Dashboard
  In events complex, technical activities and to control business processes can use a strategic level dashboard. For operational dashboards, it focuses on real time teams on transactional data. The display layer displays a graphic with the current time. To monitor ongoing activities using the operational dashboard. Responsibilities when using operational dashboard narrower ones (service, customer, sales, etc.) that require robust analysis and detailed information.

Based on the description above, it can be seen that the operational dashboard uses real time data to get precise and accurate information in making and using the dashboard.

B. *Graph*
According to Utari (2007) Diagrams or graphs are pictures that show data visually, based on observed values. The original or from previously created tables. There are several types of graphs or diagrams that can be used to display a clearer picture of information, including [5].

1) *Graphic Diagram*
To determine the trend or trend can use a line chart to show the change in value with time from a series of relative data.

2) *Bar Chart*
To present values relative to the data held, it is more appropriate to use a bar chart.

3) *Bread*
Diagram Bread (pie) diagram is usually used to describe the percentage of data. For example, how many lecturers make journals on Google Scholar? Every year.

C. Key Performance Indicator (KPI)

According to Bernard (2016), key performance indicator (KPI) is an important navigation tool used by managers to understand whether their company is on the way to success or is off the path to success.

The factor that is the key to the success of the organization is that it must have a KPI (Key Performance Indicator) carefully that can reflect important performance for the organization with the company's strategy. To set KPIs and targets to be achieved cannot be carried out by default, but must use systematic and appropriate methods. In determining and setting KPI targets correctly, it will be able to direct the organization with the potential to improve or improve performance so that KPIs are often associated with initiatives related to performance improvement. According to Soemohadiwidjojo, 2015) inappropriate assessment of performance indicators as KPIs can result in inefficient or counterproductive performance measurements. For example, to measure the level of customer satisfaction, the organization sets an indicator in the form of the number of customer complaints received. The fewer customer complaints received, the higher the level of customer satisfaction should be. This is not entirely true because there are very few customer complaints, or customers who will submit complaints cannot access the means of communication provided by the organization.

As one of the main tools of organizational management, the main objectives of determining KPI are as follows:
1)   To link the vision-mission-values, higher education strategy and lecturer performance targets with the activities of the Digital Business study program lecturers to achieve the desired performance goals.
2)   To measure the trend of lecturer performance based on many journals made in the Digital Business study program. Is there a significant increase or decrease.
3)   To compare the performance of lecturers with other lecturers so that the Digital Business study program gets an overview of the performance of the lecturers so that they can easily make decisions and policies.
4)   The results of achieving KPIs become the basis for providing rewards and consequences so that KPIs are also useful for encouraging work motivation and good behavior from employees.

D. Google Data Studio

Google studio is one of google's products as a new data visualization platform for enterprises as part of Google Analytics 360 Suits, google data studio enables users [6]:

1)   *Connect to data sources*
2)   *Create dashboards, custom reports and calculations*
3)   *Collaborate and share with another*

E. Definition of Data Visualization Data

Visualization is seen by society as modern visual communication. Michael Friendly states that data visualization is the science of visual representation of data. It is defined as information that has been abstracted in some schematic form, including characteristics or variables for units of information. This process involves the creation and study of visual representations of data [7]. The main purpose of data visualization is to communicate information clearly and efficiently through statistical graphs, plots, and information graphs. Numerical data can be visualized using dots, lines, or bars, to visually describe quantitative messages [8].

Indeed, Fernanda Viegas and Martin M. Wattenberg have recommended that good visualization should not only communicate explicitly but also increase audience engagement and attention. Data visualization is closely related to graphic information, information visualization, scientific visualization, exploratory data analysis, and statistical graphs. In today's new era, data visualization has become an area of intense research, teaching and development. According to Post, Nielsen, and Bonneau, designers should be able to unify information and scientific visualization [9].

The main purpose of visualization is to facilitate effective and clear communication in a graphical way, so that data visualization is not boring and looks interesting to people who read it.

Meanwhile, data visualization is defined in various ways to create diagrams, images or animations with the aim of communicating information. In general, large amounts of data visualization are then designed with various models to be presented.

F. Design of Information System

● Systems

System is a collection of several elements that are interconnected with one another to form a single unit to carry out a main purpose of the system. To distinguish a system or not, it can be seen from its characteristics that the system is basically complementary, has boundaries, aims, is composed of subsystems, is open and related and depends on forming a systematic unity [10].

● Information

Information is data that has been processed into a form that has meaning for the recipient (Jogiyanto, 2005)". Data is an event or fact that has no meaning. Information is generated from data that is processed into a modal. The quality of information depends on three things, namely: accurate, timely and relevant [11].

● Information System Information

System is an organization in which there is a system within an organization that brings together management and daily transaction needs that support the organization's operational functions with strategic and managerial activities to be able to make reports needed by certain outside parties [12].

G. Characteristics of Big Data

Big data has 2 special characteristics, namely structured, semi-structured, or unstructured data, for example, data in relational databases, bulletin board discussions, and videos

on their respective websites; another trait is data that is internal or external to the organization, for example, messages to after-sales service in one hand. Big data that is managed well will be able to help work towards a better [13].

III. RESEARCH METHODOLOGY

The research method was carried out using several methods according to the design and research tools. The research was conducted in a logical sequence of processes. To determine and achieve goals in solving problems used to visualize data assisted by research methods. The process can be described in the form of a flow that aims to provide a precise, systematic and orderly explanation [14]. The stages of this research can be seen in Figure 1.1
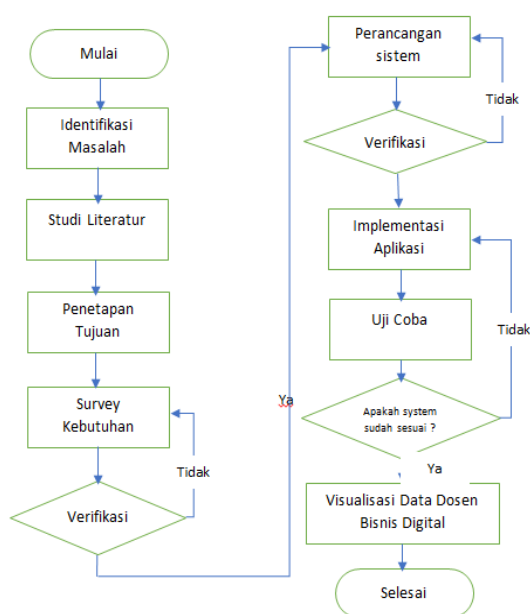
Figure 1 Research Stages The

Following is an explanation of the research methodology:

A. Problem Identification

The initial stage of the research is to conduct a process of assessing problems and understanding problems related to the performance of IIB Darmajaya lecturers. Lecturer performance is related to lecturer biodata which includes education that has been taken by lecturers, graduates from and regional colleges of lecturers and journals that have been made by lecturers to journals that have been made whether they have been published on several media platforms for journal publications such as Google Scholar, Scopus and WOS. As material for could see problems existing in determining dan making the technology into an appropriate application for today's digital era.

B. Literature Study

To support research writing, literature study is needed by collecting information according to related research topics. Sources of information can be taken from presentation documents, books, research journals and other sources obtained from several sources that can be offline or online [15]. The literature study stage is a series of learning processes related to all the methods used in making assignments. Learning is done by looking for a reference source and references that are relevant to the case study [16]. Literature can be used and obtained from a number of accredited papers and journals, e-books, and theses, as well as reading sources on the internet. The important thing to do at this stage is to learn mapping visualization technology. Mapping visualization is a state of mapping and analysis of everything that is an attribute of the performance of IIB Darmajaya lecturers. Many things that must be learned from visualization can be used to open data, store data, process graphical data into information that is easy to understand [17].

C. Setting Goals

At this stage how to set the goals of the application to be made by looking at the identification of the problems contained in the previous step. By setting the right goals, it can help direct the benefits that will be obtained from making a data visualization application for the performance of lecturers of IIB Darmajaya Digital Business Study Program.

D. Needs Survey (data obtained)

This stage takes data about Lecturers of IIB Darmajaya Digital Business Study Program which will be developed in the process of making applications in the form sheets of lecturer data covering education level, place of education, geography and journal searches made by lecturers from various platforms including No google scholar,Scopus and WOS.

E. Verification

This stage is an examination stage that is carried out carefully whether the data obtained is correct and appropriate to be used as an application for visualizing the performance data of the lecturers of IIB Darmajaya Digital Business Study Program.

F. System Design The

Next stage of system design is divided into several stages carried out during the design process system:
1) *Creating SystemAn*
Architecture Architecture that will be made to describe the business process design regarding the Lecturer Performance Visualization workflow that will be designed before heading to the application implementation stage.
2) *Creating aGUI design Storyboard*
GUI Storyboard describes the appearance of the design of the system to meet user requirements.

G. Validation

The validation process is carried out to check the results of the designs compiled based on the data obtained which are useful for the implementation of the performance visualization application for the lecturers of IIB Darmajaya Digital Business Study Program.

H. Application Implementation

The stage implementation applications will begin when the requirements have been met. This process will use digital business lecturer datasheets to build digital business lecturer data visualizations using google studio as an application used to create digital business lecturer data visualizations.

I. Trial

Testing is carried out on a functional and non-functional basis to find out the whole system based on if something goes wrong in the application it will return to the stage development and then a trial will be carried out again.

IV. IMPLEMENTATION

At this stage is the implementation of digital business study program data that has been made in excel form which is stored in the spreadsheets application. Then the data is imported into the data studio application to be presented in the form of a visualization. The following is a visualization display of digital business study programs using data studio.

A. Digital Business Study Program menu dashboard

In the picture above, the digital business study program menu dashboard is presented in the form of visualization, we can see information on the number of lecturers, educational history, and number of papers, number of lecturer papers, and a button to see the number of each paper per year, the title of the paper.
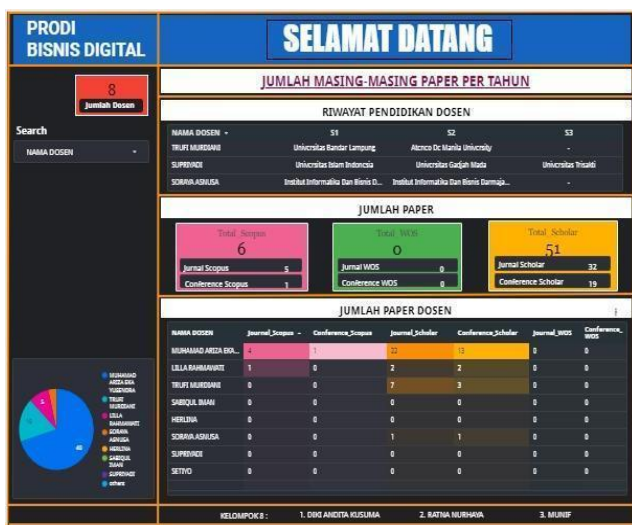

Figure 2 digital study program dashboard menu

1) Dropdown list of lecturer names the

Drop-down list of lecturer names is used to display the names of digital business study program lecturers. The field taken is the lecturer's name field, and through this button we can see the details of the lecturers one by one about their educational history, the number of Scopus indexed papers, WOS and Scholars.
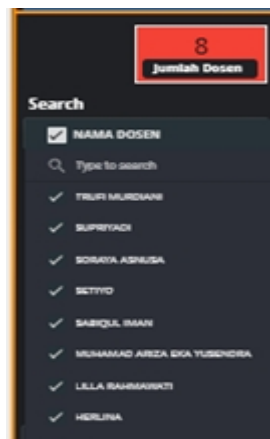

Figure 3 Dropdown list of lecturers' names Lecturer

2) History lecturer history

The Chart is used to view the education history of the lecturers starting from the history of undergraduate education, master's education, and doctoral education.

Figure 4 Chart table of lecturers' history

3) Scorecard number of papers

Scorecard number of papers is used to see the total papers indexed by Scopus, WOS, and Scholar. And each also presented the number of types of paper categorized as journals or categorized as conferences.
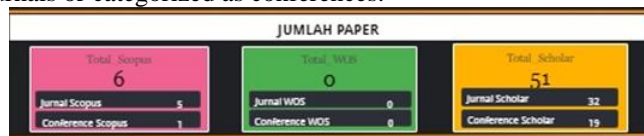

Figure 5 Scorecard number of papers

4) Chart table number of lecturer papers

Chart table number of papers is used to see the number of types of paper categorized as journals or categorized as conference based on the name of the lecturer.

Figure 6 Chart table for the number of lecturers' papers.

5) Pie chart the pie

A chart is used to display the total number of papers from each lecturer and the most dominant color is the largest number of papers.

Figure 7 PieChart

6) *Paper Per year*

Used to display Scopus, WOS, and Scholar indexed papers, and the type of paper included in the journal or entered into the conference based on the year and the name of the lecturer.

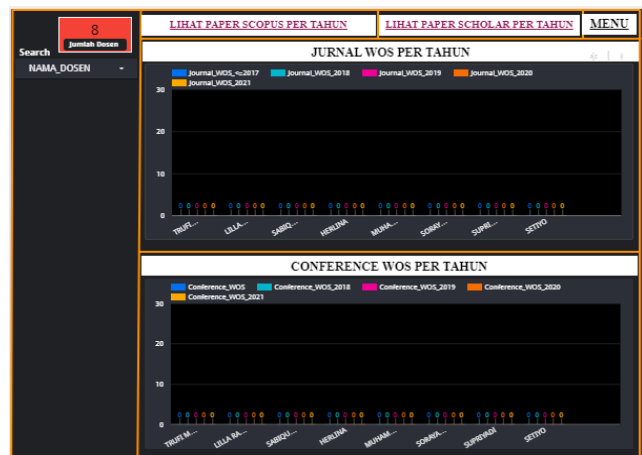Figure 8 the number of papers per year indexed by Scopus

Figure 9 the number of papers per year indexed by scholar

Figure 10 the number of papers per year indexed scholar

7) *Paper title*

Used to display the paper title of each lecturer which we can filter using the year of paper, paper (Scopus/WOS/Scholar), type of paper, and author's name.

Figure 11 Scopus indexed paper titles, WOS, scholar

V.   CONCLUSIONS AND SUGGESTIONS

A. Conclusion

Digital business study program is one of the study programs in the business economics faculty at the Darmajaya Institute of Informatics and Business (IIB). The digital business study program is a study program that studies several sciences ranging from management science, business and information technology 4.0 where the development of business models is carried out online. Data or information about lecturers who teach in digital business study programs is very important as monitoring material.

In this study, data visualization of digital business study program lecturers at the Darmajaya Institute of Informatics and Business which includes the number of lecturers, the names of the lecturers, the educational history of the lecturers (S1, S2, and S3), the number of Scopus indexed papers, WOS, and scholars, and we can looking for the title of each lecturer's paper in the last five years, so that by presenting the data visually, the information can be understood in a faster and shorter time because the information is packaged in various diagrams with attractive colors and shapes.

B. Suggestion

1) Visualization of digital business study study data only displays papers of the last 5 years, so data for digital business study study lecturers who are under 5 years old are not available.

2) The data visualization that the researchers did was limited to digital business study programs, so that data visualization of various study programs at the Darmajaya Institute of Informatics and Business could be developed.

REFERENCES

[1] AS Syed Fiaz, N. Asha, D. Sumathi, and AS Syed Navaz, "Visualization: Enhancing big data more adaptable and valuable," *Int. J. Appl. eng. res.*, vol. 11, no. 4, pp. 2801–2804, 2016.

[2] R. Toasa, M. Maximiano, C. Reis, and D. Guevara, "Data visualization techniques for real-time information - A custom and dynamic dashboard for analyzing surveys' results," *Iber. conf. inf. syst. Technol. cist.*, vol. 2018-June, pp. 1–7, 2018, doi:10.23919/CISTI.2018.8398641.

[3] N. Ahmad Syaripul and A. Mukharil Bachtiar, "Interactive Data Visualization of Open Data for DKI Jakarta Provincial Government: Topics of Regional Economy and Finance," *J. Sist. inf.*, vol. 12, pp. 15–29, 2016.

[4] FM Aditya, "Designing Dashboards as Decision Support Based on Queue Data in Antribos Applications (Case Study: Its Medical Center)," p. 111, 2018.

[5] 127-133. Arciniegas Paspuel, OG, lvarez Hernández, SR, Castro Morales, LG, & Maldonado Gudiño, CW (2021). Emotional intelligence en estudiantes de la Universidad Autónoma de Los Andes. Revista Conrado, 17(78), "No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関するTitle, "p. 6, 2021.

[6] D. Fernando, "Data Visualization Using Google Data Studio," *Natl. Semin. inf. Technol. eng.*, vol. 1, no. November, pp. 71–77, 2018, [Online]. Available: https://e-jurnal.lppmunsera.org/index.php/snartisi/issue/view/100.

[7] M. Friendly and DJ Denis, "Milestones in the History of Thematic Cartography, Data Visualization," no. January 2001, 2009, [Online]. Available: http://www.math.yorku.ca/SCS/Gallery/milestone/%0Ahttp://datavis.ca/milestones/.

[8] S. Few, "Selecting the Right Graph for Your Message," *Intell. Percept. Edge*, vol. 7, no. 14, p. 35, 2004, [Online]. Available: http://www.perceptualedge.com/articles/ie/the_right_graph.pdf.

[9] GM Nielson, "DATA VISUALIZATION: THE STATE OF THE ART Proceedings of the 4th Dagstuhl Seminar on Scientific Visualization CD-ROM," *Art Springer*, no. February, 2002.

[10] H. Nopriandi, "Student Registration Information System Design," *J. Teknol. Dan Open Source*, vol. 1, no. 1, pp. 73–79, 2018, doi:10.36378/jtos.v1i1.1.

[11] M. Susanti, "Web-Based Academics," *J. Inform.*, vol. 3, no. 1, pp. 91–99, 2016, [Online]. Available: http://lppm3.bsi.ac.id/jurnal%0ASistem.

[12] Y. Eka and E. Arviana, "Information System of Service Revenue at PDAM Tirta Patriot Bekasi Cooperative," *J. Tek. computer. AMIK BSI*, vol. 4, no. 1, pp. 1–8, 2018, [Online]. Available: https://ejournal.bsi.ac.id/ejurnal/index.php/jtk/article/view/2377.

[13] B. Tutorial and D. Brookshier, "About the Tutorial," pp. 327–328, 2000.

[14] A. & N. Achmadi, "Theory of Research Methodology," vol. pp. 1–21, 2011.

[15] S. Pomalingo, B. Sugiantoro, and Y. Prayudi, "Data Visualization as Support for Social Media Investigations," *Ilk. J. Ilm.*, vol. 11, no. 2, pp. 143–151, 2019, doi:10.33096/ilkom.v11i2.443.143-151.

[16] P. Compilation and S. Literatur, "MANUAL FOR THE STUDY OF LITERATURE COMPLETED BY: Wala Erpurini." .

[17] Y. Afiyanti, "Use of Literature in Qualitative Research," *J. Nursing Indonesia.*, vol. 9, no. 1, pp. 2003–2006, 2014, doi:10.7454/jki.v9i1.157.