

Dashboard-Based Tourism Data Visualization In Jambi Province Using The Seven Stages Of Visualizing Data

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ABSTRACT

Tourism is recognized as a global and national priority sector, holding significant development potential in Jambi Province, supported by its rich natural and cultural heritage. Effective development strategies fundamentally rely on the availability of accurate, accessible, and informative data. Although the Jambi Open Data Website has presented a tourism dashboard, observations indicate that the visualizations are statistical in nature, lack comprehensiveness, and fail to present in-depth patterns or trends, thus limiting their utility as a decision-making tool. This study aims to address this analytical gap by developing a more interactive, informative, and analytical tourism data visualization dashboard for Jambi Province using Tableau. The methodological framework employed is Ben Fry's (2008) Seven Stages of Visualizing Data, which systematically integrates data processing and visual design through Acquire, Parse, Filter, Mine, Represent, Refine, and Interact. The successful outcome is the development of three functional dashboards—Tourist and Attraction, Hotel Accommodation, and Tourism Business—which were validated using Black Box Testing. The main findings reveal significant geographic regularities within the province's tourism landscape. While Kerinci Regency records the highest number of attractions, Jambi City overwhelmingly dominates in terms of tourist arrivals, the concentration of hotel infrastructure, and the density of tourism businesses. The Creative Economy sector is predominantly characterized by Culinary and Craft businesses. In conclusion, the systematic application of the Seven Stages framework proved highly effective in producing a valid and analytical system, providing clearer, evidence-based insights into the dynamics of Jambi tourism to support future policy formulation.

INTRODUCTION

Tourism is a globally expanding sector that profoundly interconnects various facets of society, including economic, social, and cultural development, involving diverse community engagement (Bangun Mulia, 2021). As a planned journey undertaken for a specific duration outside one's usual environment (Pebriawan et al., 2023), tourism is a priority sector for many nations, including Indonesia. Rich in natural resources, culture, and customs, Indonesia leverages these assets as primary capital for its tourism industry (Maulana et al., 2020)

Jambi Province possesses significant tourism potential, boasting a wealth of natural sites, culture, and historical locations, such as the Kerinci Seblat National Park and the Muaro Jambi Temple. While the sector experienced a decline in 2020 due to the COVID-19 pandemic (down to 1,903 foreign and 959,134 domestic tourists from 9,506 foreign and 2,047,379 domestic tourists in 2019), post-pandemic recovery saw a substantial increase to 6,678 foreign and 3,267,352 domestic tourists in 2023.

The availability of accurate, accessible data is fundamental for effective tourism development strategies. Data visualization, utilizing elements like diagrams, graphs, and dashboards, is an effective solution to communicate complex information clearly and engagingly to stakeholders (Galahartlambang et al., 2021; Heri Purnadi, 2021). Recognizing this, the Jambi Data & Analytic Center (JDAC), managed by the Provincial Communication and Informatics Agency (Diskominfo) under Governor Regulation No. 28 of 2022 concerning One Data Indonesia at the Provincial Level, developed the Jambi Open Data Website, which includes a tourism dashboard (Open Data Provinsi Jambi, 2025; Adi Saputra et al., 2024).

However, preliminary observation indicates that the existing tourism dashboard has limitations in comprehensive data analysis and visualization. The information presented tends to be static, failing to clearly illustrate underlying patterns, trends, or deep insights into the sector's performance, and lacks explanations regarding the interrelationships between various factors. This static and underexplained presentation limits the dashboard's utility as a decision-making tool. The core problem is the insufficient in-depth analysis of available tourism data—covering visitor arrivals, attraction distribution, and the performance of supporting sectors like accommodation and transportation—and the lack



of integrated Key Performance Indicators (KPIs).

To address these shortcomings, this study aims to develop an improved, interactive, informative, and analytical tourism data visualization dashboard for Jambi Province using Tableau. The development methodology employed is The Seven Stages of Visualizing Data by Ben Fry (2008), which includes *acquire, parse, filter, mine, represent, refine, and interact*. This systematic approach, previously proven effective in generating comprehensive dashboards (Fauzi, 2024; Nurcahyo & Ishak, 2023), is selected for its capability to accurately analyze and visualize tourism data, facilitating clearer pattern identification and richer data exploration. By implementing this method, the resulting dashboard is expected to be analytically meaningful and aesthetically engaging, providing a better understanding of Jambi's tourism dynamics and supporting evidence-based policy formulation.

LITERATURE REVIEW

A Dashboard is a critical tool for visualizing data and information, providing real-time snapshots of key performance indicators (KPIs) to facilitate monitoring and decision-making (Prima Silalahi et al., 2021; Muhammad Amin Sunarhadi et al., 2023). Effective dashboards must be informative, concise, typically fit onto a single screen, and focus on delivering summarized or exceptional information for quick interpretation (Chandra, 2024; William et al., 2024). The broader concept of Data Visualization involves representing complex data in visual forms (charts, diagrams, maps) to enhance human understanding and analysis (Angreini & Supratman, 2021; Sudipa et al., 2023). Good visualization must not mislead or distort the data while maintaining aesthetic appeal and clarity to communicate insights effectively (Wilke, 2020; Waskom, 2021). Tableau is identified as the key software for this project. It is a powerful Business Intelligence (BI) platform known for its user-friendly, drag-and-drop interface, high flexibility in connecting to diverse data sources, and ability to create attractive, interactive visualizations, making complex data analysis accessible to both technical and non-technical users (Saepuloh, 2020; Gittleston, 2023; Marvaro & Samosir, 2021).

The chosen methodology for developing the dashboard is The Seven Stages of Visualizing Data by Ben Fry (2008). This approach provides a systematic and integrated framework that merges data processing and visual design into a single workflow, making no distinction between exploratory and expository tasks. The stages are: Acquire (collecting data), Parse (structuring and cleaning data), Filter (removing irrelevant data), Mine (analyzing for patterns/trends), Represent (selecting the basic visual model), Refine (enhancing visual clarity and aesthetics), and Interact (adding controls for user exploration). This approach is favored over high-level organizational strategies like the Business Intelligence (BI) Roadmap (Wicaksono et al., 2025), as the Seven Stages is more focused and tactical, directly addressing the technical and creative process of producing effective data visualization. Prior research has successfully utilized this method to create interactive and informative dashboards for various domains, including human capital management (Fauzi, 2024), climatology data catalogs (Alhaqqi, 2023), election logistics (Nurcahyo & Ishak, 2023), and education equity (Kerlooza et al., 2021). The final validation of the dashboard will employ Black Box Testing, a method focused on evaluating the functional specifications and expected input/output without knowledge of the internal code, ensuring the system meets customer requirements (Shadiq et al., 2021; Alhaqqi, 2023).

METHOD

The methodology for developing the data visualization dashboard in this study adheres to The Seven Stages of Visualizing Data framework proposed by Ben Fry (2008) By adding pre development stages of pre-research data collection to gain information about the data and post-development stages which is dashboard testing. The following is the research flow framework :

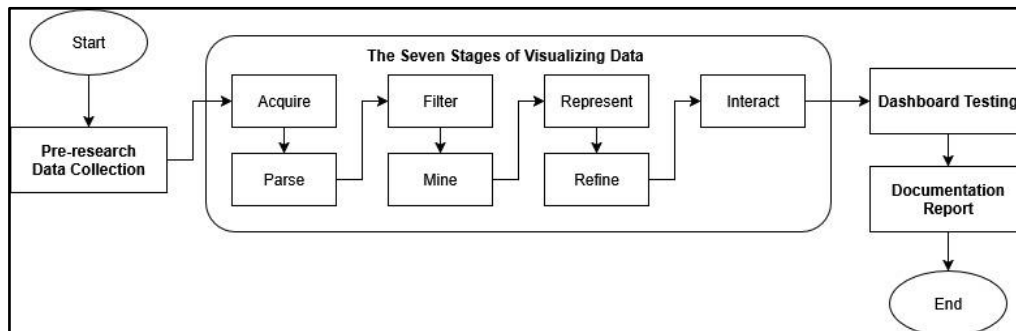


Fig 1. Reseach Flow

Pre-Research Data Collection

This research utilized a comprehensive approach to data collection to ensure the completeness and accuracy of information required for the study. The data collection methods employed were: Interview, Observation, and Literature Study. Interviews were conducted to gather essential information regarding the available datasets at the Jambi Provincial Culture and Tourism Office and the Provincial Communication and Informatics Agency (Diskominfo). The



primary goals were to identify the specific datasets for visualization and to understand the current system and processes involved in data processing, visualization, and the publication of the dashboard results. Observation was carried out to directly gather data, information, and insights into the current operational system and processes. The author specifically observed the mechanism for data visualization and conducted a thorough review of the Jambi Provincial Open Data Website concerning its content and existing tourism data visualizations. This aimed to identify procedural flow and specific issues within the existing dashboard. And finally, The literature study involved collecting data by examining, reading, and compiling information from various written sources relevant to the research topic. These sources, including books, scientific journals, articles, and research reports, provided the theoretical foundation and contextual references for data visualization, dashboard design, and the research methodology (The Seven Stages of Visualizing Data).

Acquire

This initial stage involves data collection. The primary objective is to identify and gather the raw data that is relevant and necessary to address the research questions. This raw data was obtained from the Jambi Province Communication and Information Service.

Parse

The purpose of the Parse stage is to transform the acquired raw data into a structured format that is ready for further processing. This phase includes two key activities: Data Cleansing to identifying and handling data quality issues, such as dealing with missing values (*missing values*), duplicates, inconsistent formats, and initial outliers and Data Structuring which converting the data into a tabular or other appropriate structured format and ensuring that every variable possesses the correct data type (e.g., numerical, categorical, date/time). At this stage, the researcher will clean the data, then the cleaned data will be entered into MySQL via localhost, after which the researcher will design the data type for each column that will be used in Tableau.

Filter

This stage involves data selection or screening. Its objective is to choose the most relevant subset of data for analysis and visualization while reducing noise. This is achieved by establishing logical criteria for including or excluding data, removing identified outliers that are irrelevant to the research question, and Providing justification for the data subsets that have been filtered out. At this stage there is a wireframe design to determine what data will be included in the dashboard. The following is a table of data selection and data visualization in this research.

Table 1. Data Selection

No	Dashboard Name	Data Include
1	Tourist and Tourist Attraction	1. Domestic Tourist Data 2. International Tourist Data 3. Provincial Tourist Attraction Potential Data 4. Data on Jambi Province Tourist Village Destinations According to Development Stage
2	Hotel Accomodation	1. Star-Rated Hotel Data 2. Non-Star-Rated Hotel Data
3	Tourism Businesses	1. Data on Creative Economy Actors in Jambi Province 2. Data on the Tourism Industry in Jambi Province Data on Travel Businesses by Business Type in Jambi Province

At this stage the data that has been entered into MySQL will be connected to Tableau and each table will be connected to each other as in the following image.



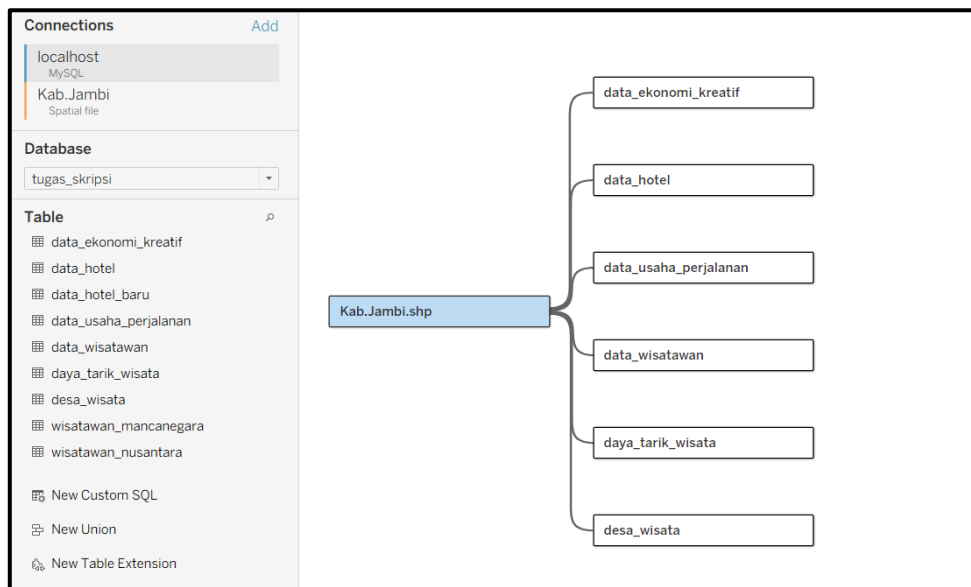


Fig 2. Connection in Tableau Data Source

Mine

The Mine stage is the application of statistical science or data mining methods. The goal is to apply statistical analysis or data mining techniques to discover relevant patterns, trends, relationships, or anomalies within the filtered data. To meet the visualization process requirements, the data to be visualized will undergo a processing stage, namely by creating calculated fields in the data available in Tableau. At this stage, the calculated fields created will then be used to visualize several worksheets within the dashboard being created.

Represent

At this stage, the data that has passed through the *Filter* and *Mine* stages is presented according to the information needs. The objective is to select the most appropriate visual form (e.g., chart or graph type) to effectively convey the findings from the *Mine* stage and answer the research questions. At this stage, a fundamental decision needs to be made regarding the most effective type of visual encoding for presenting the findings. This stage will then focus on creating the worksheet described in the filter stage and also creating a dashboard design. In the research, there are 23 data visualization worksheets in Tableau that will be created in 3 dashboards. Each will be created in several visualization forms, namely horizontal and vertical bar charts, pie charts, donut charts, line charts, symbol maps, simple text, simple tables, and tree maps.

Refine

Refine focuses on improving the visual appearance and graphic design of the dashboard to enhance the data representation. The goal is to increase the clarity, aesthetics, and effectiveness of the visualization, making it easily understandable for the audience. This includes adjusting design elements such as color schemes, fonts, text size, and layout to improve readability and visual appeal, Adding clear annotations and labeling to guide interpretation, removing any visually non-essential or distracting elements (clutter), utilizing visual techniques to emphasize key points, and conducting internal evaluation to identify areas for improvement

Interact

The final stage aims to increase user interactivity within the visualization. The objective is to add interactive functionalities to the visualization, allowing for deeper data exploration by the user. This is achieved by determining the types of interaction that will be most beneficial to the user and developing or configuring the visualization to support the chosen interactions (e.g., dynamic filtering, zooming, hover details)

Testing

Black Box Testing is used as a dashboard testing method to identify whether the created dashboard is interactive, focusing on evaluating the functionality of the dashboard application system used by users. This method provides test scenarios to users to ensure that the required information is fully understood and that no errors occur in the developed dashboard.

RESULT

The research utilized the "Seven Stages of Visualizing Data" method to develop three functional interactive data visualization dashboards for Jambi Province's tourism sector. Three dashboards were developed are the Tourist and Attraction Dashboard, the Hotel Accommodation Dashboard, and the Tourism Business Dashboard.

This section will elaborate on the finding from all three dashboards that were developed using the Seven Stages of Visualizing Data Method about what visualizations have been presented in the dashboard, what interactions can be done in the dashboard and what information can be found in the dashboard.

Tourist and Tourist Attraction

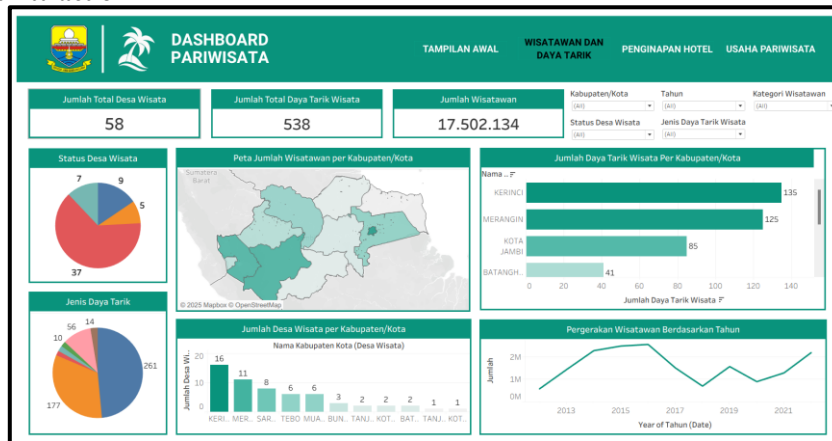


Fig 3. Tourist and Attraction Dashboard

This dashboard provides a comprehensive data visualization related to tourists, tourist attractions and tourist villages spread across Jambi Province. In this dashboard there are several visualizations such as the number of tourists, tourist attraction, and tourism villages, number of tourist attraction by type, number of tourist villages by status, map of number of tourist per regency, number of tourist attraction and villages per regency, and number of tourist each year. This dashboards have five filter cards used to sort data according to selection, namely Regency/City filter, Year filter, Tourist Category filter, Type of Tourist Attraction and Status of Tourist Village. In this dashboards has four navigation used to navigate user from this dashboard into another dashboard accordance to the title, one navigation, the Tourist and Tourist Attraction navigation is used to mark that this dashboards is indeed Tourist and Tourist Attraction Dashboard. The information that can be obtained from this dashboard is a strong positive correlation was identified between the number of tourist attractions/tourism villages and the volume of tourists (2012–2022). Kerinci Regency recorded the highest number of attractions (135) and tourism villages (16). However, the highest tourist arrivals were recorded in Kota Jambi (4.258 million), followed by Merangin (3.189 million) and Kerinci (3.085 million). Conversely, Tanjung Jabung Timur had the lowest number of attractions (13) and tourist arrivals (195,856).

Hotel Accommodation

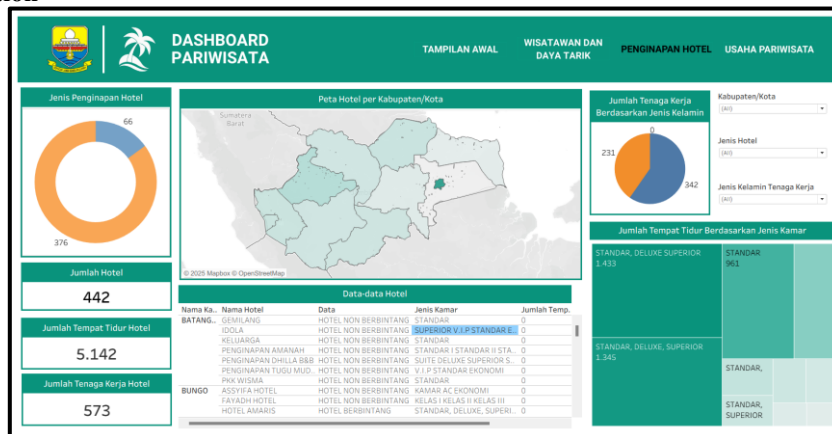


Fig 4. Hotel Accomodation Dashboard

This dashboard provides a comprehensive data visualization related to hotel accomodation spread across Jambi Province. In this dashboard there are several visualizations such as number of hotel, bed, and hotel workers, number of type of hotel, map of the number of hotels per regency, detail information about hotel accomodation, and number of



hotel workers by sex. This dashboards have three filter cards used to sort data according to selection, namely Regency/City filter, Type of Hotel and Gender of Hotel Workers. In this dashboards has four navigation used to navigate user from this dashboard into another dashboard accordance to the title, one navigation, the Hotel Accomodation navigation is used to mark that this dashboards is indeed Hotel Accomodation Dashboard. The information that can be obtained from this dashboard is Jambi Province possesses a total of 442 hotels, of which 66 (14.9%) are starred. Hotel distribution is heavily concentrated in Kota Jambi, which hosts the majority of hotels (196) and all but six of the starred hotels (60 out of 66). Kota Jambi also provides the highest accommodation capacity, with 2,492 beds out of the provincial total of 5,142. Muaro Jambi reported the lowest number of hotels (2).

Tourism Business

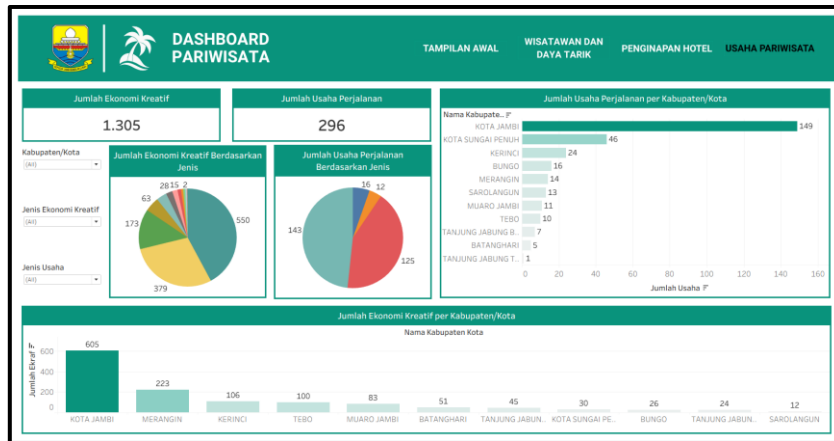


Fig 5. Tourism Business Dashboard

This dashboard provides a comprehensive data visualization related to the tourism business, namely the creative economy and travel businesses. In this dashboard there are several visualization such as numer of creative economy and travel businesses, number of type of creative economy and travel businesses, and number of creative economy and travel businesses each regency in Jambi Province. This dashboards have three filter cards used to sort data according to selection, namely Regency/City filter, Type of Creative Economy and Type of Travel Businesses. In this dashboards has four navigation used to navigate user from this dashboard into another dashboard accordance to the title, one navigation, the Tourism Businesses navigation is used to mark that this dashboards is indeed Tourism Businesses Dashboard. The province records 1,305 Creative Economy Industries and 296 Travel Businesses. The Creative Economy sector is predominantly characterized by Culinary (42.1%) and Craft (29%) businesses, with Application and Visual Communication Design being the least common types. The Travel Business sector is dominated by Transportation services (48.3%). Geographically, Kota Jambi serves as the central hub for both the Creative Economy (605 businesses) and Travel Businesses (149 businesses). Sarolangun had the lowest count of Creative Economy businesses (12), while Tanjung Jabung Timur had the lowest number of Travel Businesses (1).

DISCUSSION

The development of the three interactive data visualization dashboards for Jambi Province's tourism sector—covering Tourist and Attraction, Hotel Accommodation, and Tourism Business—successfully addressed the core problem of the existing static and underexplained dashboard. By systematically applying the Seven Stages of Visualizing Data (Acquire, Parse, Filter, Mine, Represent, Refine, and Interact), the project transformed raw provincial data into analytically meaningful and actionable insights.

The most significant finding is the pronounced geographical imbalance between the supply of tourism assets and the flow of tourist arrivals. While Kerinci Regency boasts the highest number of attractions (135) and tourist villages (16), the highest volume of tourist arrivals is concentrated in Kota Jambi (4.258 million). This correlation, while positive overall, indicates that Kota Jambi functions primarily as the province's tourism gateway and infrastructure hub, as evidenced by its overwhelming share of hotels (196 out of 442) and accommodation capacity. This suggests that tourist flow is heavily influenced by factors outside of the sheer number of attractions, such as accessibility, infrastructure, and ease of transit, limiting the conversion of attractions into actual visits in outer regencies.

CONCLUSION

This study successfully utilized the Seven Stages of Visualizing Data methodology to develop three functional, interactive data visualization dashboards (Tourist and Attraction, Hotel Accommodation, and Tourism Business) for the Jambi Province tourism sector. The deployment of an interactive, data-driven visualization tool that provides clearer insights into tourism dynamics, which was not available in the previous static data presentation. The systematic



application of the Seven Stages framework proved effective in merging data processing and visual design into a cohesive workflow, resulting in an analytically meaningful and validated system.

REFERENCES

- Adi Saputra, D., Syafa Aninditha, J., Nabela, S., Al Habib, R., Armal Pratama, R., & Sulthan Thaha Saifuddin Jambi, U. (2024). Analisis dan Perancangan Sistem Informasi Jambi Data & Analytic Center Dinas Komunikasi dan Informatika Provinsi Jambi. *Rahmat Armal Pratama INNOVATIVE: Journal Of Social Science Research*, 4, 3861–3873.
- Alhaqqi, D. (2023). *Visualisasi Katalog Data Pengamatan Klimatologi Menggunakan Metode 7 Stages of Visualizing Data (Studi Kasus: Pusat Database Badan Meteorologi Klimatologi dan Geofisika)* [Universitas Islam Negeri Syarif Hidayatullah Jakarta]. <https://repository.uinjkt.ac.id/dspace/bitstream/123456789/75485/1/DHIYA%20ALHAQQI-%20FST.pdf>
- Angreini, S., & Supratman, E. (2021). Visualisasi Data Lokasi Rawan Bencana Di Provinsi Sumatera Selatan Menggunakan Tableau. *Jurnal Nasional Ilmu Komputer*, 2(2), 135–147. <https://doi.org/10.47747/JURNALNIK.V2I2.528>
- Bangun Mulia, V. (2021). Memahami Dan Mengelola Dampak Pariwisata. *Jurnal Kepariwisataaan*, 20(1), 75–85. <https://doi.org/10.52352/jpar.v20i1.439>
- Chandra, I. (2024). Perancangan Dashboard Sistem Informasi Eksekutif Guna Pengambilan Keputusan Strategis Manajerial Di Rumah Sakit X (Designing an Executive Information System Dashboard for Strategic Managerial Decision Making at Hospital X). *Indonesia Scholar Journal of Medical and Health Science*, 3(5), 203–212. <https://doi.org/10.54402/isjmh.v3i05.659>
- Fauzi, A. (2024). *Pengembangan Dashboard Regional Human Capital Menggunakan Metode the Seven Stages of Visualizing Data (Studi Kasus: PT. Bank Syariah Indonesia Regional Office V Jakarta 2)*. Universitas Islam Negeri Syarif Hidayatullah Jakarta.
- Galahlambang, Y., Khotiah, T., & Jumain, J. (2021). Visualisasi Data Dari Dataset COVID-19 Menggunakan Pemrograman Python. *Jurnal Ilmiah Intech: Information Technology Journal of UMUS*, 3(1), 58–64. <https://doi.org/10.46772/intech.v3i01.417>
- Gittleson, W. (2023, October 20). *What is Tableau? The Complete Guide to Tableau*. DataCamp. <https://www.datacamp.com/blog/all-about-tableau>
- Heri Purnadi. (2021). Pemanfaatan Google Spreadsheet Dan Google Data Studio Sebagai Dashboard Suhu Dan Kelembaban Di Laboratorium. *Insan Metrologi PPSDK*, 1(1), 28–33. <https://doi.org/10.55101/ppsdk.v1i1.639>
- Kerlooza, Y. Y., Dharmayanti, D., Mukharil Bachtiar, A., & Nugraha, T. (2021). Data Visualization For Education Domain At Dinas Pendidikan Jawa Barat. In *Journal of Engineering Science and Technology* (Vol. 16, Issue 5).
- Marvaro, E., & Samosir, R. S. (2021). Penerapan Business Intelligence dan Visualisasi Informasi di CV. Mitra Makmur Dengan Menggunakan Dashboard Tableau. *Jurnal Sains Dan Teknologi*, 8(2), 37–46. <https://doi.org/10.53008/kalbiscientia.v8i2.197>
- Maulana, A., Fitri, C., Koesfardani, P. P., Kajian, D., Deputi, S., Pengembangan, B., Strategis, K., Pariwisata, K., & Kreatif, E. (2020). Pola Musiman Kunjungan Wisatawan Mancanegara Ke Bali Seasonal Pattern of Foreign Tourist Arrivals to Bali. *Jurnal Kepariwisataaan Indonesia*, 14(2), 73–90. <https://doi.org/10.47608/jki.v14i22020.73-90>
- Muhammad Amin Sunarhadi, R., Dewangga, A., Himawan, W., & Suryo Guritno, S. (2023). Pengembangan Dashboard Sistem Pemantauan Lingkungan Eennos Untuk Membangun Masyarakat Tangguh. *Jurnal Ekosains*, 15(1), 30–36. <https://jurnal.uns.ac.id/ekosains/article/view/80461/42644>
- Nurchahyo, A. A., & Ishak, R. F. (2023). Information Management For Educators And Professionals Penerapan The Seven Stages Of Visualizing Data Dalam Visualisasi Data Surat Suara Di Komisi Pemilihan Umum Republik Indonesia (KPU RI). *Information Management for Educators and Professionals*, 8(1), 61–70. <https://doi.org/10.51211/imbi.v8i1.2519>
- Open Data Provinsi Jambi. (2025). *Website Open Data Provinsi Jambi*. <https://opendata.jambiprov.go.id/>
- Pebriawan, K., Gusti Agung Ayu Ananda Dewi, I., Agung Eka Wirayuda, A., Surya Mahendra, G., Iefan Datya, A., Studi Sistem Informasi, P., Teknik dan Kejuruan, F., Pendidikan Ganesha, U., & Kesehatan Sains dan Teknologi, F. (2023). *Visualisasi Data Sebaran Wilayah Pariwisata Di Provinsi Bali Dengan Platform Tableau* (Vol. 3, Issue 2). <https://ejurnal.umri.ac.id/index.php/SEIS/index>
- Prima Silalahi, A., Gilbert Simanullang, H., Hang Tuah No, J., & Medan, K. (2021). Dashboard Management Penjualan dan Pembelian pada Tangkahan Ikan. *Jurnal Informatika, Manajemen Dan Komputer*, 13(1). <https://doi.org/10.36723/juri.v13i1.260>
- Saepuloh, D. (2020). Visualisasi Data Covid 19 Provinsi DKI Menggunakan Tableau. *Jurnal Riset Jakarta*, 13(2). <https://doi.org/10.37439/jurnaldrd.v13i2.37>
- Shadiq, J., Safei, A., Wahyudin Ratu Loly, R., sitasi, C., Rwr, L., & Aplikasi Peminjaman Kendaraan Operasional Kantor Menggunakan BlackBox Testing, P. (2021). Information Management For Educators And



- Professionals Pengujian Aplikasi Peminjaman Kendaraan Operasional Kantor Menggunakan BlackBox Testing. *Information Management for Educators and Professionals*, 5(2), 97–110.
- Sudipa, I. G. I., Sarasvananda, I. B. G., Hartatik, Prayitno, H., Putra, I. N. T. A., Darmawan, R., Atmojo WP, D., & Efitra. (2023). *Teknik Visualisasi Data* (S. Sepriano & E. Efitra, Eds.; 1st ed.). Sonpedia Publishing Indonesia.
- Waskom, M. (2021). seaborn: statistical data visualization. *Journal of Open Source Software*, 6(60), 3021. <https://doi.org/10.21105/joss.03021>
- Wicaksono, Y., Akbar Harahap, A., & Rochmadi, T. (2025). Implementasi Business Intelligence untuk Visualisasi Data Pengembangan Kompetensi Aparatur Sipil Negara Di Kabupaten Lebak. *Jurnal Teknologi Dan Ilmu Komputer*, 1(2), 49–58. <https://doi.org/10.35134/Jutekom.v9i2.1>
- Wilke, C. O. (2020). *Fundamentals of Data Visualization* (M. Loukides & M. Potter, Eds.; 4th ed.). O'Reilly Media.
- William, B. A., Hendrarini, N., & Meisaroh, L. (2024). Pembangunan Dashboard Pusat Komando Armada Pada PT Indo Trans Teknologi. *E-Proceeding of Applied Science*, 10(4), 901–905. <https://openlibrarypublications.telkomuniversity.ac.id/index.php/appliedscience/article/download/23770/23421>