

## **Developing Tourism Performance Dashboard for National Tourism Organisation: The Case of Indonesia**

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### **Abstract**

The tourism industry represents a significant component of the Indonesian economy, necessitating effective management and monitoring to facilitate the recovery process and ensure sustainable growth. We can construct a thematic dashboard that furnishes real-time insights and visualizations for expeditious data analysis by employing the most recent technological advances. This research examines and develops a conceptual framework for a data structure and infrastructure that is fundamental to the creation of the Tourism Performance Dashboard. The dashboard underscores the significance of the tourism sector in fortifying national economic resilience. To attain this objective, the dashboard monitors six key performance indicators. This study employs a user-centered design approach through document analysis and focus group discussions to identify essential features necessary for the dashboard. The resulting dashboard prototype exemplifies data interoperability and analytical capabilities, which have considerable potential to enhance the management of Indonesia's tourism industry.

**Keywords:** Tourism Performance Dashboard, Kipling, CHSE, Travel and Tourism Development Index

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### **A. INTRODUCTION**

As the global pandemic of the novel coronavirus (COVID-19) transitions into an endemic state, the tourism industry is demonstrating signs of gradual recovery. Effective management and monitoring are essential for tourism to achieve sustainable growth, particularly given the need for recovery processes in this sector. This condition creates new competitive dynamics among tourism businesses, products, and destinations, with the aim of attracting tourists through a new normal scheme that provides guarantees regarding cleanliness, health, safety, and environmental sustainability (CHSE) (Saepudin & Putra, 2023)

To facilitate the transition and as part of an effective marketing and management strategy, it is essential that each tourism destination possess accurate information and up-to-date data regarding its internal performance, market situation, and the performance of competitors. However, the current state of affairs remains suboptimal. As an example, Lake Toba, designated as one of the super priority destinations by the Ministry of Tourism and Creative Economy (MOTCE), should have an easily accessible and updated document relating to internal performance in the tourism and creative sector, in addition to North Sumatra's foreign tourist key market data. Nevertheless, researchers encountered difficulties such as an incomplete data set (last updated in 2022), as seen in Figure 1. It is of the utmost importance to resolve this issue, as the current situation makes data a fundamental element for the formulation of well-informed and evidence-based decisions. Once we resolve these data issues, technology can aid in data analysis and visualization by implementing appropriate functions and indicators. Consequently, the initiation of this process necessitates the implementation of analytical techniques, the formulation of conceptual designs, and the establishment of data structures and infrastructure definitions. These elements will subsequently serve as the foundation for the development of the requisite Tourism Performance Dashboard (TPD).

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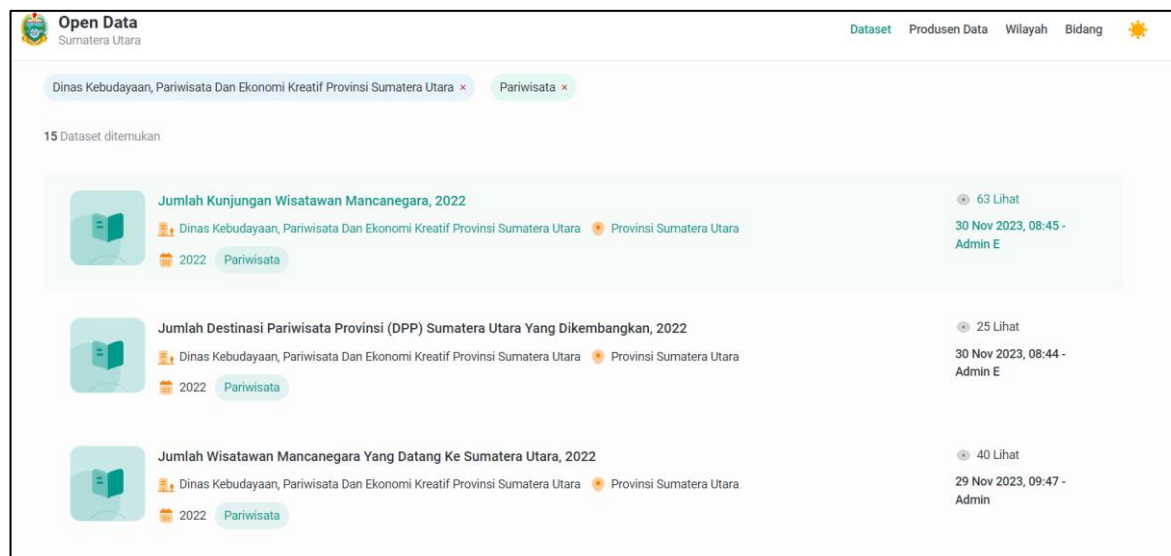


Figure 1. Data gap in North Sumatra foreign tourist visitor open data

The TDP dashboard is designed to assess the role of the tourism sector in supporting national economic resilience. The achievement of this objective, particularly in the context of the tourism sector, is monitored through the measurement of six Key Performance Indicators (KPI), including the foreign exchange value of tourism, the contribution of tourism to Gross Domestic Product (GDP), the size of the tourism sector workforce, the Travel and Tourism Development Index (TTDI) rating, the number of foreign tourist visits, and the number of domestic tourist movements. MOTCE proposes to construct the TPD as a complementary initiative to the UN Tourism Dashboard. The TPD will be enhanced with more comprehensive data sets, particularly regarding the number of international visitors to Indonesia in the current year, a comparative tool for international tourist arrivals in Indonesia with competitor countries, especially in the ASEAN region, and a head-to-head feature for TTDI values. This will enable MOTCE to identify Indonesia's relative strengths and weaknesses in comparison to competitor countries, thereby facilitating the development of more effective policies and initiatives. Therefore, the following objectives will be addressed by this study:

1. Provide a dashboard-based data analysis and visualization tool that will facilitate monitoring the performance of the tourism sector and support the recovery of the industry.
2. Provide a list of different shared data sources that application programming interfaces (APIs) and data scraping can integrate.
3. As part of the suggested marketing strategies, provide the design of both micro and macro data structures, which are necessary for monitoring changes in the tourism landscape and market profiles/characteristics.

## B. LITERATURE REVIEW

Understanding data is the key to making the best decisions for any business and organization. But sometimes, even for people who are highly skilled in data analysis, the sheer amount of information that is always accessible can be intimidating. Creating a dashboard that displays all data visualizations in one place is one of the best ways to make data interpretation easier for both technical and non-technical users. In addition to data visualization, Staron (2015) states that dashboards can accommodate various purposes with different designs, technologies, and scopes. These include disseminating information to a wide

audience or providing information to the management level on project status and parameters. Therefore, thematic dashboards can be defined as visual and data analysis tools designed to focus on a specific theme or purpose. Specific data, business objectives, or areas of analysis can express this theme, aiming to disseminate or provide information. In contrast to general dashboards, which offer a comprehensive overview, thematic dashboards present data visualizations, metrics, and key performance indicators clustered around a specific topic, facilitating a more nuanced understanding of that area. This particular type of dashboard is deemed appropriate for the purposes of TPD implementation that has a tourism theme with various scenarios, including those related to marketing and the destination point of view. Key characteristics of the thematic dashboard:

- Focuses on one theme or topic; for example, a thematic dashboard can focus on health, education, and other topics.
- Contextual and relevant, the data presented is relevant to the theme and supports the user's specific goals in understanding or making decisions based on the theme.
- Consistent design, colors, graphics, and visual elements are usually tailored to align with the theme, easing interpretation and reducing visual distractions.
- Interactivity: modern thematic dashboards are designed to be interactive, allowing users to dig deeper into the data with filters, drilldowns, or clicks on specific elements.

Researchers have conducted numerous studies on dashboard development, specifically focusing on their applications in various contexts. For example, Zulfikri & Abza (2020) created a mobile-based patient monitoring system for individuals infected with the novel coronavirus. They developed this system using the waterfall method and the Java and PHP languages. Subsequently, Isfahani et al. (2020) developed a real-time coronavirus monitoring application that can manipulate and merge data from various sources through an API in the form of JSON. Additionally, Isfahani et al. (2020) developed a real-time coronavirus monitoring application using user-centered design techniques, which involve an iterative system development process that prioritizes users' needs and involves them throughout the process to create highly usable and accessible systems (IxDF, 2016). Ilhamsyah and Rahmayudha (2017) employ a user-centered design approach in the construction of a dashboard for monitoring student evaluations, whereas Sihombing et al. (2018) utilize a prototype dashboard design approach and user-centered design techniques in their research. In some cases, user-centered design techniques are an appropriate approach for TPD dashboards because the goal is to optimize the user experience, provide solutions that truly meet user needs, and necessitate user involvement (Kasata, 2024). The Kipling method (5W 1H) is a frequently used strategic approach in project planning. This method can be beneficial when examining the problem from various angles. The 5 Ws (who, what, where, when, and why) and the 1 H (how) help understand problems, analyze inferences, and identify fundamental facts and guide statements (Lin et al., 2023).

Many fields have applied this type of approach, including the fishing industry (MacKeracher et al., 2021), the evolution of probiotics (Almeida et al., 2020), and rehabilitation (Hayward et al., 2022). Rasyida and Ulkhaq (2016) used the 5W 1H method to identify product quality defects and provide improvement recommendations at PT. Berlina, Tbk. Jia et al. (2015) conducted a case study on cloud software testing, specifically software testing for and on cloud computing platforms, to validate the feasibility of the 5W-1H framework. The selection of this method was based on its ability to effectively outline the Advance Care Planning (ACP) decision-making process among cancer patients, their family caregivers, and healthcare staff (Jinks, 2019). Then Lin et al. (2023), using the Kipling method to elaborate the contextual factors for ACP decision-making among older patients with cancer, strengthened the understanding of complicated end-of-life care decision-making procedures. The researcher posits that the kipping method is suitable for TPD, as this method encompasses the fundamental elements of what, who, when, where, why, and how, which are integral to the core problem of the event to be conveyed.

On software development, there is the research of Mishra and Dubey (2013), which focuses on comparative analysis of software engineering models ranging from traditional to modern methodologies. Then Kumar and Bhatia (2014) and Salve et al. (2018) respectively, discuss and compare several models in the software development life cycle. Each of these studies shares similarities in that each software development method has its own set of advantages and disadvantages. Choosing the correct lifecycle model is particularly crucial in the software industry, as timely delivery and adherence to quality standards are critical. Rapid Application Development (RAD) offers more and less significant advantages and disadvantages compared to the waterfall and prototyping models (Parlika et al., 2022). Therefore, the researcher regards RAD as a good strategy to be utilized in the project because of various advantages.

One of the advantages of RAD is in terms of time efficiency for software development. According to Umar et al. (2022) and Saputra and Saifudin (2022), the RAD method is a time-efficient approach for information system development. RAD can save between 21 and 120 days, although it still relies on the design and complexity of the software development project. Aswati et al. (2017) expressed that while traditional waterfall information system development typically takes at least 180 days, adopting the RAD approach allows for the completion of information system work within 30-90 days. Therefore, the RAD approach is considered a suitable option for software development. Because RAD divides the work process into numerous modules, it speeds up and shortens the software development process, enabling users to access the developed software quickly (Mulyati et al., 2024).

Additionally, there have been discussions about the indicators used to measure tourism development. The study of tourism and the competitiveness of a destination is becoming an increasingly pertinent topic in the context of accelerating globalization, technological advancement, and post-pandemic recovery. One of the studies examines various aspects that affect the performance and competitiveness of the tourism sector, with a particular focus on the Indonesian context. The World Economic Forum (Kusumawardhani, 2020) has identified 14 main pillars. The research offers a comprehensive analysis of the 14 pillars that are of significant importance to the travel and tourism industry. These pillars are of critical importance in assessing a country's tourism performance and competitiveness, particularly in Indonesia. The study concluded that, although Indonesia has significant strengths in its natural and cultural resources, several areas require improvement to enhance its competitiveness in the global tourism market. Furthermore, the study recommended enhancing security measures, improving health and hygiene standards, investing in human resource development, and ensuring sustainable tourism practices.

The results of the 2021 Travel and Tourism Development Index have significant implications for Indonesian policies, particularly in terms of enhanced accessibility and tourist convenience. It is imperative that the government persevere in its investment in tourism infrastructure. Implementing policies that promote sustainable tourism, such as those addressing nature conservation and waste management, is crucial. There is a need for increased adoption of technology in the tourism sector, including the digitalization of tourism services and online promotions, in order to enhance the sector's competitiveness and sustainability. The objective is to enhance the safety and health standards in tourist destinations through the provision of training and certification for industry players in the tourism sector (Saepudin & Putra, 2023).

### **C. RESEARCH METHOD**

As this research employs a user-centered design, it will involve users from the beginning of the project to the end. Users in this research refer to the internal unit and the data and information systems unit. Involving users from the beginning will aid in better requirements planning; content analysis and evaluation of the design will be more targeted. This approach will ensure a balance between business

objectives and user needs in the final design. Figure 2 illustrates the combination of user-centered design and RAD. As seen at figure 2, there are 3 main phases in this research, including requirements planning, content and information analysis, and RAD workshop.



Figure 2. Combination of user-centered design and RAD

### Requirements Planning

Requirement planning is the initial stage of system development, in which researchers conduct data collection through focus group discussions (FGD) and document analysis. Researchers use FGD as a data collection technique to delve deeply into the perspectives and experiences of participants on a specific topic (Kabir, 2016). FGD focuses on gathering data and information about the constructed system, as well as providing an overview of the work unit's overall business process. We conducted four offline FGDs in this research, from July to October. We invited several experts from different scientific backgrounds to the FGDs, along with representatives from other work units. The participants engaged in reviewing and discussing specific aspects to enhance their understanding of the problem at hand. In addition to adding data and information directly related to the available data, the FGD also served as a confirmation event regarding the ongoing business processes and the appointment of a person in charge (PIC) from an internal unit. A summary of the FGDs is as follows in Table 1.

We verified and confirmed the information with the internal unit representative during the Focus Group Discussions. A total of 66 active applications are included in the Application Inventory Document within Kemenparekraf (2022), with the classification of 3 Android-based applications, 1 iOS-based application, and 62 web-based applications identified. A total of 42 applications are included in the go.id domain, 15 applications in the ac.id domain, two applications in the travel domain, and one application in the.id domain. The Ministry of Tourism and Creative Economy 2020-2024 Strategy Plan Revision document serves as a guideline for the planning, implementation, and evaluation of programs revised and activities undertaken by the Ministry of Tourism and Creative Economy in pursuit of its stated vision and mission. Then researchers used the Kipling method to develop a deep grasp of the task ahead using insights and other relevant facts. The kipling method is an extremely simple but seriously powerful way for developing information. This method contains several questions that form the basis of information gathering or problem solving, as in Table 2.

### Content and Information Analysis

The objectives of content analysis include finding relationships and patterns in the efforts and strategies by which content is communicated, understanding the purpose of the content and seeing how it aligns with the purpose for which it was created, and identifying whether there is bias in the content

included (Columbia University, 2023). There are also techniques used in analyzing content and information, namely data modeling and data presentation

**Table 1. FGD Summary**

Month	Implementation	Participant	Summary
July	Junior Expert Researcher in Tourism Management,	PIC	<ul style="list-style-type: none"> <li>TDP is used internally by the Ministry of Tourism and Creative Economy to access data or information that is easy, fast, current, and reliable to answer today's challenges.</li> <li>To develop this TDP, the Ministry of Tourism and Creative Economy 2020-2024 Strategy Plan Revision document is required, namely on 6 tourism key indicators: performance, achievements, and projections.</li> <li>The data access provided by BPS is divided into macro or aggregated data and micro data.</li> <li>Macro data can be accessed and downloaded free of charge from the BPS website or through the BPS mobile application.</li> </ul>
	National Research and Innovation Agency Junior Statistician, Central Bureau of Statistics	Unit data and information system staf	
August	Associate Statistician, Central Bureau of Statistics	PIC	<ul style="list-style-type: none"> <li>Discussion on data collection methodology</li> <li>The development of the TDP will continue to be monitored, and unit data and information system are responsible for data integration and keyword setting.</li> <li>Harmonisation of applications developed by each directorate to be linked to the database via API.</li> </ul> Data visualisation suggestions for TDP:
	Junior Expert Researcher in Tourism Management, National Research and Innovation Agency	Unit data and information system staf	
September	Junior Statistician, Central Bureau of Statistics	PIC	<ul style="list-style-type: none"> <li>The data displayed should have a comparison of previous, current and target data to be achieved.</li> <li>Tourist attractions should display the growth of each province.</li> </ul> We held a special discussion with each PIC to address the existing applications in the work unit, based on the Application Inventory Document in Motce (2022). This discussion will serve as a collaborative effort between the data and information systems unit and other internal units to map, classify, and view the data generated by each application. This marks the initial phase in the planning process for integrating data from internal units within the ministry.
	First Expert Researcher Big Data Management, National Research and Innovation Agency	Unit data and information system staf	
Oktober	First Researcher in Big Data Management, National Research and Innovation Agency	PIC	TDP can help MOTCE monitor the travel patterns, understand future tourism trends, and respond to changes faster. <ul style="list-style-type: none"> <li>AI can help in managing large and complex data and provide deeper insights into better decision-making.</li> <li>AI technology can be used to understand tourist behavior and predict future trends due to the highly dynamic nature of tourism.</li> <li>What needs to be done immediately by MOTCE is to first utilise the existing dashboard and educate</li> </ul>
	Junior Researcher in Tourism Management, National Research and Innovation Agency	Unit data and information system staf	

Junior Researcher in Macroeconomics, National Research and Innovation Agency	the machine first in order present the necessary policies.
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**Table 2. Kipling (5W 1H) Framework**

Question	Common Description	Sequence of Question
Who	The actors involved	Who needs to get involved?
Why	The background of the problem that is the topic	Why is it happening?
What	The product definition and scope for the problem	What is the problem?
Where	The location of an event or problem	Where is it happening?
When	The time information of the problem being discussed	When is it happening? When will you know you have solved the problem?
How	The way and process in which an event takes place	How to overcome the problem?

Adapted from: Lin et al. (2023)

#### *Data modelling*

The process of data modeling involves the simplification of data into information, thereby providing researchers with a clear and readily comprehensible representation of the data set in question (IBM, 2024). The goal is to guarantee that the collected information from various sources and documents meets the initial research objectives. This research utilizes a record-based data model. The record-based data model provides a conceptual framework that is easily understandable to users and aligns with existing computer data storage standards. The database system uses it to outline its comprehensive logical structure and clarify its implementation. The data display follows a relational model, illustrating the interconnections among data across a series of tables, each including separate columns with unique identifiers. Following the description provided, the researcher carried out the following steps in the data modeling process: The researcher identified entities using the Kipling (5W 1H) framework. Identify the unique identifier and attributes of each entity. Each entity must have its attributes delineated to ascertain the use of the data. Finally, draft relationships between entities to understand the correlation between them.

#### *Data presentation*

The systematic compilation of data achieves the presentation of data, facilitating the drawing of conclusions and ensuring their ease of comprehension. The objectives of data presentation are to provide a visual representation of the evolution of a given situation, facilitating gradual comparisons. The three most commonly used types of data presentation are as follows: First, narration is a method of presenting research data in sentence form. The narrative offers an overview of the conclusions derived from the observations while also serving to provide supplementary information. Second, the table presents data in the form of rows and columns, arranged in a systematic manner according to specific categories. We classify tables into three types: one-way tables, two-way tables that show the relationship between two characteristics, and three-way tables that show the relationship between three or more characteristics. Charts or diagrams, which are two-dimensional visual representations of data, comprise both numerical and textual elements. This method of data presentation facilitates the identification of patterns and relationships, enhancing comprehension.

### Rapid Application Development (RAD) Workshop

This research proposes RAD as the development method. The RAD method is efficient in terms of time, human resources involved, and costs incurred in developing software. RAD employs an iterative process for system development, initially constructing a pre-built functional model of the system in two phases to ascertain user requirements. This implies that the RAD workshop takes place subsequent to the requirement planning and content and information analysis phases. During the RAD workshop stage, the application developer's active participation and collaboration with the involved users are crucial for achieving the desired outcome. The following steps are best practices from successful RAD implementations:

1. Users engage in discussions and establish objective values for the system quality parameters they need to meet. Objective values are technical functions that must be present and implemented in the system.
2. Application developers and users set thresholds to determine the technical feasibility of the application based on existing technology, time, and budget values.
3. Developers build a prototype that meets objective values and thresholds. Users and application developers communicate to ensure that the developed application possesses high quality and fulfills user requirements.
4. Users test the prototype to ensure the application meets objective values.
5. The process is carried out repeatedly (the design, prototyping, testing, and improvement) if there is a mismatch with the user's needs that have been identified in the previous stage.

The results of this stage of research are general system specifications, data structures, and application prototypes.

## D. RESULTS AND DISCUSSIONS

### Results of Focus Group Discussion and Document Analysis

This is a follow-up to one of the findings from the Focus Group Discussion (FGD) that took place in July (see table 1). Researchers conducted document analysis at the Office of the Ministry of Tourism and Creative Economy, specifically focusing on the 2020-2024 Strategic Plan and Revision Plan Documents that the Ministry of Tourism and Creative Economy prepared. In this document, researchers found the national KPIs for the tourism sector, as can be seen in Figure 3.

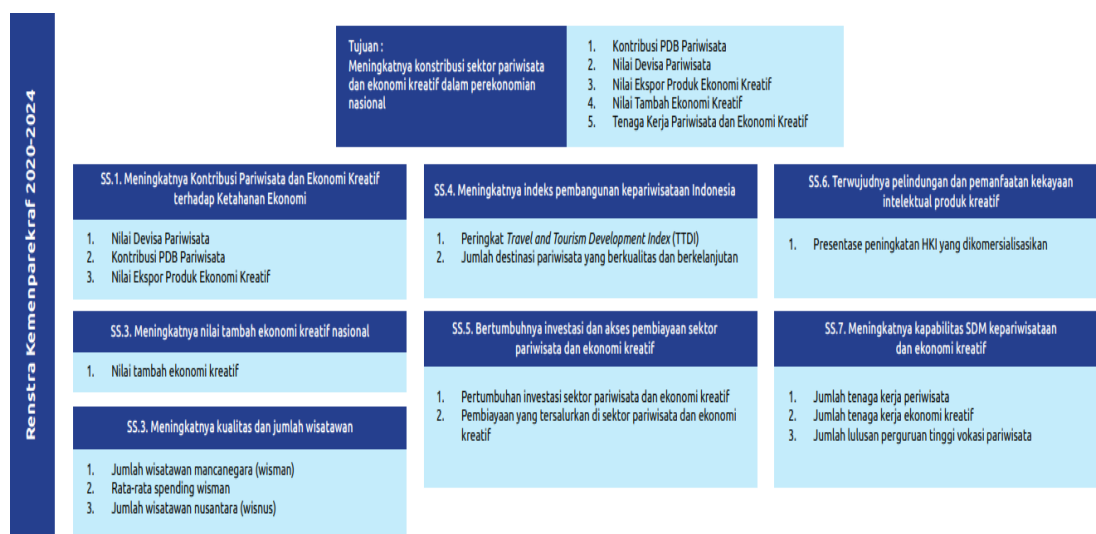


Figure 3. KPIs for Tourism and Creative Economy

Source: Kemenparekrif/Baparekrif, (2020)



Consequently, the Kemenparekraf/Baparekraf strategy map divides the KPIs in the tourism sector into several perspectives. Stakeholders' perspective represents the desired outcome or impact of the Kemenparekraf/Baparekraf strategy. The strategic objectives (SS) represent the desired outcome. SS.1: We expect the tourism and creative economy to contribute more to economic resilience. Two (2) strategic objective performance indicators (IKSS) for the tourism sector gauge the attainment of the strategic objective. The internal process perspective pertains to the processes that generate outputs from the customer perspective. Correct execution of the process anticipates the achievement of the customer perspective's output. In this perspective, there is one strategic goal, namely: SS.7. The objective is to enhance the capacity of the human resources in the tourism and creative economies. The attainment of the strategic objective is evaluated through one (1) IKSS. The customer perspective consists of two strategic objectives: We measure the achievement of SS.4, which relates to increasing the index of Indonesian tourism development, using one (1) IKSS. SS.3, which pertains to enhancing the quality and quantity of tourists, employs three (3) IKSS to measure the achievement of this strategic goal.

### Result of Kipling Method

Then, to identify the core information of the system to be constructed, the kipling method is employed. This method refers to six fundamental questions: Who, What, When, Where, Why, and How. These questions embody a methodical approach to problem-solving, encompassing a comprehensive definition and analysis of the problem. The results of using the kipling method can be seen in table 3.

**Table 3. Result of Kipling method to tourism related**

Question	Common Description	Tourism Related	Answer
Who	The actors involved	The subject engages in tourism activities	Foreign tourists Domestic tourist
Why	The background of the problem that is the topic	Purpose of visit	Holiday, business, healthcare, religious
What	The product definition and scope for the problem	Tourist interests	Natural, man-made, adventure, cultural tourism
Where	The location of an event or problem	The destination	Tourist destination
When	The time information of the problem being discussed	• Time or day which tourists visit • frequency of visit	• School holiday, summer • Returning tourists
How	The way and process in which an event takes place	Tourist behaviour and interaction	• Decision to purchase goods or not • Type of goods purchased • Amount spent on accommodation and transportation

### Data Modelling and Relational

After obtaining the results of the questions using the kipling method, further analysis is carried out to classify and find the entities. At first, identify the entities based on the Kipling (5W 1H) framework. Entities are fundamental concepts that embody recognizable objects or objects intended for database storage. Furthermore, it is essential to provide a unique identifier for each entity. These features are known as primary keys, which are attributes that delineate its properties. Simultaneously, one must delineate the attributes and relationships between entities to comprehend their correlation. This process is a series on finding microdata; the following entities have been identified (see Table 4).

**Table 4. Identifying entities**

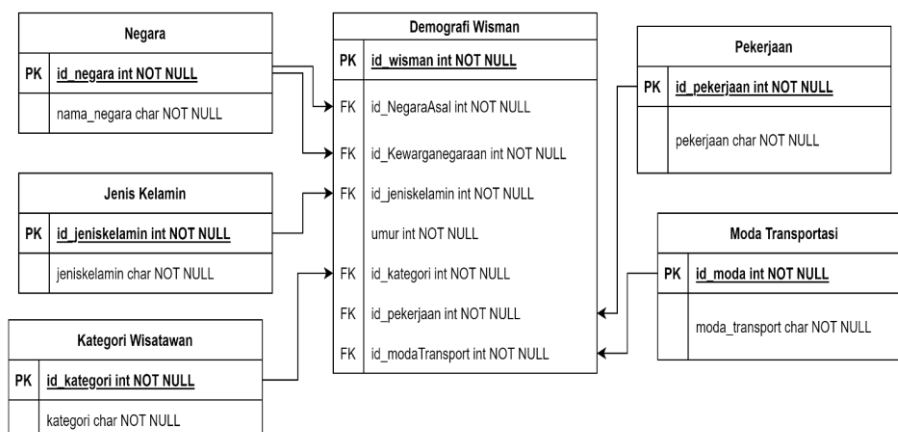
Tourism Related	Answer	Entities
Subject that performs tourism activity	Foreign tourists Domestic tourist	Demographic, with additional information such as: <ul style="list-style-type: none"> <li>Country (foreign tourist)</li> <li>Province, district or city (domestic tourist)</li> <li>Age information, age range: toddler or teenager, 10-20 years old, 20-25 years old.</li> <li>Gender information</li> <li>Occupation information</li> </ul>
Purpose of arrival	Holiday, business, healthcare, religious	Purpose of arrival
Tourist interests	Natural, man-made, adventure, cultural tourism	Attractions
The destination	Tourist destination	Destination
• Time or day which tourists visit	• School holiday, summer	Tourist visit
• frequency of visit	• Returning tourists	
Tourist behaviour and interaction	• Decision to purchase goods or not • Type of goods purchased • Amount spent on accommodation and transportation • The choice to engage a tour guide or to travel independently.	Moda transportation Tourist spending Tourist perception

**Micro Data Modelling and Relational**

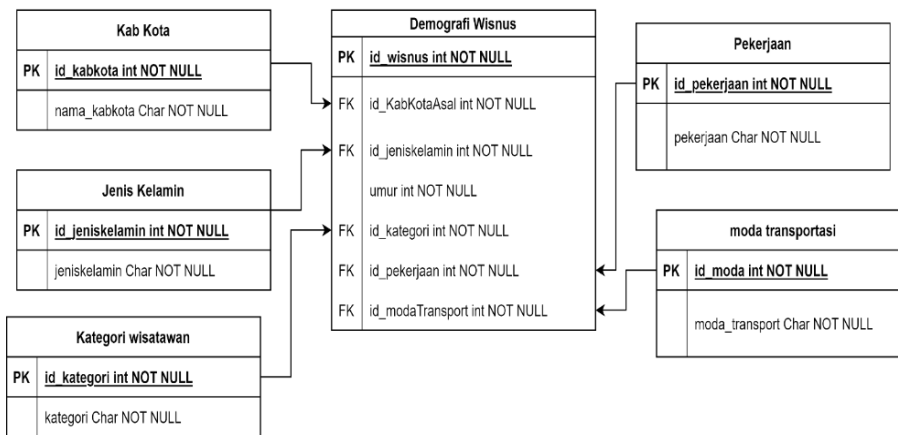
Microdata refers to data that is self-contained and specific within its small scope yet collectively contributes to macrodata. Microdata can be used in analyzing more detailed data and evaluating it separately as needed (Solutions, 2022). The following are the models and relationships of microdata that have been described, including tourist demographic data, tourist travel patterns, tourist spending, and tourist perception.

*Tourist Demographic Data*

Statistical data related to characteristics for both foreign (Figure 4) and domestic tourists (Figure 5) based on classifications such as country of origin, nationality, gender, age, and occupation.



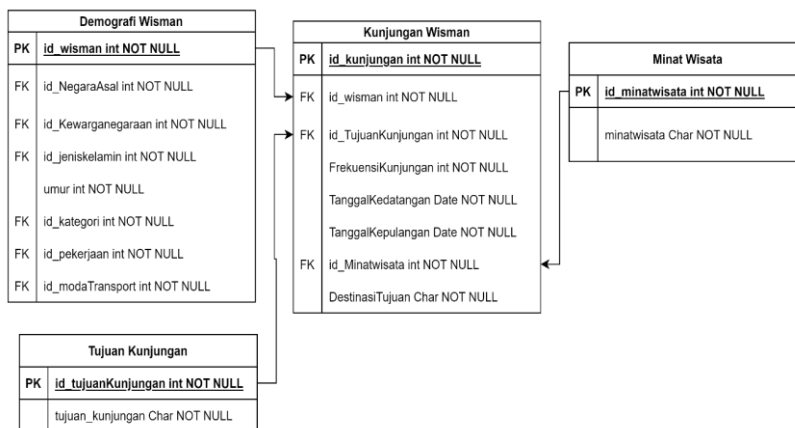
**Figure 4. Model and relation of foreign tourist demographic data**



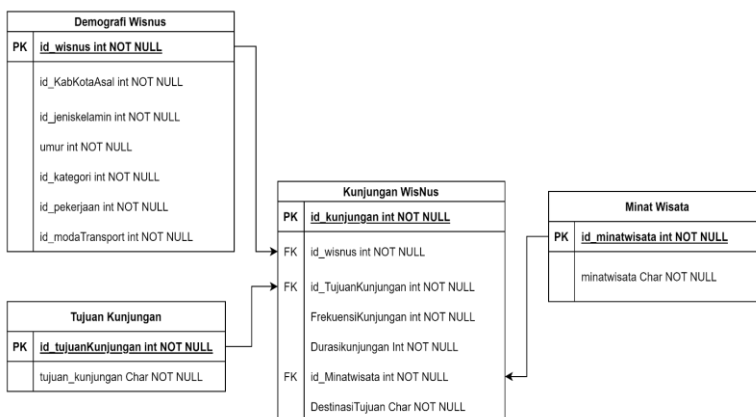
**Figure 5. Model and relationship of domestic tourist demographic data**

*Tourist Travel Pattern*

Structure, framework, and systematic flow of tourist trips from one tourist attraction to another and interrelated tourist attraction within the scope of tourist destinations (Figure 6 and Figure 7), which are prepared through identification and mapping of potential tourist attractions, tourist facilities, and accessibility with the aim of stimulating tourist visits.



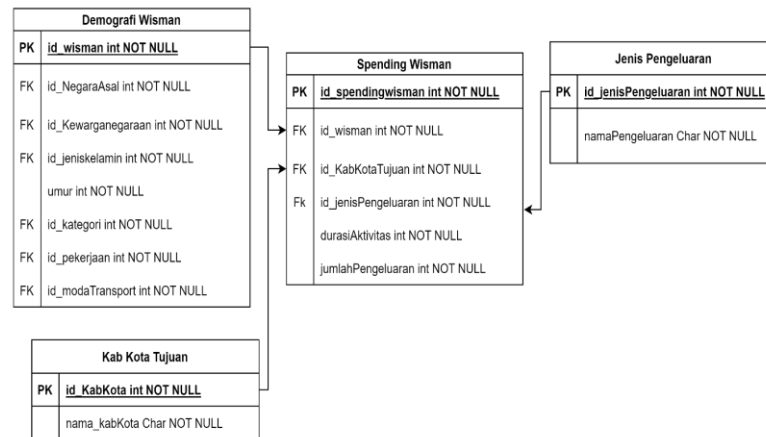
**Figure 6. Model and data relations of foreign tourist travel patterns**



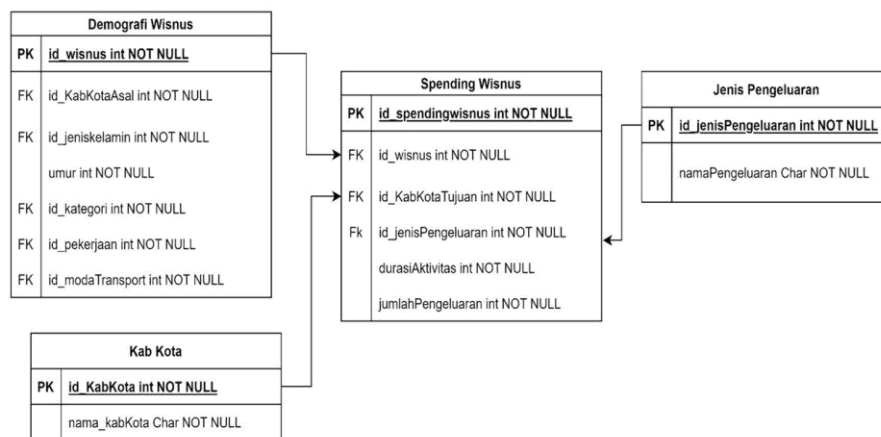
**Figure 7. Model and data relations of domestic tourist travel patterns**

### Tourist Spending

Tourists incur or spend a significant amount of expenses during their trip, beginning with their departure from home and ending with their arrival and departure from the destination. In general, the biggest expenditure of foreign tourists is for accommodation/lodging, food and beverage, souvenirs, entertainment, local transportation, domestic flights, vehicle rental, local tour packages, health and beauty needs, and other purposes (see Figure 8 and Figure 9).



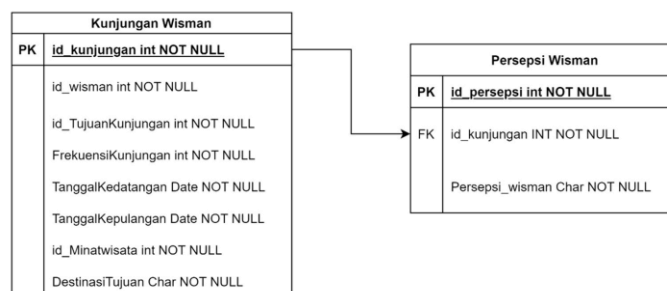
**Figure 8. Model and data relations of foreign tourist spending data**



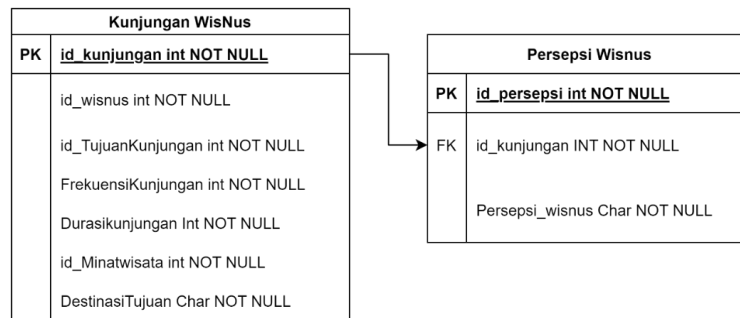
**Figure 9. Model and relation of domestic tourist spending data**

### Tourist Perception

Perception is a process of interpreting existing information to get a meaningful picture of a particular object and is highly dependent on the abilities and circumstances of the individual concerned (Figure 10 and Figure 11).



**Figure 10. Model and relation of foreign tourists perception data**



**Figure 11. Model and relation of domestic tourists perception data**

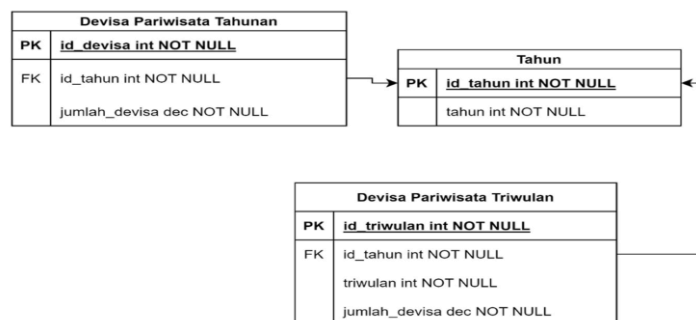
**Macro Data Modelling and Relational**

Once the fundamental microdata required for tourism analysis has been outlined, it is essential to identify supplementary data for TPD, which monitors the measurement of six (six) KPIs specific to the tourism sector. In order to locate the requisite data, the researcher visited a number of open data provider websites, including BPS.go.id, data.go.id, Kemenparekraf.go.id, and Satudata.kemenparekraf.go.id. The following findings emerge from an analysis of open data provider websites:

**Table 5. KPI of tourism sector and its data source**

KPI	Data source
The foreign exchange value of tourism	webapi.bps.go.id/developer/ Method: API
The contribution of tourism to Gross Domestic Product	bps.go.id/id/query-builder Method: dataset CSV
The size of the tourism sector workforce	satudata.parekraf.go.id kemenparekraf.go.id/statistik-pariwisata-dan-ekonomi-kreatif/statistik-tenaga-kerja-pariwisata-dan-ekonomi-kreatif-2018-2021-2 Method: dataset CSV/XLSX
The Travel and Tourism Development Index rating	prakarsa.kemenparekraf.go.id/ Method: dataset CSV/XLSX
The number of foreign tourist visits	webapi.bps. go.id/developer/ Method: API
The number of domestic tourist movements	webapi.bps. go.id/developer/ Method: API

Ministries and agencies provide macro data in accordance with their duties. Macro data refers to aggregate or large-scale data that offers a comprehensive view of the market and insights into prevailing trends (Solutions, 2022). The following are the models and relationships of macrodata that are based on KPIs in the tourism sector:



**Figure 12. Model and relation of tourism foreign exchange value**

### Tourism Foreign Exchange Value

Tourism Foreign Exchange is foreign exchange earnings from the tourism sector derived from foreign tourist visits (Figure 12).

### GDP Contribution of Tourism Sector

GDP is basically the sum of value added generated by all business units in a particular country, or the sum of the value of final goods and services produced by all economic units. This indicator demonstrates the percentage contribution of the tourism sector to a country's significant economic indicator over a specified period, both in current prices and in constant prices (Figure 13).

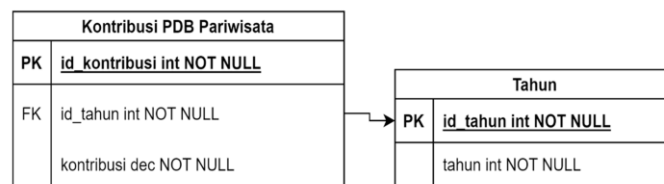


Figure 13. Model and relation of GDP contribution of tourism sector

### Tourism Labour

Labor who work in 12 tourism business activities based on the scope of tourism and creative economy businesses in Indonesian Standard Industrial Classification (KBLI) 2015 (Figure 14).

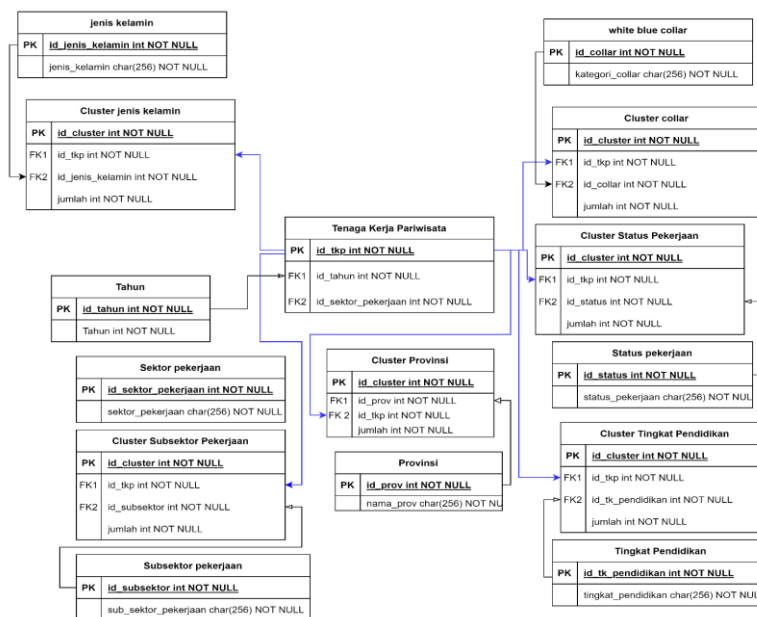


Figure 14. Model and relation of tourism labour data

### Foreign Tourist Spending

The pattern of tourist spending during a tourist visit is usually in the form of accommodation, food and beverages, shopping and souvenirs, entertainment, local transportation, domestic flights, health, and beauty (see Figure 15).

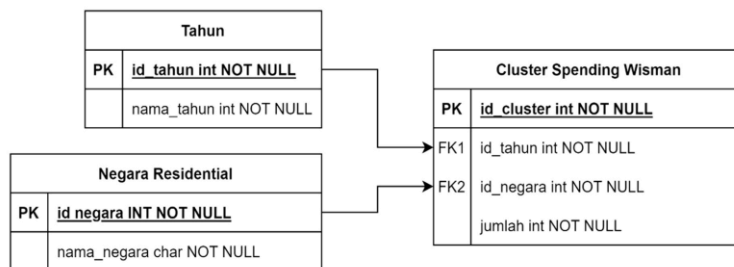


Figure 15. Model and relation of foreign tourist spending

*Travel and Tourism Development Index*

The pattern of tourist spending during a tourist visit is usually in the form of accommodation, food and beverages, shopping and souvenirs, entertainment, local transportation, domestic flights, health, and beauty (Figure 16)

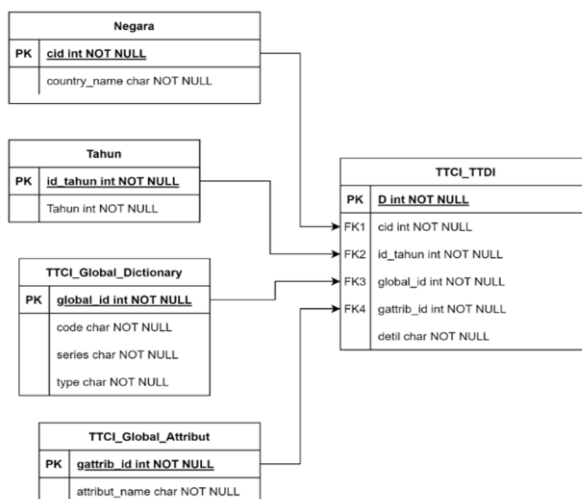


Figure 16. TTDI data model and relationship

*Foreign Tourist Visit*

Number of foreign tourist visits for vacation, leisure, sports, business, attending meetings, studies, and visits for health reasons (Figure 17).

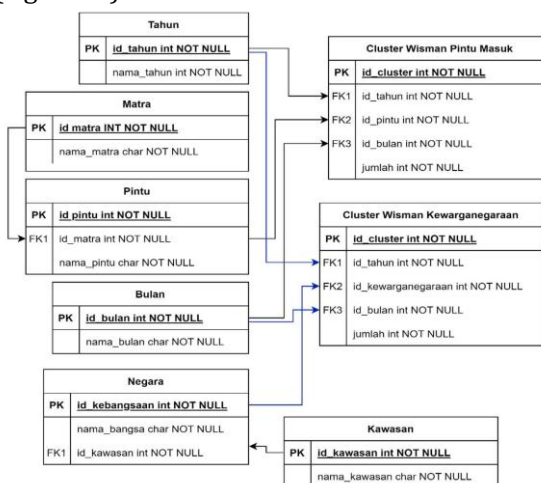


Figure 17. Model and relation of foreign tourist visit

### Domestic Tourist Movement

Indonesian residents who travel within the geographical area of Indonesia (domestic travel) voluntarily, i.e., travel for less than 6 months and not for the purpose of going to school or working (earning wages or salaries) (Figure 18).

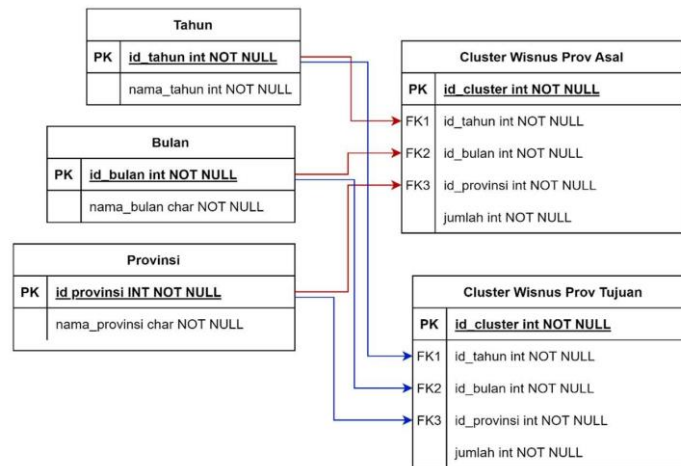


Figure 18. Model and relation of domestic tourist movement

### Workshop RAD

#### System Requirements

System requirements are a detailed identification of the functionality needed by the system to fulfill customer requirements. Functional requirements in an information system are as follows: the system can accommodate the registration of new users with limited access rights according to their designation for data management. For the initial page for the public, the system displays information on lockdown status, inbound and outbound travel status, achievements of tourist numbers, tourist numbers, earthquake alerts, statistics on COVID-19 sufferers, and community disturbance alerts. The system accommodates services related to the performance of the tourism sector's national KPIs with the latest data. The proposed system infrastructure scheme can be seen in Figure 19.

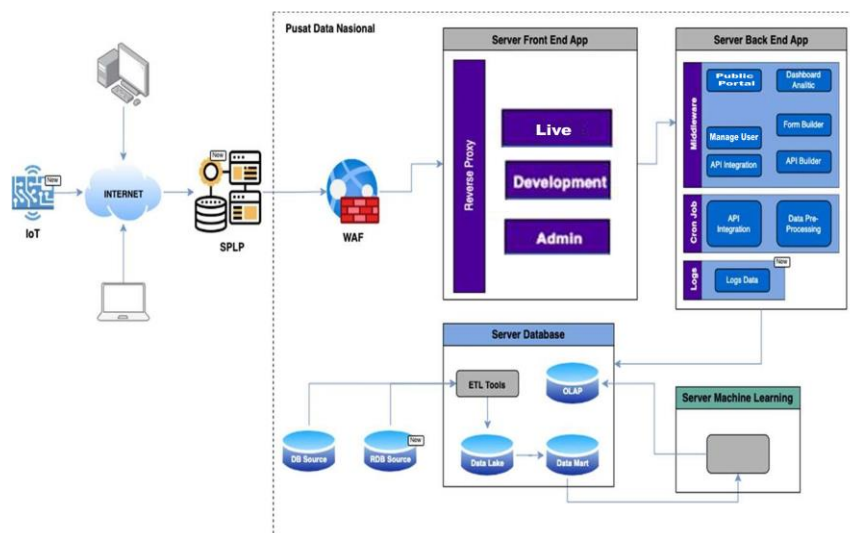


Figure 19. Schematic infrastructure for government (Indonesia)



As an ideal system infrastructure scheme with the concept of distributed architecture, at least five (five) servers are needed to handle starting from the data retrieval process, preprocessing data, to cleansing data into data marts that are ready for analysis.

### System Modeling

#### Context Diagram

Context diagram or level 0 is the lowest level diagram, which describes the system interacting with external entities. The diagram does not provide a comprehensive account of the system; rather, it offers a comprehensive representation of the system in a straightforward, intelligible, and accessible manner.

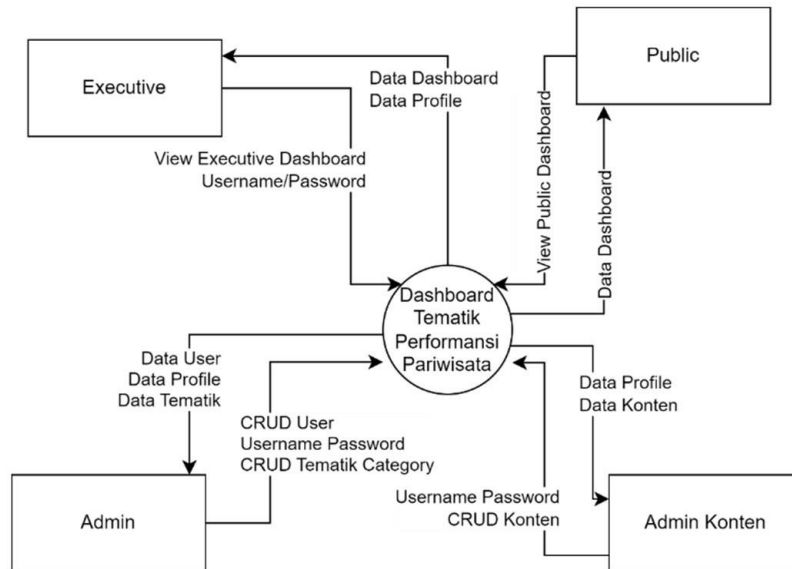


Figure 20. Context Diagram

#### Diagram Level 1

DFD level-n represents a further elaboration of the context diagram. At this level, each running process is more detailed, with the result that the main process is brakedown into smaller sub-processes.

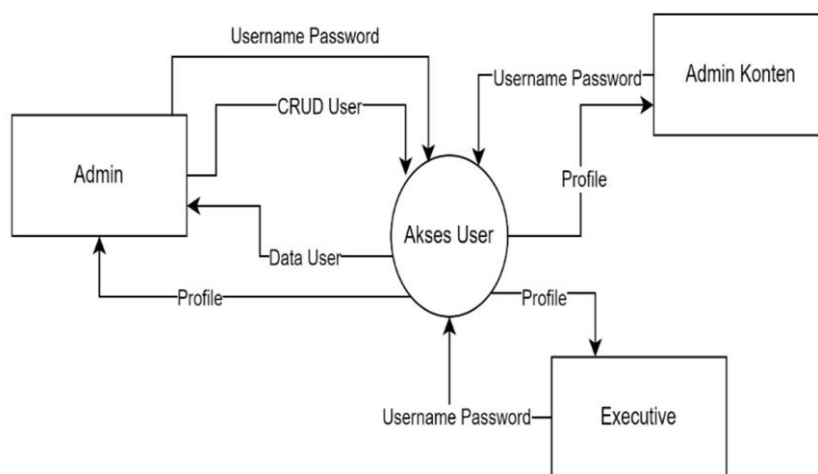


Figure 21. DFD lv 1 user access

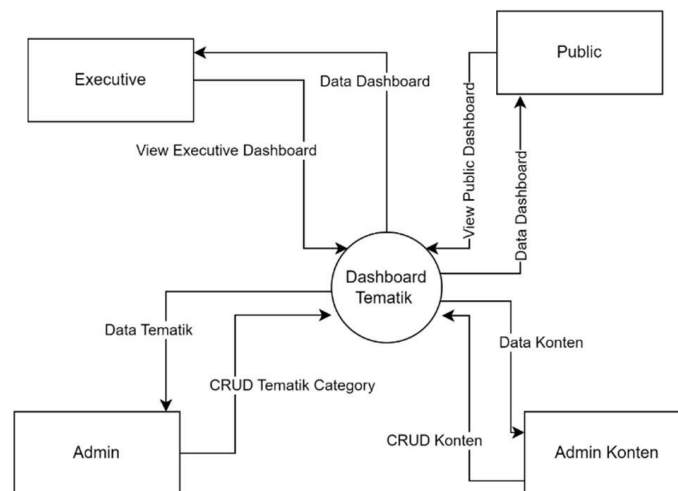


Figure 22. DFD lv 1 dashboard access

### Dashboard Modul

In essence, the modules scheduled for inclusion on this dashboard can be broadly categorised in Table 6.

Table 6. Details of the dashboard module

Public dashboard modul		
1. COVID 19 Status	1. Close public transport 2. Restrictions on gatherings 3. International travel control 4. Workplace closing	Data source : <a href="#">Oxcgrt</a> Method: API Access start: 19 February 2023
2. Earthquake alert	1. Date and time 2. Shakemap 3. Magnitudo 4. Location	Data source: <a href="#">BMKG</a> Method: API Access start: 09 March 2023
3. Indonesia COVID Statistic	1. Confirm 2. Cured 3. Death 4. On Treatment	Data source : <a href="#">Oxcgrt</a> Method: dataset CSV Last access: 11 January 2023
4. Tourist Movement Statistic	1. Foreign tourism movement (ytd) 2. Foreign tourism movement (monthly) 3. Domestic tourism movement (ytd)	Data source: <a href="#">BPS</a> Method: API Access start: 12 March 2023
5. Tourism Risk Level	1. Indonesia news update 2. Alert category 3. Alert level	Data source : <a href="#">riskline</a> Method: API Access start: 10 July 2023
6. Travel Advisory	1. Indonesia 2. Vietnam 3. Singapore 4. Thailand	Data source: <a href="#">travel-advisory</a> Method: API Access start: 11 December 2023
Login modul		
1. Login Input	1. Username and Password	
Executive dashboard modul		
1. Home	1. Foreign exchange value of tourism 2. Tourism GDP contribution 3. Number of tourism workers 4. TTDI rating 5. Number of foreign tourists	(1, 5, 6) Data source: <a href="#">BPS</a> Method: API Start access: 12 March 2023 (2, 7)

	6. Number of domestic tourists	Data source: <a href="#">BPS</a>
	7. Total spending of foreign tourists	Method: dataset CSV Last access: 01 March 2024 (3) Data source: <ul style="list-style-type: none"> <li>• <a href="#">satudataparekraf</a></li> <li>• <a href="#">kemenparekraf</a></li> </ul> Method: dataset CSV/XLSX Last access: 01 March 2024 (4) Data source: <a href="#">prakarsa</a> Method: dataset CSV/XLSX Last access: 01 Pebruari 2024
2. List Menu	<ol style="list-style-type: none"> <li>1. Customer Perspective                             <ul style="list-style-type: none"> <li>• TTDI H2H</li> <li>• TTDI Indonesia</li> <li>• Foreign tourist number H2H</li> <li>• Domestic tourist movement</li> </ul> </li> <li>2. Stakeholder Perspective                             <ul style="list-style-type: none"> <li>• Devisa</li> <li>• PDB</li> </ul> </li> <li>3. Internal Perspective                             <ul style="list-style-type: none"> <li>• 5 DSP</li> <li>• Tourism worker profile</li> </ul> </li> <li>4. Tematic insight COVID impact                             <ul style="list-style-type: none"> <li>• On tourism workers</li> <li>• On foreign tourist movement</li> <li>• COVID policy comparison</li> </ul> </li> </ol>	
3. Customer Perspective	<ol style="list-style-type: none"> <li>1. TTDI H2H</li> <li>2. TTDI Indonesia</li> <li>3. Foreign tourist number H2H</li> <li>4. Domestic tourist movement</li> </ol>	Data source: <a href="#">BPS</a> Method: API Start access: 12 March 2023 12 March 2023 Data source: <a href="#">prakarsa</a> Method: CSV/XLSX dataset Last access: 01 February 2024
4. Stakeholder perspective	<ol style="list-style-type: none"> <li>1. Devisa</li> <li>2. PDB</li> </ol>	Data source: <a href="#">BPS</a> Method: API Start access: 12 March 2023
5. Internal Perspective	<ol style="list-style-type: none"> <li>1. 5 DSP</li> <li>2. Tourism workers profile</li> </ol>	Data source: <a href="#">sisparnas</a> Method: API Start access: 12 March 2023 Data source : <a href="#">kemenparekraf</a> Method: CSV/XLSX dataset Last access: 01 March 2024
6. Tematic insight	COVID impact <ol style="list-style-type: none"> <li>1. On tourism workers</li> <li>2. On foreign tourist movement</li> <li>3. COVID Policy Comparison</li> </ol>	Data source: <ul style="list-style-type: none"> <li>• <a href="#">satudataparekraf</a></li> <li>• <a href="#">kemenparekraf</a></li> </ul> Method: dataset CSV/XLSX Last access: 01 March 2024 Data source: <a href="#">BPS</a> Method: API Start access: 12 March 2023

### User Interface Desain

The user interface is the medium through which the user experience is realized, facilitating the performance of essential functions and the utilization of features. Collaboration plays a crucial role in creating thoughtful and introspective experiences, as both UI and UX design combine to form the end user experience.

The Graphical User Interface (GUI) is a commonly used user interface format. GUI is a prevalent format for user interfaces. A GUI is an interface to a computer operating system that employs a graphical menu (IxDF, 2016). The graphical menu serves to enhance the display, thereby fostering a user-friendly operating system that instills user confidence (Figure 23 and Figure 24). The graphical menu may be formed by graphics or images, facilitating user interaction with the operating system. The following GUI is designed for TPD :

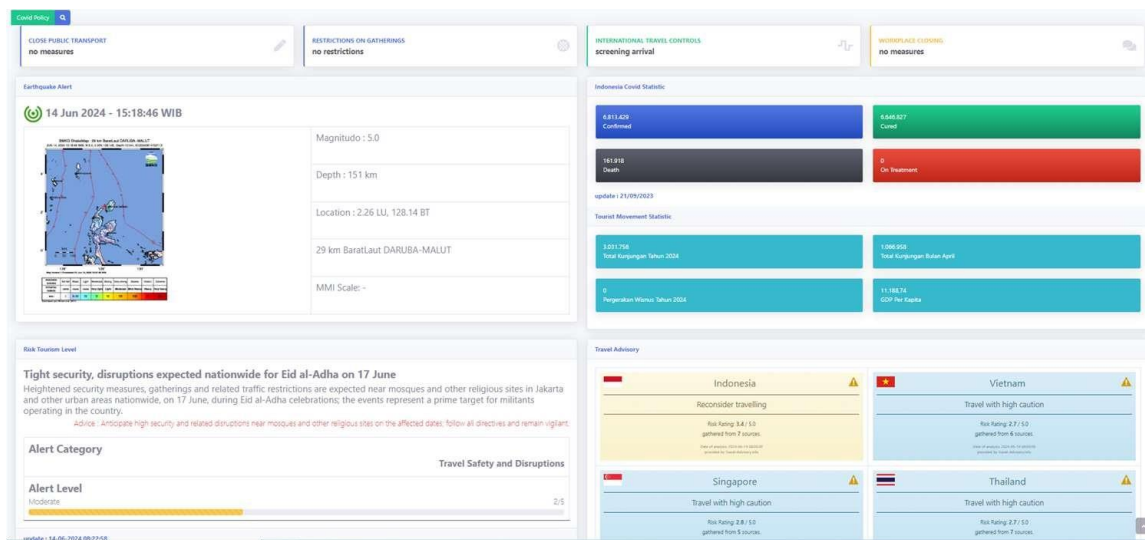


Figure 23. Public dashboard



#### Getting Back to Basics

Welcome back! Please login to your account to continue.

Login

Administrator

Password

.....

LOG IN

[Lupa sandi lewat Anda?](#)

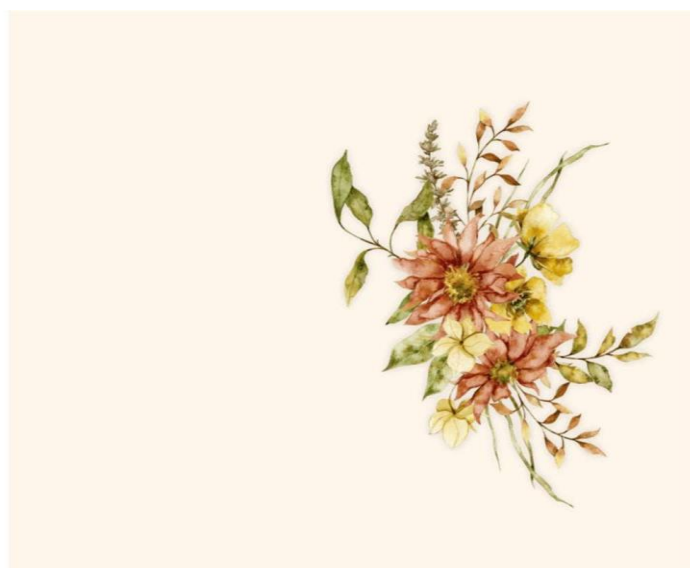


Figure 24. Login modul

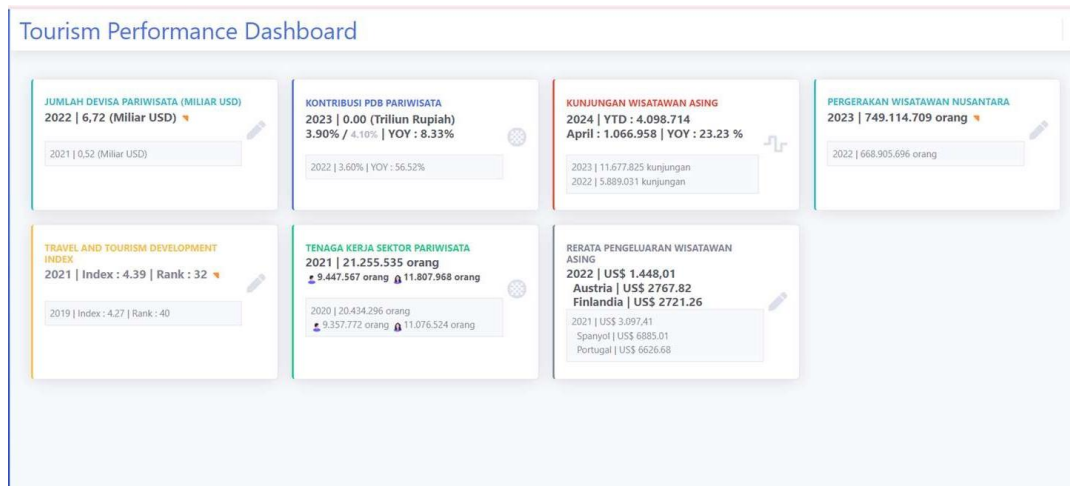


Figure 25. Executive dashboard

Figure 25 is the default executive dashboard display. This dashboard is the default display, the display when the user success enters the TPD. This dashboard displays KPI data from the tourism sector.

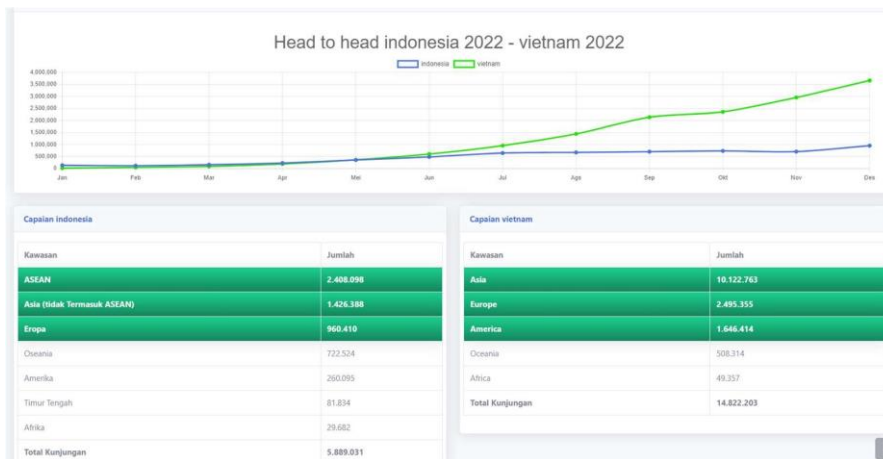


Figure 26. Foreign tourist visit head to head dashboard

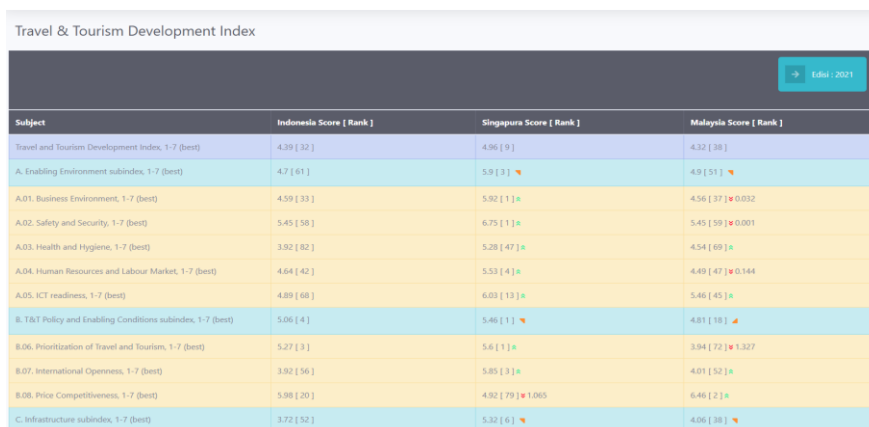


Figure 27. TTDI Head to head dashboard

We will provide a head-to-head comparison for each KPI. This feature is useful for comparing the value of Indonesia's indicators with those of competitor countries. Figure 26 illustrates a head-to-head comparison of Indonesia's tourist visit numbers with those of competitors. Furthermore, a percentage contribution of visits per region accompanies the comparison, offering valuable insights into the Indonesian market. Figure 27 presents a head-to-head comparison of Indonesia's TTDI index with those of competitor countries.

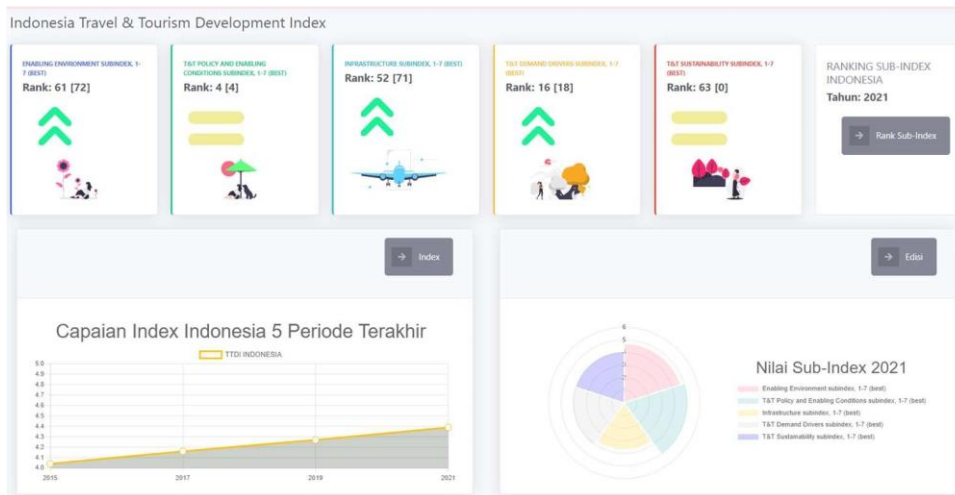


Figure 28. TTDI Indonesia Detail Dashboard

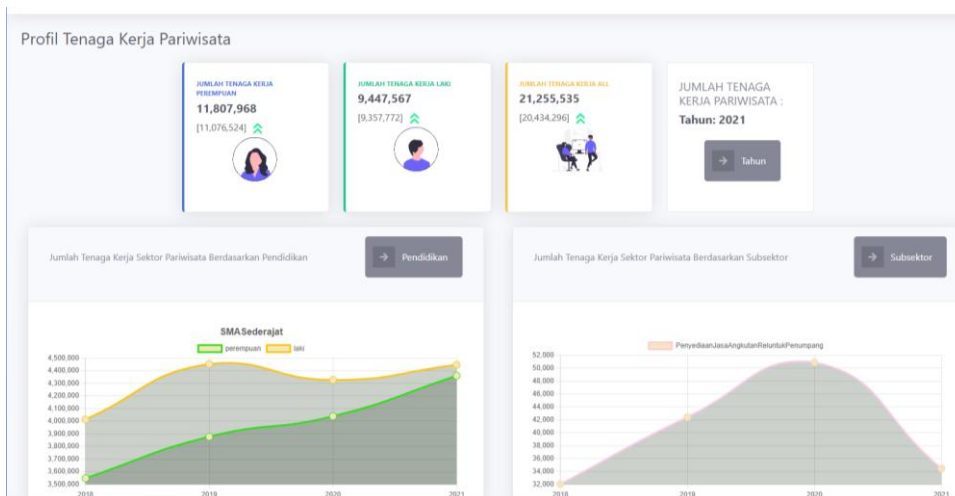


Figure 29. The tourism sector's workforce detail dashboard

Each KPI receives a comprehensive set of details in addition to the head-to-head feature. Figure 28 illustrates the specifics of TTDI Indonesia, while Figure 29 depicts the particulars of the tourism labor profile. Overall, the collaborative implementation of each phase produced the following results: Focus Group Discussions (FGDs) revealed a clear alignment between business processes (defined KPIs) and stakeholder expectations, thereby ensuring that the dashboard development aligns with the performance monitoring needs of the tourism sector. The Kipling Method helps identify core entities, processes, and data sources, in line with the study's goal of creating a structured, efficient, and user-centered dashboard, ensuring relevance for stakeholders in the tourism sector. Data Modeling and Analysis: the development of models and relational, both micro and macro data, that reflect KPIs, establishing a robust data

foundation is crucial for precise monitoring and visualization. Through iterative prototyping and active user collaboration, the Rapid Application Development (RAD) workshop transforms concepts into practical system designs. This ensures that the final application facilitates policymaking, thereby directly achieving the study's goal of enhancing tourism management. These stages collectively ensure that the dashboard meets the intended goal of enhancing data-driven decision-making in Indonesia's tourism sector.

## E. CONCLUSION

In accordance with the research objectives, the researcher has provided analyses, design concepts, and definitions of data structures and infrastructure, as well as prototypes that can be developed into a broader tourism performance dashboard. The researchers successfully scraped and integrated data from several shared data sources to produce data analysis and visualization, giving Indonesia a competitive advantage. The RAD method approach offers the advantage of speed in developing applications with relatively short deadlines, while also ensuring the appointment of experienced experts. Note that this research has certain limitations. Its objective is to produce analysis, design concepts, and definitions of data structures and infrastructure, along with microsite prototypes. The purpose of these prototypes is solely to showcase the performance of national KPIs within the tourism sector. Internal work units or external sources may provide various types of data. Once collected, this data can be analyzed and visualized in specific thematic areas. The research utilizes open data sources, which are provided at no cost but may experience delays in updates.

We suggest further development of this study by focusing on the National Key Performance Indicators (KPIs) of the Creative Economy Sector. The scope of the research can encompass policy, investment, industry, labor, intellectual property rights (IPR), and marketing. For sustainable tourism planning, complete and reliable micro and macro data is required. It is the joint responsibility of national and local tourism agencies to collect and manage such data. Research projects with a specific budget can utilize paid tourism data sources as references. Data sources include Amadeus and PATA. Such data can provide broader and more varied insights to complement the multi-sectoral data presentation. The combination of RAD and reuse-based software engineering represents an area worthy of further research.

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