Implementation of Website-Based Business Intelligence System Using Key Performance Indicators at DPM FT UNESA

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ABSTRACT

This research aims to implement a website-based Business Intelligence system using **Key Performance Indicators (KPI)** at DPM FT UNESA to support a more effective, efficient, and data-driven monitoring and evaluation process for student organizations. The research addresses the absence of an integrated system capable of providing real-time information on work programs, proposals, and accountability reports, resulting in a monitoring process that is still conducted manually and is less efficient. This study employs the **Cross-Industry Standard Process for Data Mining (CRISP-DM)** methodology, which consists of the stages of Business Understanding, Data Understanding, Data Preparation, Modeling, Evaluation, and Deployment. The system was developed using the Laravel framework and implements **Role-Based Access Control (RBAC)** to manage access permissions for three user roles: DPM FT Administrator, Advisor, and Student Organization (Ormawa). The Business Intelligence dashboard presents interactive data visualizations in the form of KPI Cards, Bar Charts, Gauge Charts, Donut Charts, and Line Charts based on ten **Key Performance Indicators** designed using the SMART method. The results indicate that the developed system successfully integrates student organization data into a real-time and interactive dashboard, thereby supporting monitoring, evaluation, and data-driven decision-making processes within DPM FT UNESA.

Keyword: Business Intelligence, Key Performance Indicators (KPI), Dashboard, Data Visualization, Role-Based Access Control (RBAC).

INTRODUCTION (12 PT)

Student organizations (*Ormawa*) serve as platforms for students to develop leadership, communication, teamwork, and responsibility through various organizational activities. In addition to fostering soft skills, student organizations also play an important role in accommodating student aspirations and promoting a participatory campus environment [1]. At the Faculty of Engineering, Universitas Negeri Surabaya (DPM FT UNESA), the supervision of student organization activities is carried out by the Faculty Student Representative Council (*Dewan Perwakilan Mahasiswa Fakultas Teknik* – DPM FT UNESA) through monitoring activity proposals, work program implementation, and accountability reports (*Laporan Pertanggungjawaban* or LPJ). According to DPM FT UNESA data in 2025, there are 14 active student organizations that require regular supervision, making effective information management essential.

Based on observations and interviews conducted with DPM FT UNESA, the monitoring process is still performed manually by reviewing activity proposals, work programs, and accountability reports individually. This approach requires considerable time, particularly in identifying administrative status, monitoring work program progress, and evaluating organizational compliance with document submission requirements. Furthermore, information required for evaluation is not presented in an integrated visualization, making timely and data-driven decision-making difficult. Similar challenges have also been identified in student organization management, where documents are stored separately, making information retrieval inefficient and limiting organizational transparency. Digital transformation has the potential to improve transparency and accountability by providing structured and accessible information.

Data has become a valuable organizational asset that supports objective and evidence-based decision-making [2]. One of the approaches widely adopted to transform raw data into meaningful information is *Business Intelligence* (BI), which integrates, analyzes, and visualizes data to provide comprehensive insights for decision-makers. Previous studies have shown that BI dashboards improve monitoring effectiveness and support decision-making by presenting information in a real-time and interactive manner [3]. In addition, successful dashboard implementation depends on an effective access control mechanism to ensure that users can only access information according to their responsibilities through the implementation of *Role-Based Access Control* (RBAC) [4].

Based on these challenges, this study implements a website-based *Business Intelligence* system using *Key Performance Indicators* (KPI) at DPM FT UNESA. The KPIs were designed using the SMART approach, while data processing followed the *Cross-Industry Standard Process for Data Mining* (CRISP-DM) methodology. The system was developed using the Laravel framework and incorporates *Role-Based Access Control* (RBAC), enabling the dashboard to present data through *KPI Cards, Bar Charts, Gauge Charts, Donut Charts,* and *Line Charts* according to the access rights of DPM FT Administrators, Supervisors, and Student Organizations. The proposed dashboard is expected to support monitoring, evaluation, and data-driven decision-making in a more effective, transparent, and efficient manner.

Unlike previous studies that primarily focused on implementing *Business Intelligence* in business, industrial, or educational environments, this research emphasizes its application in student organization governance, particularly within a faculty-level student legislative body. The novelty of this study lies in the integration of SMART-based *Key Performance Indicators,* CRISP-DM-based data processing, and the implementation of a website-based BI dashboard with *Role-Based Access Control* to support the monitoring and evaluation of student organizations at DPM FT UNESA.

METHODS

This study is applied research that aims to develop a website-based Business Intelligence system to support the monitoring and evaluation of student organizations at the Faculty of Engineering Student Representative Council, Universitas Negeri Surabaya (DPM FT UNESA).

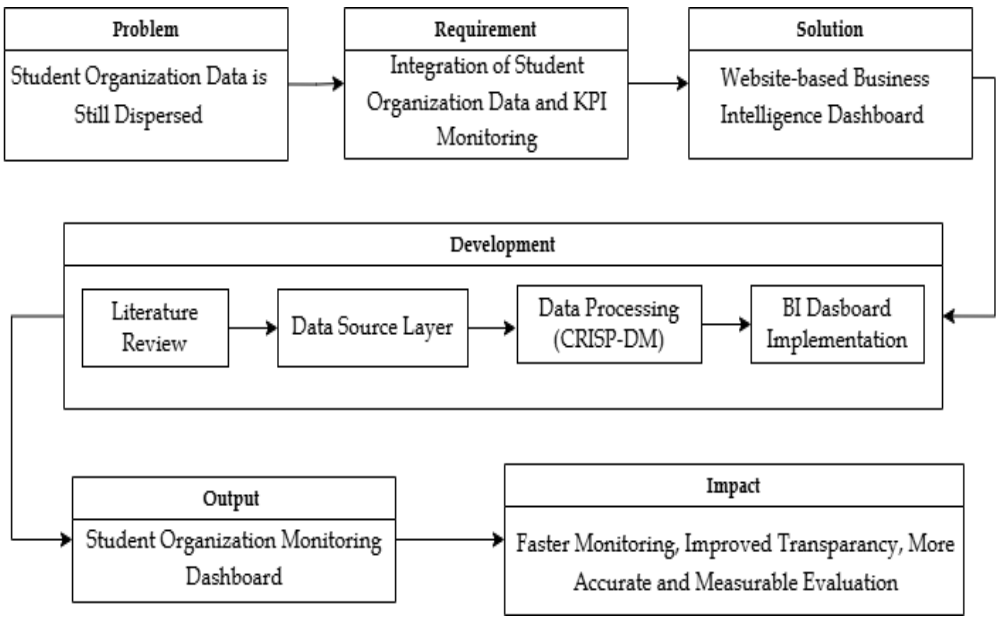


Figure 1. Methods

The research process began with the identification of the main problem, namely that student organization data were scattered across multiple sources, causing the monitoring of activity proposals, work programs, and accountability reports to be conducted manually. Based on this problem, a system requirements analysis was

performed to integrate student organization data into a Business Intelligence dashboard capable of presenting real-time information to support data-driven decision-making.

The system development process commenced with a literature review to establish the theoretical foundation on Business Intelligence, Key Performance Indicators (KPI), Role-Based Access Control (RBAC), dashboards, and the Cross-Industry Standard Process for Data Mining (CRISP-DM) methodology. Subsequently, data were collected from multiple sources (data source layer), including student organization data, activity proposals, work programs, and accountability reports (LPJ). These data were processed using the CRISP-DM methodology, which consists of the stages of Business Understanding, Data Understanding, Data Preparation, Modeling, Evaluation, and Deployment [5]. During the Modeling stage, organizational performance indicators were designed using the SMART approach and visualized through KPI Cards, Bar Charts, Gauge Charts, Donut Charts, and Line Charts [6].

The system was developed using the Laravel framework and implemented Role-Based Access Control (RBAC) to manage access permissions for DPM FT Administrators, Supervisors, and Student Organizations (Ormawa). The implementation resulted in a website-based dashboard that integrates all organizational data into a centralized platform. The proposed dashboard is expected to accelerate the monitoring process, improve the transparency of student organization management, and support more effective, measurable, and data-driven evaluation and decision-making.

RESULTS AND DISCUSSION (12 PT)

This section presents the implementation results of the website-based *Business Intelligence* system developed to support the monitoring and evaluation of student organizations at the Faculty of Engineering Student Representative Council, Universitas Negeri Surabaya (DPM FT UNESA). The results include the implementation of data sources, the visualization of *Key Performance Indicators* (KPI), the implementation of *Role-Based Access Control* (RBAC), the implementation of dashboards for each user role, and a discussion of the contribution of each role to the monitoring and evaluation process.

Data Used as The KPI Source

The data used as the source of the *Key Performance Indicators* (KPI) were obtained from the DPM FT UNESA website database stored on the server (*cPanel*). The dataset includes student organization data, work programs, activity proposals, and accountability reports. It contains various attributes that support the analysis process, including student organization identity, activity category, work program status, and administrative document completion status.

Before being used for KPI calculation, the data underwent integration, data cleaning, and attribute selection to ensure consistency, completeness, and data quality. These processes produced a structured dataset that was ready to be used as the primary source for analysis and automated KPI calculation.

The implementation results indicate that the integrated dataset can be directly utilized by the *Business Intelligence* system to generate real-time information. This process enables any changes made to the website database to be automatically reflected on the dashboard without requiring manual data processing. Consequently, the dashboard provides more accurate, consistent, and up-to-date information, thereby supporting a more effective monitoring and evaluation process for student organizations.

Key Performance Indicator

Setiap Each *Key Performance Indicator* (KPI) was calculated based on the data available in the DPM FT UNESA website system after undergoing data integration and processing. The calculated KPIs were then visualized through a website-based *Business Intelligence* dashboard, enabling users to understand organizational performance quickly, accurately, and comprehensively. As a result, the dashboard serves as an effective tool for monitoring organizational performance while supporting evaluation and data-driven decision-making.

Table 1. Key Performance Indicator

KPI	KPI Name	Definition	Output
1	Number of Active Student Organizations	Indicates the number of active student organizations (Faculty Student Executive Board/BEM and Student Association/HMP) that have at least one active work program within a specific period.	KPI Card
2	Total Work Programs per Student Organization	Indicates the total number of work programs proposed by each student organization within a specific period	KPI Card
3	Number of Work Programs by Category	Indicates the number of work programs based on activity categories to identify the distribution of organizational activities.	Bar Chart
4	Number of Proposals per Student Organization	Indicates the number of activity proposals submitted by each student organization within a specific period.	Bar Chart
5	Percentage of Accountability Reports (LPJ)	Indicates the percentage of accountability reports (LPJ) submitted compared to the total number of completed work programs.	Gauge Chart
6	Number of Problematic Accountability Reports	Indicates the number of invalid accountability reports and reports that have not been submitted despite the completion of the corresponding work programs.	KPI Card
7	Percentage of Completed Work Programs	Indicates the percentage of completed work programs relative to the total number of proposed work programs, where completion is determined based on the submission of accountability reports (LPJ) by each student organization.	Donut Chart
8	Percentage of Work Programs Not Yet Started	Indicates the percentage of work programs that have not yet started relative to the total number of proposed work programs.	Donut Chart
9	Work Program Ranking Across Student Organizations	Compares the number of work programs among student organizations to identify those with the highest number of work programs within a specific period.	Bar Ranking
10	Trend of Accountability Reports by Period	Indicates the trend in the number of accountability reports (LPJ) submitted over a specific period to identify reporting patterns.	Line Chart

Role-Based Access Control

The implementation of *Role-Based Access Control* (RBAC) in the *Business Intelligence* system aims to manage user access permissions according to their respective roles and responsibilities [7]. The RBAC mechanism ensures that each user can only access information relevant to their assigned authority, thereby maintaining data security, confidentiality, and integrity. In this study, three primary user roles were defined: DPM FT Administrator, Supervisor, and Student Organization (*Ormawa*). Each role was assigned different access privileges to the dashboard and *Key Performance Indicators* (KPI). The definitions of the access permission codes used in the system are presented in Table 2.

Table 2. Definition of RBAC Access Permission Codes (B/R/A/C)

Code	Meaning	Description
B (Browse)	View Summary	Access the dashboard page or view KPIs and charts in a general overview without detailed information.
R (Read)	View Details	Access detailed information, including data tables, work program details, document details, and drill-down views.
A (Add)	Add data	Enter new data or upload documents (not applicable to dashboard KPI).
C (Change)	Modify data	Edit or update data, validate documents, change status, and correct data.
*	Own Data Only	Access is limited to data belonging to the respective user.

Table 3. RBAC Matrix for Dashboard KPIs

KPI	KPI Name	Administrator DPM FT	Supervisor	Ormawa
KPI 1	Number of Active Student Organizations	B, R	×	×
KPI 2	Total Work Programs per Student Organization	B, R	B*, R*	B*, R*
KPI 3	Number of Work Programs by Category	B, R	B*, R*	B*, R*
KPI 4	Number of Proposals per Student Organization	B, R	B*, R*	B*, R*
KPI 5	Percentage of Accountability Reports (LPJ)	B, R	B*, R*	B*, R*
KPI 6	Number of Problematic Accountability Reports	B, R	B*, R*	B*, R*
KPI 7	Percentage of Completed Work Programs	B, R	B*, R*	B*, R*
KPI 8	Percentage of Work Programs Not Yet Started	B, R	B*, R*	B*, R*
KPI 9	Work Program Ranking Across Student Organizations	B, R	×	×
KPI 10	Trend of Accountability Reports by Period	B, R	×	×

Based on these access permission definitions, each Key Performance Indicator (KPI) on the dashboard was mapped according to the information requirements of each user role. This mapping ensures that the information presented aligns with the responsibilities of each user while supporting effective monitoring and evaluation without compromising data security.

Dashboard

Dashboard Role Administrator DPM FT

The Administrator Dashboard provides a comprehensive overview of all student organization data and Key Performance Indicators (KPIs) *Student Representative Council of the Faculty of Engineering* at Universitas Negeri Surabaya (DPM FT UNESA). The dashboard is designed to support the monitoring and evaluation of work programs, activity proposals, and accountability reports (LPJ) submitted by all student organizations through various data visualizations, including KPI Cards, Bar Charts, Gauge Charts, Donut Charts, and Line Charts. By integrating all key information into a single interface, the dashboard enables administrators to monitor organizational performance in real time, providing a faster, more structured, and data-driven monitoring process.

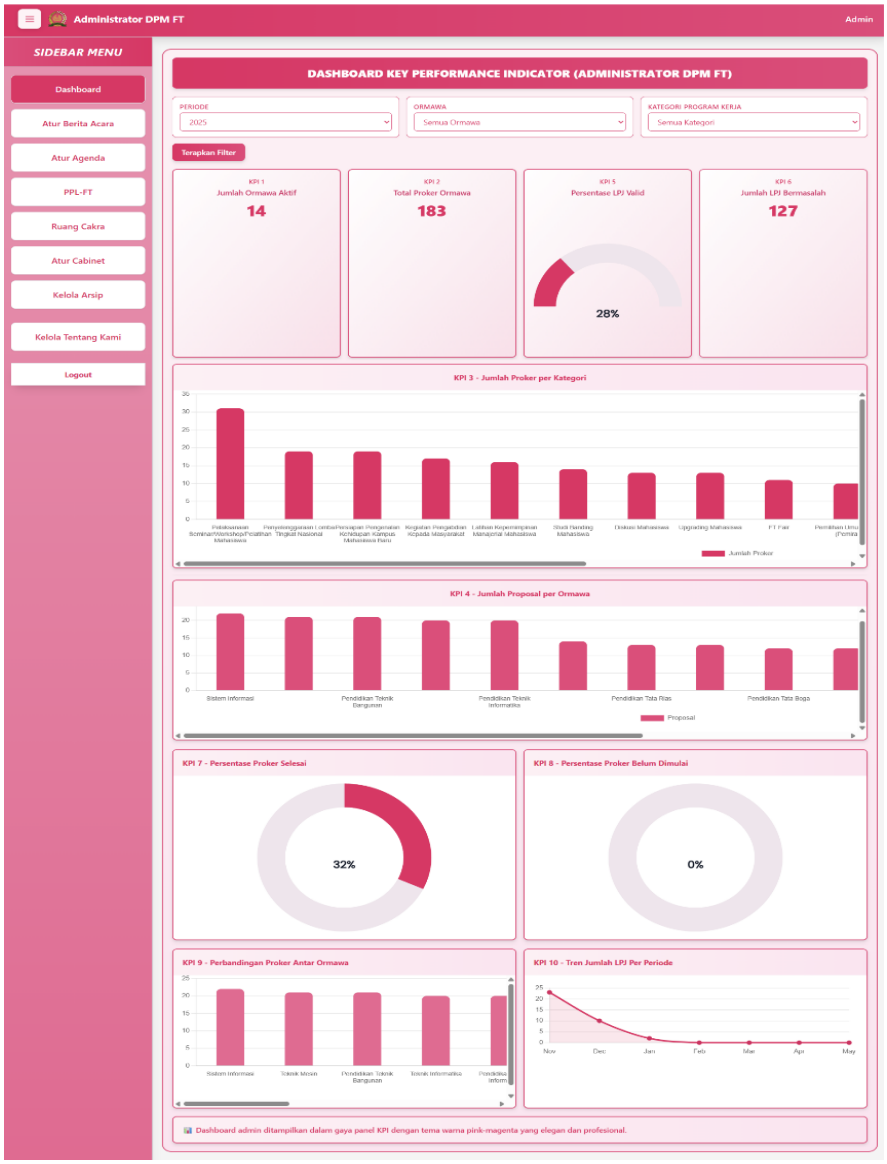


Figure 2. Dashboard Administrator DPM FT UNESA

Based on the implementation results shown in **Figure 2,** the Administrator Dashboard successfully presents comprehensive information on student organization performance through a unified interface. Information such as the number of active student organizations, total work programs, distribution of work programs by category, number of submitted proposals, percentage of valid accountability reports (LPJ), number of problematic LPJs, and comparisons of work program activities among student organizations can be monitored directly without requiring manual data processing. All information is generated automatically through data aggregation processes implemented within the controller, ensuring that the dashboard is continuously updated based on the latest data stored in the database.

The implementation of the Administrator Dashboard has transformed the monitoring process, which was previously performed manually, into a more effective, efficient, and data-driven approach. In addition to serving as a data visualization platform, the dashboard functions as a **decision support tool**, enabling administrators to formulate policies, provide recommendations, and evaluate the performance of student organizations within the Faculty of Engineering, Universitas Negeri Surabaya.

Dashboard Key Performance Indicator Role Supervisor (Pembina)

The **Supervisor Dashboard** displays Key Performance Indicators (KPIs) for student organizations under the supervision of each assigned supervisor. It is designed to assist supervisors in monitoring organizational activities, work program implementation, and the completeness of administrative documents. The

information presented is restricted according to user access permissions, ensuring that supervisors can only access data related to the student organizations under their responsibility.



Figure 3. Dashboard KPI Supervisor (Pembina)

Based on the implementation results shown in **Figure 3**, the Supervisor Dashboard successfully provides more specific monitoring information according to the scope of responsibility assigned to each supervisor. The dashboard presents information on the total number of work programs, proposal status, the percentage of submitted accountability reports (LPJ), and the progress of student organization activities. This information enables supervisors to conduct more focused monitoring and evaluation, as the displayed data is limited to the student organizations under their supervision.

Through the available visualizations, supervisors can quickly assess the administrative status of student organizations, such as identifying organizations that have not yet submitted their accountability reports (LPJ), have incomplete or problematic administrative documents, or have not yet implemented their planned work programs. These insights can serve as the basis for providing guidance, supervision, and recommendations, thereby improving the effectiveness of organizational development and support.

The implementation of the Supervisor Dashboard also enhances the efficiency of the monitoring process by eliminating the need to manually review administrative documents individually. Since all relevant information is integrated and updated in real time, supervisors can perform monitoring activities more quickly, systematically, and efficiently.

Dashboard Key Performance Indicator Role Student Organization (Ormawa)

The **Student Organization Dashboard** displays the **Key Performance Indicators (KPIs)** of the student organization currently logged into the system. The dashboard is designed to monitor organizational performance in real time through informative and well-structured data visualizations. The information presented focuses exclusively on the organization's own performance, enabling users to independently monitor the progress and achievements of their work programs and organizational activities.

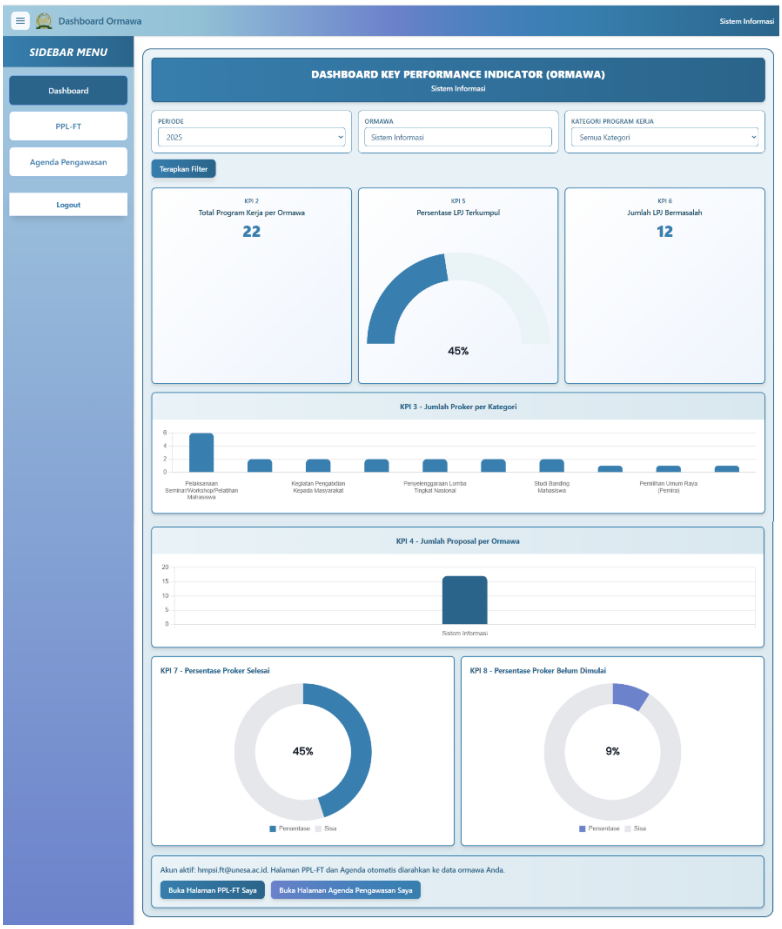


Figure 4. Dashboard KPI Student Organization (Ormawa)

Based on the implementation results shown in **Figure 4**, the Student Organization Dashboard successfully provides comprehensive information regarding the organization's performance and achievements. The dashboard presents information on the total number of work programs, proposal status, the percentage of submitted accountability reports (LPJ), and the completion rate of organizational work programs. Presenting this information through interactive visualizations enables users to quickly understand their organizational performance and evaluate the progress of ongoing activities.

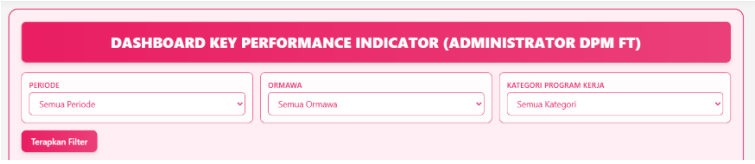
In addition to serving as a monitoring tool, the dashboard also functions as an internal evaluation platform for student organizations. Users can monitor the implementation status of work programs, assess the completeness of administrative documents, and identify documents that still require follow-up actions. These insights are expected to improve organizational awareness and discipline in fulfilling administrative requirements and implementing work programs according to the planned schedule.

The implementation of the Student Organization Dashboard enables organizations to conduct independent monitoring and evaluation without relying on reports from other parties. Furthermore, the dashboard enhances transparency, accountability, and the overall effectiveness of student organization management by providing integrated, real-time, and easily understandable information

Interactive Dashboard Features

The dashboard is equipped with interactive features to improve user flexibility by providing filtering options based on student organization, organizational period, and work program category within the Faculty of Engineering. These features allow users to analyze data according to their specific needs, making the dashboard more dynamic, informative, and adaptable. By enabling flexible data exploration, the interactive features enhance the effectiveness of the dashboard as a data analysis and decision-support tool.

The interactive feature in the **DPM FT Administrator Dashboard** is implemented through dropdown filters that simplify the monitoring and analysis of student organization data. The available filters include **organizational period, student organization, and work program category**, allowing administrators to display information according to specific analytical requirements. Based on the selected filters, the KPI visualizations are automatically updated in real time, making the evaluation process more flexible, efficient, and informative.



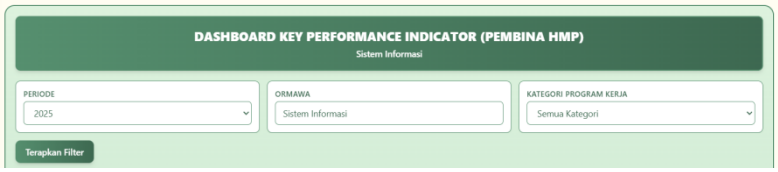
Fiture 5. Role Administrator DPM FT Filter Dropdown

The interactive feature on the Administrator DPM FT dashboard is implemented through dropdown filters to facilitate the monitoring and analysis of student organization data. The available filters include period, student organization (Ormawa), and work program category, allowing administrators to display information according to specific monitoring requirements. By applying these filters, the KPI visualizations on the dashboard are automatically updated in real time, enabling a more flexible, efficient, and informative evaluation process.



Fiture 6. Role student organization (Ormawa) Filter Dropdown

The interactive feature on the **Supervisor** dashboard is designed to facilitate the monitoring of student organizations under each supervisor's responsibility. The available filters allow supervisors to select the **period** and **work program category**, enabling the displayed KPI data to be adjusted according to specific monitoring and evaluation needs in real time. As a result, supervisors can analyze organizational performance more efficiently and make timely decisions based on up-to-date information.



Fiture 7. Role Supervisor (Pembina) Filter Dropdown

CONCLUSION

This research successfully implemented a website-based *Business Intelligence* dashboard using *Key Performance Indicators* (KPI) at DPM FT UNESA to support the monitoring and evaluation of student organizations. The system integrates ten KPI designed using the SMART method and processes organizational data automatically through the CRISP-DM methodology, enabling real-time monitoring and data-driven

decision-making. The dashboard presents information using *KPI Cards, Bar Charts, Donut Charts, Gauge Charts,* and *Line Charts*, while the implementation of *Role-Based Access Control* (RBAC) ensures that each user accesses information according to their respective roles and responsibilities. The proposed system contributes to improving the effectiveness, transparency, and efficiency of organizational performance monitoring and provides a practical implementation of *Business Intelligence* for student organization governance.

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