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Development and Design of an Insight Dashboard Using the Laravel Framework

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Abstract

The increasing demand for data-driven governance in higher education requires institutions to develop effective systems for managing, analyzing, and presenting academic information to support strategic decision-making. Conventional manual data management processes often create challenges related to data accuracy, accessibility, reporting efficiency, and institutional quality assurance. This research aims to develop an Insight Dashboard using the Laravel framework to support academic performance monitoring and improve data-based decision-making at the Quality Assurance Institute (LPM) of ITENAS Bandung. The research employed the Cross Industry Standard Process for Data Mining (CRISP-DM) methodology, consisting of business understanding, data understanding, data preparation, modeling, evaluation, and deployment stages. The developed system integrates academic data processing and interactive visualization features to display key performance indicators, including research productivity trends, publication outputs, citation performance, indexed journal distribution, and academic unit comparisons. The results indicate that the dashboard successfully transforms institutional academic data into meaningful insights through dynamic filtering, automated calculations, and visualization components. The system presents important performance indicators, such as total publications, citation impact, publication quality levels, and research output trends, enabling stakeholders to conduct more accurate evaluations and formulate evidence-based strategies. In conclusion, the Insight Dashboard provides an effective solution for strengthening higher education quality management by facilitating continuous monitoring, improving information accessibility, and supporting sustainable data-driven institutional development. Future research may expand the system by incorporating predictive analytics and additional academic performance indicators.

INTRODUCTION

In today's digital era, computer-based information processing has become an integral part of various sectors, including higher education institutions that are required to continuously improve their quality and accountability. One of the main benchmarks of institutional quality is through periodic accreditation processes, which require accurate, structured, and accessible data management (Mahanti, 2019). As the need for data collection for quality management increases, reliance on manual systems can lead to a variety of issues, such as input errors, data loss, and additional management workloads (Jangam & Muntala, 2023; Williams & Tang, 2020).

The National Institute of Technology (ITENAS) Bandung, through the Quality Assurance Institute (LPM), has a vital function in ensuring quality and preparing for accreditation needs. However, LPM Itenas still faces significant challenges due to data management, which is still

mostly done manually. This condition limits the ability to conduct in-depth analysis and optimal strategic decision-making (Kahagalage et al., 2024; Laureiro-Martínez & Brusoni, 2018). In fact, data-driven decisions have proven to be much more effective. A study from MIT shows that companies that implement data-driven decision-making have 5-6% higher productivity than those that do not (Brynjolfsson et al., 2011).

To overcome these challenges, LPM Itenas requires a centralized system that is able to automate the process of data collection, processing, and presentation (Ferri & Ikhbar, 2023; Khairunnisa et al., 2025). The proposed solution is the development of a dashboard, which is a visual display containing the information needed to achieve the goal, which is designed to be understandable at a glance (Prasetiya & Susilowati, 2016). This insight dashboard will be specifically designed to monitor the performance of lecturers and students based on 15 Key Performance Metrics (KPIs) set by the National Accreditation Board for Higher Education (BAN-PT). With this dashboard, it is hoped that LPM Itenas can switch from intuitive decision-making to data-based, factual, and more accurate decisions to support sustainable institutional quality improvement (Damiyano, 2025).

In the current digital transformation era, higher education institutions worldwide are experiencing increasing pressure to strengthen institutional governance through effective data management and evidence-based decision-making (Elugbaju et al., 2024; Magakwe, 2025). Universities are no longer only required to produce academic outputs but also to demonstrate accountability, transparency, and continuous quality improvement through measurable performance indicators (Talukder, 2025). The rapid growth of digital information has created substantial opportunities for universities to utilize institutional data as a strategic asset. However, many higher education institutions still face challenges in transforming fragmented academic data into meaningful information that can support managerial decisions. The inability to optimize institutional data may reduce the effectiveness of quality assurance processes, accreditation preparation, and long-term strategic planning.

The demand for data-driven governance in higher education has become increasingly important as accreditation systems and global university rankings emphasize measurable performance indicators, including research productivity, publication quality, academic outcomes, and institutional effectiveness. Previous studies have demonstrated that organizations implementing data-driven decision-making achieve improved operational performance because decisions are based on factual evidence rather than intuition alone. Brynjolfsson et al. (2011) reported that organizations adopting data-driven management practices tend to achieve higher productivity compared with organizations relying on traditional decision-making approaches. This phenomenon indicates that educational institutions require integrated information systems capable of converting large-scale academic datasets into actionable insights.

Despite the availability of academic information systems, many universities continue to experience limitations in utilizing institutional data for strategic monitoring. Data are frequently stored in separated databases, processed manually, and presented through static reports that require significant time and human resources. Such conditions may lead to delayed decision-making, inconsistencies in reporting, and difficulties in identifying performance trends. In the context of quality assurance, these challenges become more critical because accreditation processes require accurate, structured, and accessible evidence regarding institutional

performance. The manuscript identifies that LPM ITENAS Bandung still encounters difficulties because academic performance data management remains largely dependent on manual processes, limiting the institution's ability to conduct comprehensive analysis and generate strategic insights.

One potential solution to overcome these challenges is the development of an interactive dashboard that integrates data processing, visualization, and performance monitoring functions (Afrin, 2025; Kobi, 2024). Dashboards have increasingly been adopted in various organizational contexts because they provide concise visual representations of complex datasets, allowing decision-makers to understand performance conditions quickly. In higher education environments, dashboards can support administrators in monitoring research productivity, publication trends, accreditation indicators, and academic achievements. Previous studies have highlighted that visualization-based systems improve information accessibility and facilitate managerial interpretation by transforming raw data into meaningful patterns.

Several previous studies from information systems and data analytics fields have explored dashboard development for organizational decision support (Sultana, 2025). Research on business intelligence dashboards has demonstrated that visualization platforms can enhance organizational responsiveness by providing real-time or near-real-time performance information. Similarly, studies regarding academic analytics have emphasized the importance of integrating institutional data sources to support strategic planning and quality improvement (Gonugunta & Leo, 2024; McNaughton et al., 2017). However, many existing studies focus primarily on student learning analytics, academic attendance monitoring, or general institutional reporting, while fewer studies specifically address dashboard development for higher education quality assurance units responsible for accreditation and institutional performance evaluation.

Furthermore, previous dashboard development research often emphasizes the technical aspects of system construction without deeply considering the alignment between dashboard indicators and institutional quality assurance requirements. The challenge is not only developing a visualization interface but also ensuring that the displayed information represents relevant performance metrics required by institutional stakeholders. The manuscript addresses this issue by designing an Insight Dashboard specifically for LPM ITENAS Bandung, incorporating 15 key performance indicators (KPIs) related to lecturer and student performance monitoring, research productivity, publication outputs, and accreditation requirements. Therefore, the research gap lies in the limited availability of integrated academic dashboards that combine data processing, visualization, and quality assurance-oriented performance evaluation within a higher education context.

The urgency of this research is strengthened by the increasing need for universities to adopt sustainable digital governance models. Without an integrated analytical platform, quality assurance units may experience difficulties in identifying performance weaknesses, comparing achievement levels among academic programs, and designing targeted improvement strategies. A dashboard-based approach provides an opportunity to shift institutional management practices from reactive reporting toward proactive decision-making. Through systematic visualization of academic trends, decision-makers can identify areas requiring intervention, allocate resources more effectively, and develop policies based on empirical evidence.

The novelty of this research is demonstrated through the development of an Insight Dashboard that integrates Laravel-based web application development with the CRISP-DM methodology for academic performance analytics. Unlike conventional reporting systems, the proposed dashboard does not merely display static information but provides interactive visualization features, dynamic filtering based on year, study program, journal level, and citation performance. The system also incorporates data processing mechanisms that directly utilize institutional academic databases, enabling more accurate and structured analysis. This approach provides a practical model for implementing data-driven quality assurance systems in higher education institutions.

The development process also contributes methodological value by demonstrating how CRISP-DM can be adapted beyond traditional data mining applications into institutional performance monitoring systems. Through stages including business understanding, data understanding, data preparation, modeling, evaluation, and deployment, the research provides a structured framework for transforming academic data into strategic information. The integration of Laravel framework technology further contributes technical value by providing a scalable and modular architecture capable of supporting future expansion of institutional analytics systems.

Based on these considerations, this research aims to design and develop an Insight Dashboard using the Laravel framework to support academic performance monitoring and data-driven decision-making at LPM ITENAS Bandung. Specifically, this study seeks to develop an integrated visualization system capable of presenting research productivity trends, publication performance, citation impact, and academic achievement indicators in an accessible format. The contribution of this research is expected to provide both theoretical and practical benefits: theoretically, it enriches studies on academic analytics and higher education information systems; practically, it assists institutional leaders, quality assurance managers, and academic stakeholders in improving decision-making processes, strengthening accreditation preparation, and supporting continuous institutional quality improvement.

METHOD

In the development of this dashboard, the author applied the Cross Industry Standard Process for Data Mining (CRISP-DM) methodology. This methodology serves as a standard framework that divides the data project into six systematic stages. The implementation of each stage of CRISP-DM that the author carried out during practical work activities is described in detail in the following points.

1. Business Understanding
   This phase is the initial phase that focuses on understanding the context and objectives from the business side. This stage is crucial to define project goals and ensure that the dashboard built can provide added value for Itenas LPM. At this stage, the authors identify the need for key metrics (KPIs) required for monitoring accreditation and research performance.
2. Data Understanding
   At this stage, an initial exploration of the available data is carried out. The goal is to gain insight into the characteristics, structure, and quality of raw data sourced from academic

databases. This understanding is the basis for determining the limitations of analysis and choosing the right visualization method.

3. Data Preparation
   This stage includes all activities to process the raw data to make it ready for use. To ensure the quality and structure of the data, the authors apply the ETL (Extract, Transform, and Load) process as the main mechanism in this stage (Wijaya & Pudjoatmodjo, 2016).
4. Modeling
   In this phase, an in-depth Data Analysis process is carried out. Data that have gone through the ETL process are grouped and summarized to produce valuable conclusions (Sarie et al., 2023). The visualization model was developed using the ApexCharts library to represent the data into a graph (such as a bar chart or line chart) that is able to answer the business objectives that have been formulated at an early stage.
5. Evaluation
   Furthermore, after the dashboard and visualization model are created, the results are critically assessed. This stage aims to ensure that the information displayed is valid, accurate, and truly useful to the stakeholders. The evaluation was carried out by matching the results of the visualization with the initial needs of LPM Itenas.
6. Deployment
   This is the final stage where the results of the analyzed analysis that have been evaluated are implemented into the operational environment. The dashboard system is integrated so that it can be actively used by LPM Itenas to support strategic and operational decision-making.

RESULTS AND DISCUSSION

Specification Requirements

Functional Requirements defined the services and key features provided by the system to users. At this stage of implementation, all features are developed to support the process of performance monitoring and interactive data visualization.

Table 1. Functional Needs

Needs ID	Description
FR-PEN-AN-01	The system is able to calculate the total number of studies per year and display it in the form of a trend graph of the last 3 years.
FR-PEN-AN-02	The system is able to calculate **the average** number of research per permanent lecturer in the last 3-year period.
EN-PEN-AN-03	The system is able to calculate and display the amount of research funding received based on the source category (Internal, National, etc.).
FR-PEN-AN-04	The system is able to group and display outputs (publications, copyrights, patents, books, etc.) from each research.
EN-PEN-AN-05	The system is able to display the relationship between the researcher and the lecturer, including the involvement of the lecturer in several studies (it can be many-to-many).

Based on the details in the table above, the functional needs of the system are focused on five key aspects of research data analytics. The selection of these five aspects aims to cover all crucial academic performance indicators, from publication productivity to the impact of citations produced. The elaboration of the five main focuses can be seen in the following points.

1. Performance Trend Analysis (FR-PEN-AN-01 & FR-PEN-AN-02) The system is designed to provide a time-series overview of research productivity. This feature processes historical data for the last 3 years to display a graph of the growth trend in the number of studies and calculate the average productivity ratio per lecturer. This information is crucial for LPM to see the consistency of academic performance from year to year.
2. Mapping Resources and Outputs (FR-PEN-AN-03 & FR-PEN-AN-04) The system has the ability to classify data based on financial categories and output types. Users can monitor the composition of research funds (Internal vs External) as well as see the distribution of research outputs (Journals), which is an important indicator in accreditation assessment.
3. Data Relationship Integrity (FR-PEN-AN-05) The system handles complex data relationship logic (many-to-many). This ensures that one research title conducted by a team (more than one lecturer) can be recorded and linked to each lecturer's profile accurately without duplicating incorrect data.

Non-Functional Needs

As a complement to the functional specifications, the system is also built with a series of non-functional needs in mind. This aspect includes response time limitations, data security, and interface comfort to maintain system stability when processing large amounts of data.

Table 2. Non-Functional Needs

Needs ID	Description of Non-Functional Needs
NFR-01	The system is able to calculate and display the total number of research per lecturer and per year in less than 3 seconds. Even when processing 1,000+ entries.
NFR-02	The system is able to provide search features and research filters by year, source category, and funding scheme with an easy-to-understand interface.
NFR-03	The system is capable of having a responsive and intuitive user interface (UI), so users can input research data in less than 20 seconds per entry without any special training.
NFR-04	The system is able to implement login authentication and role-based access control to prevent changes to research data by unauthorized users
NFR-05	The system is capable of maintaining the integrity of the data, including automatic validation that jumlah_dana is not negative and that the year is within the logical range (e.g., 2000–TS).
NFR-06	The system is able to handle the increment of research data of 500 entries per semester without degradation of search query or reporting performance

Based on the table above, system quality standards are grouped into three main pillars to ensure sustainability and comfort, as the author conveys in the points below.

1. Performance and Scalability (NFR-01 & NFR-06) Systems are optimized to maintain response time efficiency. The main target is the presentation of visual data in less than 3 seconds, although the volume of data continues to increase as the semester progresses. This ensures that the dashboard remains responsive and doesn't experience performance degradation (lag) when handling thousands of historical research data in the future.
2. User Comfort and Efficiency (NFR-02 & NFR-03) The usability aspect is a priority so that the system can be used without the need for intensive training. The interface is intuitively designed to speed up the workflow of lecturers or admins, with a short target data input time (less than 20 seconds) and easy navigation in searching and filtering specific data.

3. Data Security and Integrity (NFR-04 & NFR-05) To guarantee the validity of information, the system implements a layered defense mechanism. In terms of access, role-based authentication (Role-Based Access Control) is applied to restrict access rights. In terms of data, the system has automatic logic validation (such as rejecting negative fund values or illogical years) to prevent human error that can damage the accuracy of reports.

Data Preparation

The data processing implementation stage is a technical realization of the Data Preparation phase in the CRISP-DM method. Before the data can be visualized on the dashboard, a raw data acquisition process is carried out to ensure the validity and availability of the information. In this system, data is not manually inputted one by one, but is extracted from the central academic database (SIKAD). This is done to maintain the integrity of the data so that it is in sync with the university's data. The following is a breakdown of the specifications of the data sources used in the implementation process:

Table 3. Source of Insight Data

Data Name	Data Source	Collection Method	Frequency	Format Data	Insurer Answer
Research Data (Details & Totals)	SIKAD (via *phpMyAdmin*)	UPT ICT exports data using *the SQL queries* that have been provided.	Per Year	*SQL*	UPT TIK Itenas
Publication Data	SIKAD (via *phpMyAdmin*)	UPT ICT exports data using *the SQL queries* that have been provided.	Per Year	*SQL*	UPT TIK Itenas
Work Recognition Data	SIKAD (via *phpMyAdmin*)	UPT ICT exports data using *the SQL queries* that have been provided.	Per Year	*SQL*	UPT TIK Itenas

Based on the details of the data sources above, there are several technical aspects that are implemented in the system workflow:

1. Data Person in Charge, Data is obtained directly from the Itenas ICT Unit as the person in charge of official data. This ensures that the research data displayed on the dashboard is valid and verified data, not assumption data.
2. Format and Compatibility (Data Format) Since the data is received in SQL format, the integration process into the system is carried out through the import database mechanism. This makes it easier to migrate data into the MySQL table structure that has been built in sub-chapter 4.2 without the need to perform complex format conversions (such as from Excel or PDF).
3. Update Cycle (Frequency) The nature of data updated Per Year affects the design of the system backend, where the system is focused on handling batch processing (processing large amounts of data at once) at the end of the academic period, rather than real-time streaming.

Modelling

Based on the results of the needs analysis, an interactive dashboard visualization was designed that aims to present comprehensive academic performance data. This dashboard provides hierarchical data visualization, from executive summaries to granular data breakdowns. This is aimed at facilitating stakeholders, such as Faculty and Study Program Leaders, in monitoring performance trends and supporting data-driven strategic decision-making.

From a technical point of view, this application is built using the Laravel framework. The data management mechanism is designed efficiently where the system does not migrate or duplicate bulk data to separate storage. Instead, the data is loaded dynamically (on-the-fly) directly from the SIKAD database whenever there is a request from the user. This process is managed by a Service Layer that leverages Eloquent ORM to interact with the database.

Before moving on to user functionality, the initial stage of implementation is focused on building the technical architecture that is the backbone of the system. This architecture is designed to ensure that the flow of data from the database to the user interface runs efficiently and structured. The system is built using the Laravel framework by implementing a Service Layer design pattern to separate business logic from controllers.

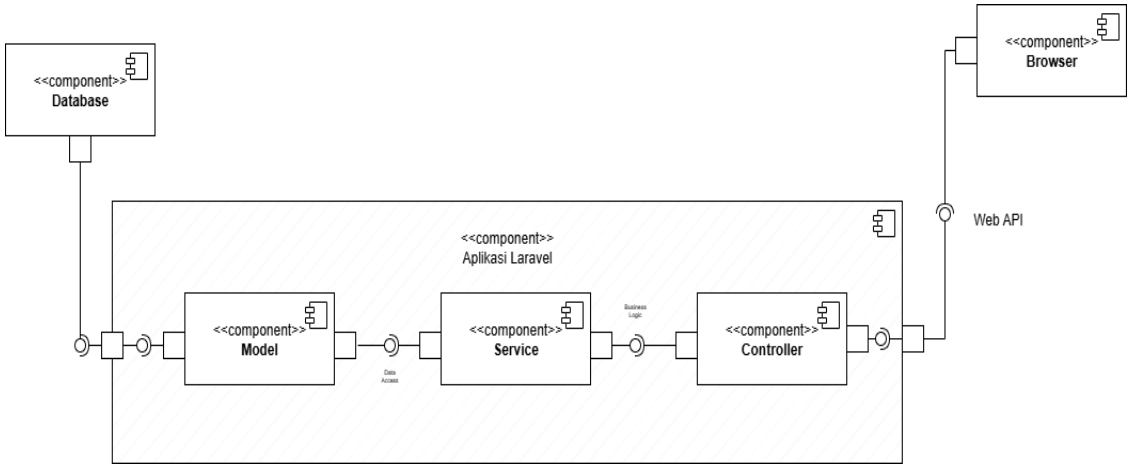

Figure 1. Architectural Component Diagram

Based on the above component diagram, the system architecture consists of three main layers that are integrated with each other:

1. Model & Database: Responsible as a data access layer (Data Access) that retrieves raw data directly from physical storage.
2. Service: Acts as the centre of business logic. This is where the entire process of KPI calculation, data aggregation, and data cleansing is done before it is sent to the user.
3. Controller & Browser: Handles client-side HTTP requests and presents visual responses.

This structure guarantees that the system has a modular foundation and is ready to handle complex data requests.

Visualization

Once the data processing logic and backend architecture have been successfully implemented, the next stage is the development of the user interface.

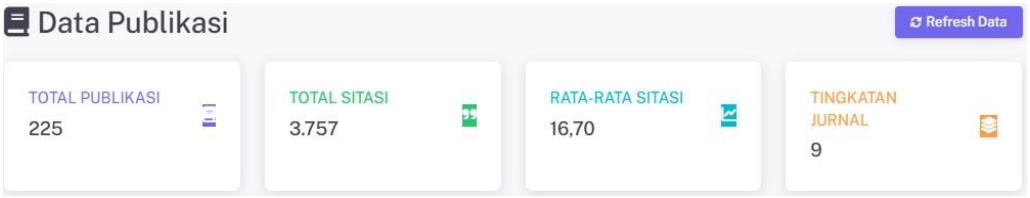

Figure 2. Publication Scorecard

As part of the main view of the dashboard, the system presents performance information in the form of a concise panel of metrics (scorecards) as seen in Figure 4.X. This section is designed to provide quick insights to leaders on the current status of academic publications without the need to manually drill down through raw data.

Based on the image above, there are four key performance indicators (KPIs) that are displayed as a result of the calculation process on the backend side:

1. Total Publications (225): Shows the cumulative number of scientific papers that have been recorded.
2. Total citations (3,757): Represents the academic impact of all publications.
3. Average Citations (16.70): This is the result of the division between the total citations and the total publications, providing an overview of the average quality per work.
4. Journal Level (9): Indicates the diversity of the classification of the journal in which the publication is published.

In addition, in the upper right corner there is a 'Refresh Data' feature button. This feature allows users to retrigger the data fetching process from the server in real-time, ensuring that the numbers displayed are always up-to-date according to the latest data conditions.

Figure 3. Publication Output Quality Indicator

In addition to displaying absolute numbers, the system also presents proportional analysis to measure the quality of research outputs more objectively. Figure 3 shows the Indexed Journal Output Percentage indicator panel. This panel serves to monitor how much research lecturers have managed to penetrate high-reputable publications.

This visual component breaks down the data into four informative metrics:

1. 3-Year Average (5.00%): Displays historical performance baseline as a benchmark to compare whether current performance has increased or decreased.
2. Total Research (2,572) & Indexed Publications (86): Presents ratio-forming data transparently, so that users understand the origin of percentage numbers.
3. Output Percentage (3.34%): This is the result of the system's automatic calculation ({86/2572}x100%) that shows the performance achievement in the current period.

This feature also comes with an Operational Definition visible at the bottom of the panel (info icon), which confirms that the 'Indexed' category only includes reputable journals Scopus (Q1-Q4) as well as Sinta 1 and Sinta 2. This logic filter is applied to the Service Layer to guarantee that the data presented is valid for accreditation needs.

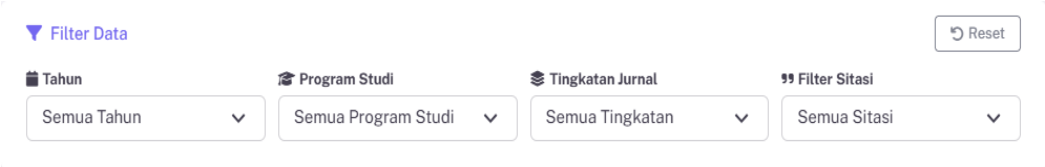

Figure 4. Publish Data Filter

One of the key features that ensures the interactivity of the INSIGHT system is the dynamic data filtering mechanism, as shown in Figure above. This panel allows users to narrow the scope of analysis according to their specific needs.
The system provides four main dimensions of combined filters:

1. Year: For temporal trend analysis (e.g., looking at 2023-specific performance).
2. Study Program: Allows comparison of performance between academic units or focuses on one specific study program.
3. Journal Tier: Filters outputs based on publication quality (for example, showing only Scopus-indexed journals).
4. Citation Filter: Filters works based on the impact of citations obtained. Technically, any changes made to this dropdown will trigger an asynchronous request (AJAX Request) to the Controller. The filter parameters are then sent to the Service Layer to modify the WHERE clause in the database query, so that all visualization components on the page (such as scorecards and graphs) will be updated automatically (real-time updates) without the need to reload the page. There is also a 'Reset' button to quickly restore the dashboard to its default state (global view).

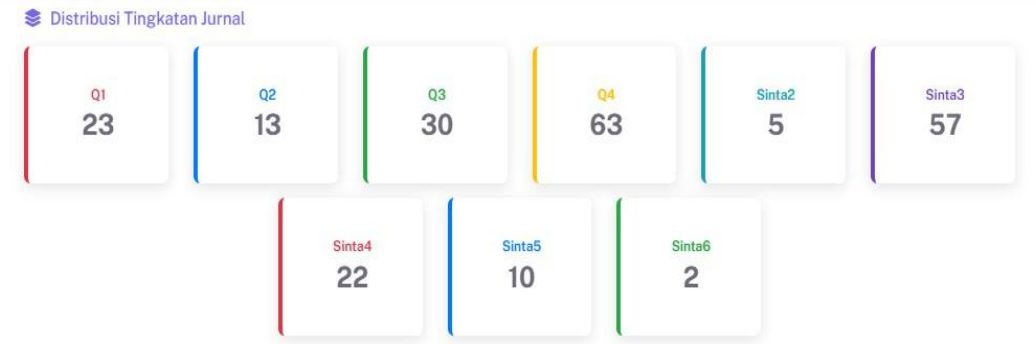

Figure 5. Publication Journal Level Distribution

To provide a more specific mapping of publication quality, the system presents the Journal Level Distribution panel as seen in the Figure above. This visualization breaks down the total publications into accreditation clusters, both at the international (Scopus Q1–Q4) and national (Sinta 2–6) levels.

The presentation of data in the form of individual metric cards aims to make it easier for leaders to identify the distribution pattern of publications. Based on the data in the figure, it can be analyzed that the majority of international publications are concentrated in the quartile of Q4 (63 titles) and Q3 (30 titles), while the national category is dominated by Sinta 3 (57 titles).

This distribution information is very crucial for the Dean and Head of Study Program to develop a quality improvement strategy, for example by encouraging lecturers who have published a lot of work in Q4 and Q3 to start targeting Q2 or Q1 journals (which currently have 13 and 23 titles) to improve the institution's reputation.

Figure 5. Line Chart Publication

To complement the performance analysis, the system provides a time-series-based data visualization feature as shown in Figure 4.8. This line chart serves to map the evolution of lecturers' research productivity from year to year, so that leaders can identify patterns of growth, stagnation, or decline in performance.

Based on this visualization, it can be drawn that the productivity of publications has experienced an exponential upward trend in the last five years. The surge in performance was seen significantly starting in 2020 (23 titles) and reaching its peak in 2024 with a total of 66 publication titles. This historical information is vital for the faculty to evaluate the effectiveness of the research incentive policies that have been implemented.

In addition to the analysis function, this graph is also equipped with an interactive feature in the upper right corner (toolbar), which allows users to zoom in, shift the area (pan), and download the visualization in image format (PNG/SVG) for the purpose of compiling annual reports.

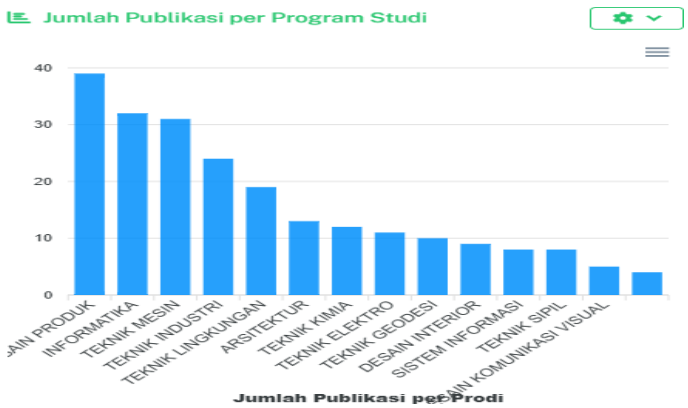

Figure 6. Publication Chart Bar

To dissect the performance of publications down to the level of operational units, the dashboard presents a comparative graph between Study Programs (Prodi) as seen in Figure 6 This visualization uses a bar chart model that is sorted in descending order from the largest number to the smallest, making it easier for leaders to recognize the map of research strength in the faculty environment instantly.

From the data presented, it can be seen that there is a significant variation in productivity between units. The Product Design and Informatics Study Program occupies the top position as the largest contributor of publications (in the range of 30-40 titles), while several other study programs still need a strategic boost to increase the quantity of their research outputs.

This comparative information has high strategic value for the Dean in formulating evidence-based policies. High-performing units can be given incentives or appreciation, while low-productivity units can be given special mentoring or journal writing workshops to balance the overall academic performance of the faculty.

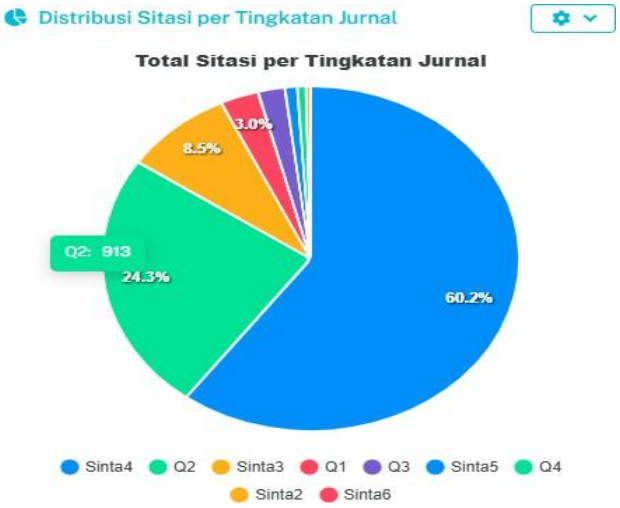

Figure 7. Pie Chart Publications

To measure the academic impact of the resulting publications, the system presents a visualization of the Citation Distribution in the form of a pie chart as shown in the Figure above. This diagram maps the percentage of citation contributions from each journal level to the total faculty citations. Unlike the number of publications graph, this graph provides insight into the quality and visibility of research. Based on the data displayed, it can be seen that the dominance of citations comes from journals in the Sinta 4 category of 60.2%, followed by reputable international journals in Q2 which accounted for 24.3% (with a total of 913 citations). This feature also comes with hover interaction (as seen on the green label 'Q2:913'), which allows users to see the absolute numerical details of each piece of the diagram. This information is very crucial for faculty journal managers and leaders to find out at which level lecturers' writings are most referred to by other researchers.

Evaluation

Based on the stage of identifying needs and analyzing the business processes that have been carried out, functional requirements specifications for the Research Data Analysis module are prepared. This need is designed so that the system is able to process data automatically, from statistical aggregation to visualization of performance trends.

Table 4. Test Case

Id. at 1	Test Steps	Expected Result	Actual Result Manual Testing	Status
TC-PEN-AN-01	Validating Research Trend Charts of the Last 3 Years	The graph accurately displays the data on the number of studies over the past 3 years	Trend charts successfully display by year range and amount of data	Pass
1.1	Go to the Research Dashboard menu	Dashboard page opens	Open page	Pass
1.2	Navigate cursor (hover) on the research bar chart/trend line	The tooltip displays the number of research per year (e.g.: 2023, 2024, 2025)	Tooltip appears and numbers as per database	Pass
TC-PEN-AN-02	Validate Calculation Average Research per Lecturer	The system displays valid average numbers (Total Research / Number of Lecturers)	Average number Valid according to the formula Manual calculation	Pass
2.1	See on the information card (Card) "Average Research per Lecturer"	The average number of studies appears	Numbers appear with the exact decimal	Pass
2.2	Compare the numbers on the dashboard with Manual calculation of raw data	The numbers on the dashboard are the same as the calculation results Manual	Synchronous calculation results	Pass

Dashboard Insight

This interactive dashboard is designed to present a comprehensive analysis of research and publication performance through a variety of dynamic data visualizations. By utilizing the filtering feature based on Year, Study Program, Journal Level, and Number of Citations, this dashboard allows stakeholders to segment data in a granular manner. Key metrics such as Total Publications (225 titles), Total Citations (3,757), and Average Citations (16.70) are calculated in real-time, providing an accurate picture of current academic productivity and impact. As a key performance indicator, the system also displays the Percentage of Research Output in the form of indexed journals calculated by comparing the number of reputable publications (Scopus & Sinta 1-2) to the total research.

From the data presented, several strategic insights can be drawn. First, the trend of publication productivity shows consistent positive growth since 2019, with a significant spike reaching its peak in 2024 as many as 66 publications. Secondly, although the quantity is increasing, the quality side of the output still requires special attention; It is recorded that the percentage of indexed journal output is currently at 3.34%, which is still below the baseline of the last 3 years average of 5.00%. Third, the distribution of publication contributions varies between academic units, where the Product Design and Informatics study program appears as the main contributor with the highest number of publications compared to other study programs.

Overall, this dashboard not only facilitates real-time monitoring of research trends, but also provides an empirical foundation for decision-makers (such as LPPM or Dean). This information is crucial to formulate strategies to improve the quality of outputs, such as through

incentives for writing indexed journals—as well as equitable distribution of research productivity across study programs to improve the institution's reputation (Xu et al., 2021). This dashboard project is part of the development of a broader lecturer performance monitoring system. The in-depth analysis of the system as a whole is beyond the scope of this report and is documented separately.

CONCLUSION

The development of the Insight Dashboard using the Laravel framework successfully provides an integrated platform for monitoring and analyzing academic performance data at LPM ITENAS Bandung. By implementing the CRISP-DM methodology, the research successfully transformed raw academic data into meaningful information through structured processes involving data understanding, preparation, modelling, evaluation, and deployment. The developed dashboard is capable of presenting key performance indicators, including publication trends, citation performance, indexed journal output, research productivity distribution, and academic unit comparisons through interactive visualization features. The system enables stakeholders to access accurate and structured information to support evidence-based decision-making, replacing conventional manual reporting processes that are less efficient and prone to data management limitations. The implementation of dynamic filtering, automated data processing, and visualization components demonstrates that the dashboard can function as an effective decision-support tool for strengthening institutional quality assurance, improving accreditation preparation, and supporting continuous academic performance improvement. Future research should focus on expanding the dashboard capabilities by integrating broader institutional performance indicators beyond research and publication data, such as teaching performance, student achievement, community service activities, and financial performance indicators. Further studies may also evaluate the usability, effectiveness, and user acceptance of the system involving wider stakeholders, including faculty leaders, study program managers, lecturers, and quality assurance teams. The integration of predictive analytics, machine learning approaches, and real-time data processing could also be explored to develop a more advanced intelligent dashboard capable of forecasting academic performance trends and recommending strategic interventions. In addition, future development should consider interoperability with national higher education data platforms and other institutional systems to create a more comprehensive academic analytics ecosystem that supports sustainable digital transformation in higher education institutions.

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