Brilliance
Research of Artificial Intelligence

E-ISSN : 2807-9035
Volume 5, **Number** 2, November 2025
https://doi.org/10.47709/brilliance.v5i2.7094

Business Intelligence Roadmap for Tableau Dashboard Development in Higher Education

Yuda Fatoni[1*], Pradita Eko Prasetyo Utomo[2], Rizqa Raaiqa Bintana[3]
[1,2,3]Universitas Jambi, Indonesia
[1]fatoniyuda02@gmail.com, [2]pradita.eko@unja.ac.id, [3]rizqa.raaiqa.bintana@unja.ac.id

open access

***Corresponding Author**

Article History:
Submitted: 17-10-2025
Accepted: 23-10-2025
Published: 31-10-2025

Keywords:
Business Intelligence Roadmap; Tableau; Data Visualization; Dashboard; Jambi University;

ABSTRACT

Universities are increasingly required to make data-driven decisions, yet many are still hindered by static and non-interactive reports. This study addresses these challenges at the Jambi University with the aim of designing and developing a series of interactive dashboards using Tableau, applying an adaptive framework based on the Business Intelligence Roadmap. The research methodology includes three main stages: pre-development, development, and post-development. The technical process involves Extract, Transform, Load (ETL) of data from different datasets into a MySQL database that serves as a centralized data source before visualization. The main results of this study are seven functional dashboard prototypes that were successfully developed, covering data analysis of lecturers, graduates, and other strategic areas. This dashboard is capable of presenting key insights, such as the lecturer-to-student ratio and lecturer qualification profiles (29.8% holding a PhD), in a visual and interactive manner. Furthermore, the prototype was successfully integrated into a web interface, demonstrating the technical feasibility of its implementation. This study concludes that the application of an adapted BI Roadmap is an effective approach for dashboard development in an academic environment. The results not only provide a decision-support tool for the Jambi University but also offer a methodological framework that can be replicated.

INTRODUCTION

Higher education institutions are required to continuously improve the quality of services through data-driven decision making (DDDM), a trend that is becoming increasingly crucial in the digital era (Henderson & Corry, 2021). Utilizing data as the basis for planning, monitoring, and evaluation enables higher education institutions to enhance the effectiveness of their strategic policies (Rizkiawan et al., 2024). This is grounded in the fact that educational institutions face challenges in improving the quality of education and student learning outcomes amid increasingly intense competition (Singgih et al., 2024). In this context, Business Intelligence (BI) serves as a technological solution for extracting valuable insights from raw data. One of the main components of BI is data visualization through interactive dashboards, which transform complex data into easily understandable information to support rapid and accurate decision making (Fauzi et al., 2023).

Jambi University (UNJA) has implemented a dashboard to monitor performance indicators, but its development still uses a traditional approach that relies on direct queries to the database. The research indicates that traditional data approaches suffer from significant drawbacks, including high dependency on IT teams, specialized programming requirements, and time-consuming development processes (Darmawan & Swalaganata, 2025). Furthermore, the lack of utilization of modern BI tools like Tableau results in limited flexible and interactive data visualization options.

Tableau is a business intelligence software that can simplify complex data into interactive visualizations that are easy to understand. Tableau also supports the integration of various data sources, allowing exploration without requiring deep programming skills, and accelerates the analysis process (Thakur & Das, 2023). With these capabilities, Tableau can be an effective solution in supporting the implementation of data-driven decision making in universities (Gaftandzhieva et al., 2023). Previous studies have shown the successful application of Tableau using the Business Intelligence Roadmap approach in other institutions (Al Malik et al., 2023; Mellyka et al., 2025), however, specific implementation for developing a centralized data dashboard at the Jambi University has not been explored, indicating a research gap that needs to be addressed.

Therefore, this study aims to develop a dashboard using Tableau by applying the Business Intelligence Roadmap framework (Moss & Atre, 2003). This development is not intended to replace existing systems, but rather to explore the potential of Tableau in presenting more interactive, flexible, and informative data visualizations as an alternative exploration that is expected to serve as an additional reference for university leadership in strategic decision-making, while also providing practical reference contributions for dashboard development in the academic environment.

Brilliance
Research of Artificial Intelligence

E-ISSN : 2807-9035
Volume 5, **Number** 2, November 2025
https://doi.org/10.47709/brilliance.v5i2.7094

LITERATURE REVIEW

To meet the demands of data-driven decision making, universities are increasingly adopting Business Intelligence (BI) as a strategic framework. BI integrates a series of processes, ranging from data preparation—such as Extract, Transform, Load (ETL) to clean and consolidate raw data from various sources—to final presentation in the form of actionable insights (Fauzi et al., 2023). Its implementation has been proven to support institutional governance, from performance monitoring to efficient resource management (Gaftandzhieva et al., 2023). However, the main challenge in many educational institutions in Indonesia is the dependence on static reports, which hampers real-time analysis and decision-making through interactive dashboards.

Data visualization through interactive dashboards emerges as a direct solution to the limitations of static reports. Dashboards are developed based on Gestalt theory, which understands how humans organize and perceive information as a whole, rather than in parts (Mubarok, 2023). This theory provides a scientific basis for how the human brain groups visual elements based on proximity, similarity, and continuity, thus ensuring that dashboards are effective. Effective data visualization enables organizations to make precise strategic decisions and convey information attractively to stakeholders through various types of interactive visuals (O. Embarak, 2018). A study by Ernawan (2024) shows that a well-designed dashboard can significantly improve decision-making efficiency. Nevertheless, the success of a dashboard depends not only on technical sophistication but also on the balance between functionality and ease of use to ensure widespread adoption by users.

Modern BI platforms like Tableau address the need for ease of use, as they allow the development of interactive visualizations without requiring programming skills, simply through drag and drop (Mittal & Raheja, 2024). Research in the context of higher education by Al Malik et al., (2023) proves that Tableau is effective in improving the transparency and accessibility of institutional data. However, the implementation of Tableau often focuses only on the final visualization output and neglects the systematic development process. The absence of a structured framework risks producing dashboards that are not aligned with the institution's strategic goals.

To bridge the gap between tools and strategies, a systematic development methodology becomes crucial. The Business Intelligence Roadmap (BI Roadmap) proposed by Moss and Atre offers a structured approach through six stages: justification, planning, business analysis, design, construction, and implementation. The importance of developing functional dashboards in Indonesian higher education institutions has also been proven in recent research. For example, Mellyka et al., (2025) successfully developed an interactive alumni dashboard at Mulawarman University that has been proven to meet user needs and is expected to improve the effectiveness of institutional data management. From this review, a clear research gap has been identified: although the benefits and success of dashboards (end products) in Indonesia have been proven (Mellyka et al., 2025), the application of systematic development methodologies (such as BI Roadmap) to ensure that the development process is aligned with strategy—especially when combined with tools such as Tableau—is still very limited in documentation. This study aims to fill that gap.

METHOD

This research uses the Business Intelligence Roadmap system development methodology Moss & Atre (2003) by adding a pre-development stage of literature review, as well as a post-development stage which is dashboard testing. The following is the research flow framework:

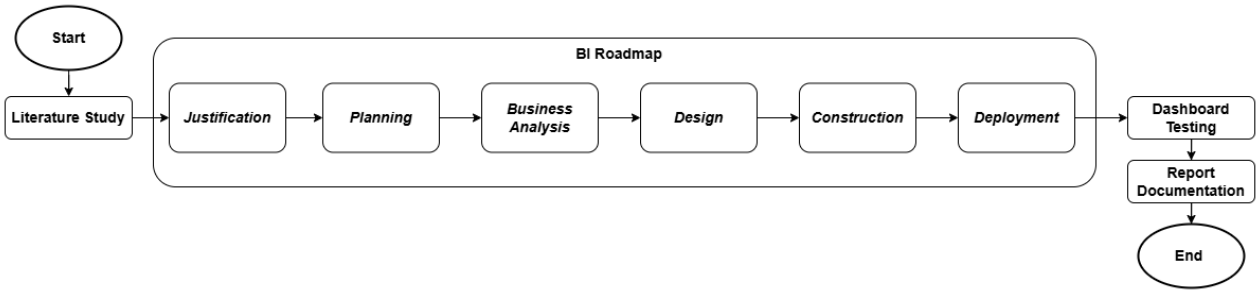

Fig. 1 Research Flow

Literature Study

An in-depth study was conducted on previous research focusing on the implementation of Tableau in higher education institutions as well as the practical application of the Business Intelligence Roadmap. To understand the existing landscape, a comparative analysis (benchmarking) was conducted on the internal dashboards of Jambi University that are already in use, as well as several public dashboards from other universities. This analysis aims to identify best practices and essential features that need to be accommodated in development.

Justification

At this stage, the justification of this project is reinforced. An in-depth analysis of the available dataset in Excel

Brilliance
Research of Artificial Intelligence

E-ISSN : 2807-9035
Volume 5, **Number** 2, November 2025
https://doi.org/10.47709/brilliance.v5i2.7094

format is conducted to ensure technical feasibility and the relevance of the information that can be generated.

Planning

The strategy and technical flow of development are formulated. Raw data from Excel is planned to undergo an Extract, Transform, Load (ETL) process using Tableau Prep. The ETL results are then integrated into a MySQL database that serves as a centralized data source before finally being visualized using Tableau Desktop.

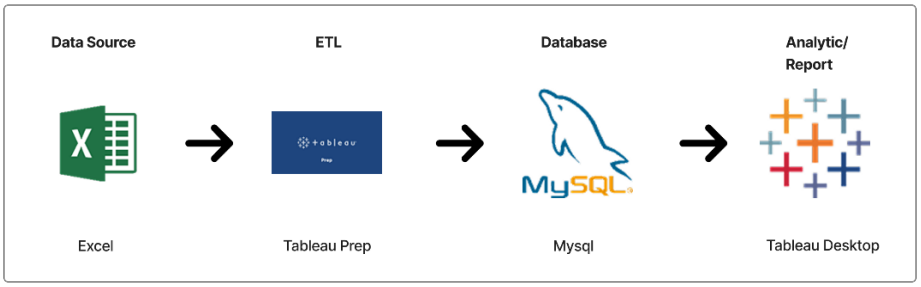

Fig. 2 Data Processing Flow

Business Analysis

Functional requirements are translated into technical specifications. A simple ETL process is designed to transform each dataset into structured tables within a MySQL database. Furthermore, the design for each data visualization (charts, tables) is defined in detail, complete with metric validation using the SMART principles (Specific, Measurable, Achievable, Relevant, Time-bound) to ensure each visualization addresses specific business questions. This is to guarantee clarity of objectives and feasibility of implementation. This validation process is illustrated in Table 1 for the visualization "Number of lecturers by faculty."

Table 1. Vizualization Plan

Analysisi Objective	Metrik / KPI	Type Of Visualization	SMART
Understanding the distribution of lecturers by faculty	Number of lecturers per faculty	Bar Chart	S: Specifically measures the allocation of lecturer human resources in each faculty unit. M: Quantitatively measurable by counting the number of lecturers. A: Serves as a basis for calculating the lecturer-to-student ratio. R: Relevant for resource planning and operational quality assurance. T: Can be monitored each semester or academic year.

Design

Based on the validated visualization design, wireframes or visual frameworks for each dashboard view were created using the Gestalt theory approach. This approach helps in creating visual coherence and makes it easier for users to understand the information presented (Sulianta, 2024). These wireframes serve as a blueprint for layout design, selection of chart types, and placement of interactive filters, ensuring that the elements support each other and reinforce the intended message. Thus, before the technical construction process begins, these wireframes act as an important guide for creating an effective and intuitive dashboard for users, as illustrated in Figure 3.

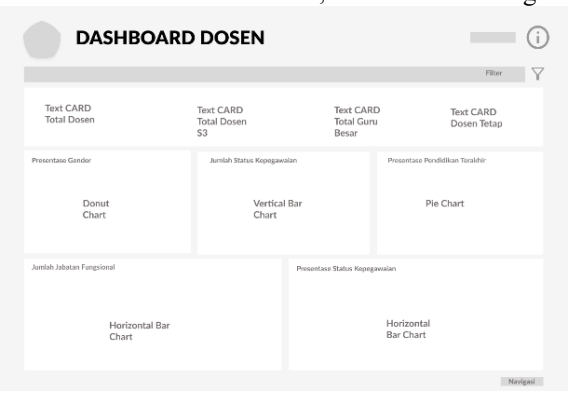

Fig 3. Example of Lecturer Dashboard Wireframe

Brilliance
Research of Artificial Intelligence

E-ISSN : 2807-9035
Volume 5, **Number** 2, November 2025
https://doi.org/10.47709/brilliance.v5i2.7094

Construction

At this stage, dashboard development is carried out technically within the Tableau Desktop software. Visualizations and interactive elements are created by connecting Tableau directly to a MySQL database that already contains clean and structured data.

Deployment

The completed dashboard was then implemented in two steps. First, the dashboard was published on the Tableau Public platform for accessibility. Second, the dashboard was integrated (embedded) into a graphical user interface (GUI) using the Tableau API for presentation simulation within an internal portal. The graphical user interface (GUI) plays a very important role as the main medium for user interaction with the system.

Testing

To ensure the quality and functionality of the dashboard, testing was conducted using the black-box method. Test scenarios were designed to validate all interactive features—such as filters, buttons, and tooltips—without looking at the internal code, to ensure the dashboard operates according to the defined requirements. Through this method, it can be assessed whether the system is free from functional errors, enabling the software to operate properly and be ready for use (Priyaungga et al., 2020).

RESULT

Se As a result of applying the research framework outlined in the Methods section, this study successfully developed seven functional interactive dashboard prototypes. Each dashboard is designed to address specific analytical needs based on different datasets. The seven dashboards produced are:

1. Faculty Dashboard
2. Internship Monitoring Dashboard
3. Student Activities Outside Campus Dashboard
4. Student Achievement Dashboard
5. New Student Dashboard
6. Active Students 2025 Dashboard
7. Graduate Analysis Dashboard

This section will elaborate on the findings from two dashboards as representative examples of all dashboards: the Faculty Dashboard and the Graduate Analysis Dashboard, as well as demonstrate the results of their integration into a web interface.

Lecturer dashboard

This dashboard provides a comprehensive data visualization related to the profiles and qualifications of 1,216 lecturers at the University of Jambi. The main interface of this dashboard displays a summary of key metrics at the top, highlighting that 29.8% (362 lecturers) have obtained a doctoral degree, of which 82 are Professors, as shown in Figure 4.

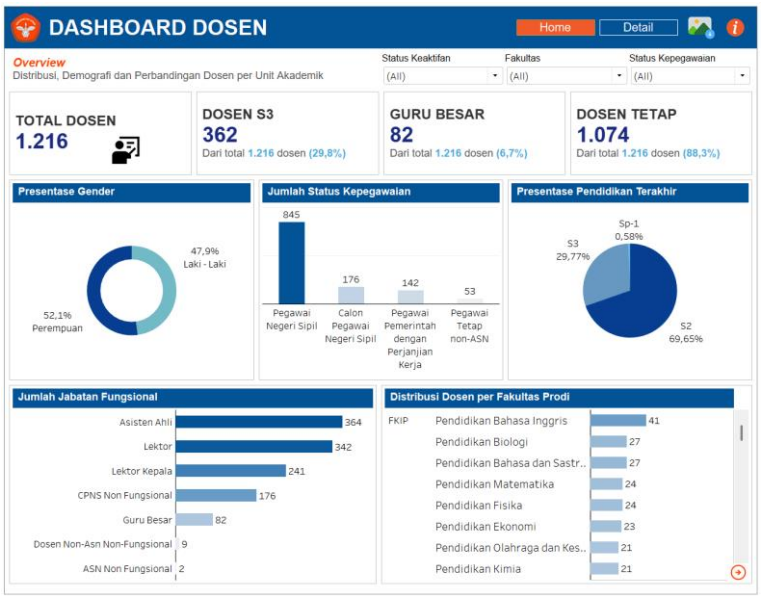

Fig 4. lecturer dashboard

Brilliance
Research of Artificial Intelligence

E-ISSN : 2807-9035
Volume 5, **Number** 2, November 2025
https://doi.org/10.47709/brilliance.v5i2.7094

The data visualization results displayed on the dashboard show:

- Demographic Profile : The gender proportion of lecturers is relatively balanced, with 52.1% female and 47.9% male.
- Employment Status : The majority of lecturers, totaling 845 individuals, are civil servants.
- Functional Position : The most common functional position is Assistant Expert (364 lecturers), followed by Lecturer (342 lecturers).

Graduate Analysis Dashboard

This dashboard is designed to analyze graduate data, focusing on graduation trends and academic performance. The user interface is shown in Figure 5.

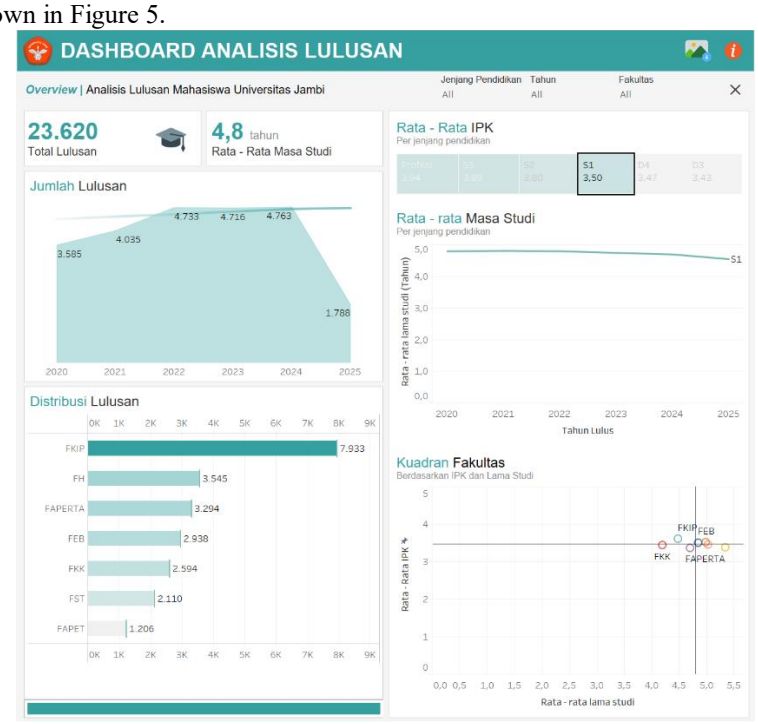

Fig 5. Graduate Analysis Dashboard

This dashboard is designed to analyze data from 23,620 graduates, focusing on graduation trends and academic performance. The user interface is shown in Figure 6. This dashboard is highly interactive; although the image displays data filtered for the undergraduate level, users can dynamically select other education levels (D3, Master's, Doctorate, Professional) for deeper data exploration. The data analysis results from this dashboard, with the undergraduate filter active, show:

- Trends and Distribution: The trend in the number of graduates peaks in 2024 (4,763 graduates), with the Faculty of Teacher Training and Education (FKIP) contributing the highest number of graduates (7,933 people).
- Academic Performance (Undergraduate Level): For the undergraduate level, the average Cumulative Grade Point Average (GPA) is 3.50, with an average study period of 4.8 years. The quadrant visualization maps the performance of each faculty based on these two metrics, providing a quick overview of academic efficiency.

Dashboard Functionality Summary

In addition to the two dashboards that have been described in detail, five other supporting dashboards were also successfully developed to meet the data analysis needs across various strategic areas of the university. Each dashboard is designed with specific objectives and key metrics. A summary of the functionalities of these five dashboards is presented in Table 2.

Table 2. Dashboard Functionality Summary

Dashboard Name	Main Purpose	Key Metrics/KPIs Displayed
Cooperation Monitoring Dashboard	Monitors the activity status of cooperations and provides an overview	- Cooperation Activity Status - Cooperation Growth Trends - Types of Cooperation - List of Cooperations That Will Expire

Brilliance
Research of Artificial Intelligence

E-ISSN : 2807-9035
Volume 5, **Number** 2, November 2025
https://doi.org/10.47709/brilliance.v5i2.7094

Student Activity Dashboard Outside Campus	Analyzing student participation and types of activities	- Types of activities attended by students - Number of activities per Faculty and Study Program - Activity trends per year - Total activities and participating students
Student Achievement Dashboard	Analyzes student achievements and accomplishments	- Achievement trends per year - Distribution of achievements by faculty-program - Achievements based on organizer, accomplishments, and level
New Student Dashboard	Analyzes trends and demographics of new student admissions	- Student origin by province - Number of students by admission pathway - Most popular study programs - Number of students by education level
Active Student Dashboard 2025	Provides an overview of the number and activity status of students	- Number of student activity statuses per faculty/program - Number of students per level - Gender Percentage

Implementation of Graphical User Interface (GUI)

As part of the implementation (deployment) phase, the dashboard prototype was successfully integrated (embedded) into a simple web interface to simulate its use within an internal portal. The results of this integration are shown in Figure 6.

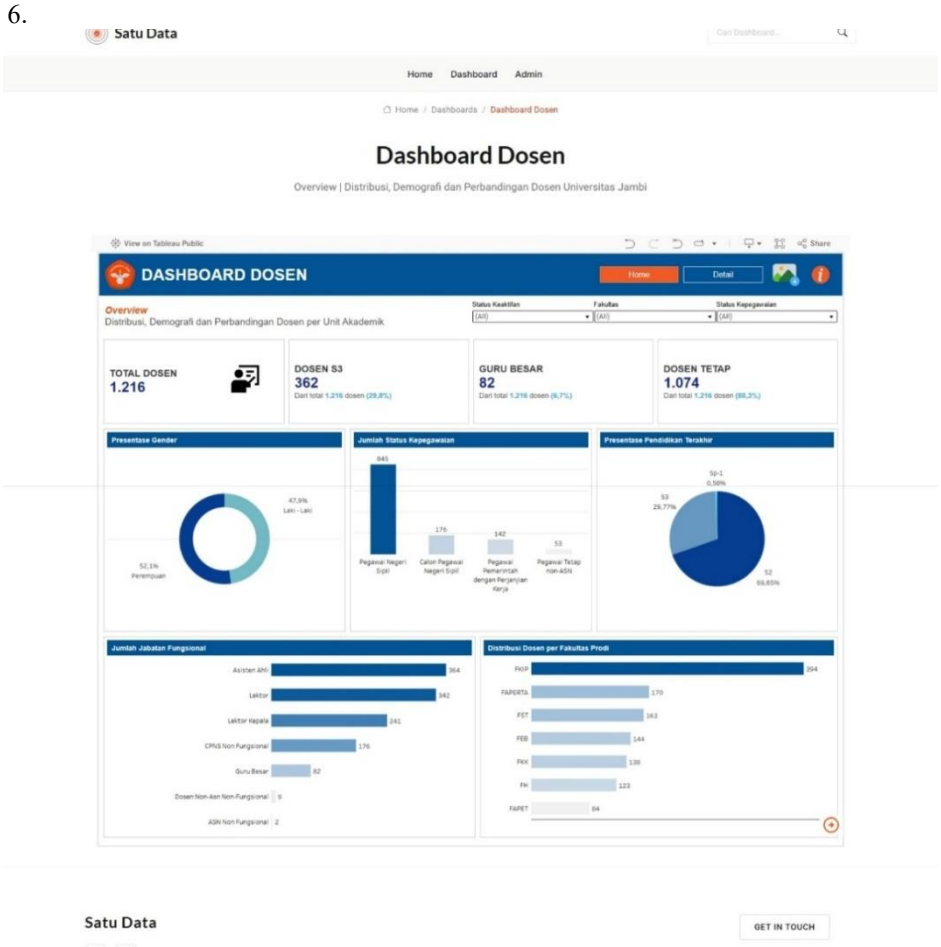

Fig 6. Tableau Embed GUI

E-ISSN : 2807-9035
Volume 5, **Number** 2, November 2025
https://doi.org/10.47709/brilliance.v5i2.7094

The results show that the dashboard can be displayed and operate fully within the web page. All interactive functionalities, including filters, navigation buttons, and tooltips, remain intact and responsive, confirming the technical success of the integration process using the Tableau V3 API.

DISCUSSION

The results of this study provide several important implications. First, the successful development of seven interactive dashboards directly addresses the use of modern BI tools in tackling university challenges. Specific findings from the dashboards, such as visualizations of faculty distribution or the ability to compare average GPAs across education levels with a single click, are not merely presentations of numbers but serve as triggers for strategic questions for management. This indicates a shift from mere data reporting to facilitating self-service data analysis.

Methodologically, this study demonstrates that an agile and structured approach through a BI Roadmap can be implemented effectively even without a well-established data warehouse infrastructure. By utilizing simple ETL processes and defining data relationships at the software level (Tableau), this research proves that institutions can initiate BI initiatives with available resources. The successful integration of dashboards into the web GUI is also an important evidence, showing that the results of this study are not merely standalone visualizations, but components ready to be integrated into the university's broader digital ecosystem. This aligns with the goals of modern BI, which emphasize data accessibility and ease of use for decision-makers.

CONCLUSION

This study successfully applied an adaptive framework based on the Business Intelligence Roadmap to design, develop, and implement seven functional dashboard prototypes from various datasets at the Jambi University. The main contribution of this research is providing strong proof-of-concept evidence that the use of modern BI tools can significantly enhance data analysis capabilities in a university environment. Practically, this study produced an interactive decision support tool. Methodologically, this study presents a workflow that can be replicated by other institutions facing similar challenges.

REFERENCES

Al Malik, M. H., Andrian, R., & Utami, Y. T. (2023). Analisis Visualisasi Data Prestasi Mahasiswa Universitas Lampung Menggunakan Tableau. *Jurnal Pepadun*, *4*(2), 158–165. https://doi.org/10.23960/pepadun.v4i2.172

Darmawan, R., & Swalaganata, G. (2025). ANALISA KOMPARATIF POWER BI DAN TABLEAU DALAM IMPLEMENTASI BUSINESS INTELLIGENCE PADA BRAZILIAN E-COMMERCE PUBLIC DATASET BY OLIST. *JATI (Jurnal Mahasiswa Teknik Informatika)*, *9*(5), 8936–8944. https://doi.org/10.36040/jati.v9i5.15178

Embarak, O. (2018). The Importance of Data Visualization in Business Intelligence. In Dr. O. Embarak, *Data Analysis and Visualization Using Python* (pp. 85–124). Apress. https://doi.org/10.1007/978-1-4842-4109-7_2

Ernawan, E. (2024). Pemanfaatan Management Dashboard Dalam Pengambilan Keputusan Strategis Pada Perusahaan Bisnis Konstruksi (Studi Kasus PT. XYZ). *Jurnal Mirai Management*, *9*(2), 124. https://doi.org/10.37531/mirai.v9i2.7174

Fauzi, A., Nugroho, A. A., Monte, A. K., Ignesia, A. A., Makruf, M. N., Andreas, R., & Hasanah, S. R. N. (2023). Pemanfaatan Business Intelligence Dalam Pembuatan Strategi dan Pengambilan Keputusan Bisnis. *Jurnal Portofolio : Jurnal Manajemen Dan Bisnis*, *2*(3), Article 3.

Gaftandzhieva, S., Hussain, S., Hilcenko, S., Doneva, R., & Boykova, K. (2023). Data-driven Decision Making in Higher Education Institutions: State-of-play. *International Journal of Advanced Computer Science and Applications*, *14*(6). https://doi.org/10.14569/IJACSA.2023.0140642

Henderson, J., & Corry, M. (2021). Data literacy training and use for educational professionals. *Journal of Research in Innovative Teaching & Learning*, *14*(2), 232–244. https://doi.org/10.1108/JRIT-11-2019-0074

Mellyka, G., Islamiyah, I., & Widagdo, P. P. (2025). Penerapan Business Intelligence dalam Dashboard Data Alumni Universitas Mulawarman. *Jutisi : Jurnal Ilmiah Teknik Informatika Dan Sistem Informasi*, *14*(1), 189. https://doi.org/10.35889/jutisi.v14i1.2419

Mittal, M., & Raheja, N. G. (2024). *Data Visualization and Storytelling with Tableau*. CRC Press. https://books.google.co.id/books?id=s_AIEQAAQBAJ

Moss, L. T., & Atre, S. (2003, February 25). *Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications*. https://www.semanticscholar.org/paper/Business-Intelligence-Roadmap%3A-The-Complete-Project-Moss-Atre/4e9078005edbb68b0a89d0b2c0c493e09c7f2b87

Mubarok, F. S. (2023). Penerapan Prinsip Gestalt Dalam Desain Visual Untuk Meningkatkan Memori Dan Pemahaman Pesan. *Jurnal Ilmiah Komunikasi Makna*, *11*(2), 152. https://doi.org/10.30659/jikm.v11i2.33002

Priyaungga, B. A., Aji, D. B., Syahroni, M., Aji, N. T. S., & Saifudin, A. (2020). Pengujian Black Box pada Aplikasi Perpustakaan Menggunakan Teknik Equivalence Partitions. *Jurnal Teknologi Sistem Informasi Dan Aplikasi*, *3*(3), 150. https://doi.org/10.32493/jtsi.v3i3.5343

Brilliance
Research of Artificial Intelligence

E-ISSN : 2807-9035
Volume 5, **Number** 2, November 2025
https://doi.org/10.47709/brilliance.v5i2.7094

Rizkiawan, M. A., Anhari, T., & Alim, E. S. (2024). Application of Business Intelligence Using Tableau in Visualizing New Student data. *Kesatria : Jurnal Penerapan Sistem Informasi (Komputer Dan Manajemen)*, *5*(4), Article 4. https://doi.org/10.30645/kesatria.v5i4.477

Singgih, S., Adila, A. S. D., Nadhifah, I. N., Kurnia, S. A., & Mazita, A. (2024). Development of Data-Driven Educational Decision Implementation Guidelines Assisted by Formative Tests in Science Learning. *AL-ISHLAH: Jurnal Pendidikan*, *16*(3), Article 3.

Sulianta, F. (2024). *Visualisasi Data untuk Pemula*. Feri Sulianta. https://books.google.co.id/books?id=tcQsEQAAQBAJ

Thakur, J., & Das, P. (2023). Improving Data Analysis and Visualization in Market Research with Tableau. *2023 3rd International Conference on Technological Advancements in Computational Sciences (ICTACS)*, 572–576. https://doi.org/10.1109/ICTACS59847.2023.10389971