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Harmonization of Population Data Between BPS and Palembang City Disdukcapil Using an Agile-Based Dashboard

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Abstract− Population data play a strategic role in supporting regional development planning and evaluation, particularly in urban areas with high population density such as Palembang City. However, discrepancies between population data produced by the Central Statistics Agency (BPS) and the Population and Civil Registration Office (Disdukcapil), resulting from differences in de facto and de jure recording concepts, pose challenges for comprehensive population analysis and policy formulation. This study focuses on the harmonization and integration of population data from BPS and Disdukcapil into a unified analytical platform. A dashboard-based system developed using the Agile method is employed as a supporting tool to facilitate population data analysis and support data-driven decision-making in Palembang City. Population data were obtained from official BPS publications and Disdukcapil administrative records, supported by observations, interviews, and questionnaires. The results show that all system functionalities operated successfully based on black-box testing, achieving a 100% success rate across all test scenarios. The main contribution of this research lies in the harmonization of de facto and de jure population data, which improves data consistency and supports more effective population analysis for regional development planning.

Keywords: Population Data Harmonization; BPS; Disdukcapil; Dashboard-Based System; Agile Method; Palembang City

1. INTRODUCTION

Population data plays a strategic role in supporting regional development planning, implementation, and evaluation, particularly in urban areas with high population density. Accurate population data are essential for formulating effective public policies and supporting sustainable development [1]. The accuracy and integration of population data greatly affect the quality of local government decision-making in formulating development policies [2].

One of the main challenges in population data management in Indonesia is the discrepancy between population data produced by the Central Statistics Agency (BPS) and the Population and Civil Registration Office (Disdukcapil). These differences arise from variations in population recording concepts applied by each institution [3]. This condition demands the availability of an accurate, informative, and easy-to-understand population data presentation system for various stakeholders.

In Palembang City, inconsistencies in population data have complicated comprehensive population analysis and regional policy formulation. These inconsistencies arise from differences in population recording approaches, where the Central Statistics Agency (BPS) applies a de facto approach based on the actual presence of individuals at the time of data collection, while the Population and Civil Registration Office (Disdukcapil) applies a de jure approach based on official population administration and registered domicile [4], [5]. Such differences lead to discrepancies in population figures between agencies, potentially causing confusion for data users in analyzing demographic conditions and formulating regional development policies [6], [7].

In addition, the presentation of population data that is still dominated by static tables does not support the understanding of the patterns and dynamics of demographic change [8]. Therefore, a dashboard-based approach is used as a supporting tool to present population data that has been harmonized to make it easier to analyze and utilize in decision-making [9], [10], [11].

However, studies that explicitly discuss the harmonization of population data between BPS and Disdukcapil remain limited. Other studies emphasize visualization aspects without addressing differences between de facto and de jure population recording concepts [10]. Consequently, the integration of population data from BPS and Disdukcapil into a unified analytical dashboard platform has rarely been discussed explicitly in prior research.

Based on the identified research gap, this study focuses on the harmonization and integration of population data from BPS and Disdukcapil. A dashboard-based system developed using the Agile method is utilized as a supporting tool to facilitate population data analysis and support data-driven decision-making in Palembang City [12].

2. RESEARCH METHODOLOGY

2.1 Types of research

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This research focuses on designing and developing a system in the form of an interactive dashboard to support the harmonization and analysis of population data from the Central Statistics Agency (BPS) and the Population and Civil Registration Office (Disdukcapil). This approach is used because the research does not aim to test statistical hypotheses, but rather to produce an information system that can present population data in an integrated and informative manner [12].

2.2 Time and Place of Research

This research was carried out in the Odd Semester of the 2025/2026 Academic Year, starting from September 13, 2025 to December 31, 2025. The research activities were carried out in two government agencies in Palembang City. The first location is the Central Statistics Agency (BPS) of Palembang City which acts as the main source of population statistical data as well as a place to observe the data presentation system. The second location is the Palembang City Population and Civil Registration Office (Disdukcapil) which is a source of population administration data, including birth, death, and population migration data used in the development and analysis of the Interactive Dashboard.

2.3 Research Target

The system development method used in this study is Agile Development. The Agile Development method was chosen because it is iterative and adaptive to changing user needs, thus allowing system development to be carried out in stages with continuous improvement [13]. The Agile approach is considered suitable for the development of web-based information systems that require flexibility in data presentation and user interfaces [12].

2.4 Procedure

Fig 1. Stages of the Agile Method

The research procedure is carried out based on stages in the Agile Development method, which includes:

a. Planning

The planning stage is carried out to identify problems in the presentation of population data and the needs of system users. This process was carried out through direct observation of the data presentation system at the Central Statistics Agency (BPS) of Palembang City, interviews with BPS staff, and the distribution of questionnaires to prospective system users. This stage aims to obtain system needs, both functional and non-functional needs [13].

b. Design

At the design stage, the system is designed using the Unified Modeling Language (UML) approach to describe the needs and flow of the system in a structured manner. The UML diagrams used include use case diagrams, activity diagrams, and class diagrams. The use of UML aims to make it easier for developers to understand the interaction between users and systems as well as the data structure to be used [14].

c. Development

The development stage is carried out by implementing the design results into a web-based system. The interactive dashboard was developed using the Next.js and React frameworks to build the user interface, as well as MySQL as a database for population data management. The use of modern web technology aims to produce a system that is responsive, efficient, and easy to develop [15]. The development process is carried out in stages according to the Agile principles, by evaluating and improving each iteration.

d. Testing

System testing is carried out using the black-box testing method, which is testing that focuses on the functionality of the system without looking at the program's code structure internally. This method is used to ensure that each feature of the system runs according to the needs and scenarios that have been designed [16]. The test includes login features, data management by admins, graphical visualizations, interactive maps, data filter features, and dashboard display on the user side.

e. Evaluation

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The evaluation stage is carried out to assess the effectiveness and ease of use of the system based on test results and user feedback. The evaluation aims to ensure that the interactive dashboard developed is able to present population data in a clear, informative, and in accordance with the needs of users in conducting population data analysis [13].

2.5 Data, Instruments, and Data Collection Techniques

The data used in this study consisted of primary data and secondary data. Primary data was obtained through observations, interviews, and questionnaires given to BPS Palembang City staff and system users. Secondary data was obtained from the official publication of the Central Statistics Agency of Palembang City and population administration data from the Palembang City Population and Civil Registration Office [3].

2.6. Data analysis technique

The data analysis technique is carried out descriptively based on the stages in the Agile Development method. Population data is analyzed through the process of grouping data based on the year and sub-district region, as well as presenting data in the form of graphs, tables, and interactive maps. The results of the analysis are used as a basis for the development of an interactive dashboard to support the analysis of population dynamics in Palembang City [9].

RESULT AND DISCUSSION

The results of this study were obtained through the application of the Agile Development method in the development of an Interactive Dashboard for Population Dynamics Analysis of Palembang City. The discussion is presented based on the stages of Agile which includes:

3.1 Planning

To obtain a more structured picture of system needs, the identification of functional and non-functional needs of the system is carried out based on the results of observations, interviews, and analysis of user needs [13]. Details of the functional and non-functional requirements of the system generated at the planning stage are presented in Table 1.

Table 1. Planning Stage Results

Aspects	Method	Key Results
Population data needs	Observations	The data is still presented in the form of static tables and lacks visualization
Data presentation problems	Interview	Users have difficulty understanding trends and comparing data between years
System feature requirements	Questionnaire	Requires an interactive dashboard with graphs, map, and data filters

3.2 Design

Based on the needs obtained at the planning stage, the system design was carried out using the Unified Modeling Language (UML) approach and interface design.

3.2.1 Use Case Diagram

The use case diagram illustrates the interaction between actors and the Palembang City Population Interactive Dashboard system. In this system, there are two main actors, namely Admin and User. The Admin has full access rights to the system, whereas the User can only access and view population information[14]. The following use case diagram shows the interaction relationship between actors and systems.

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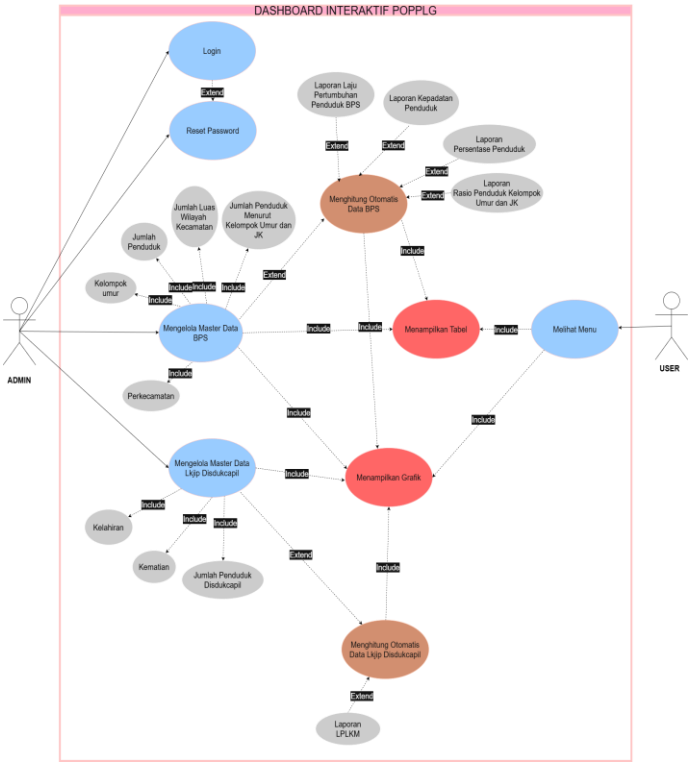
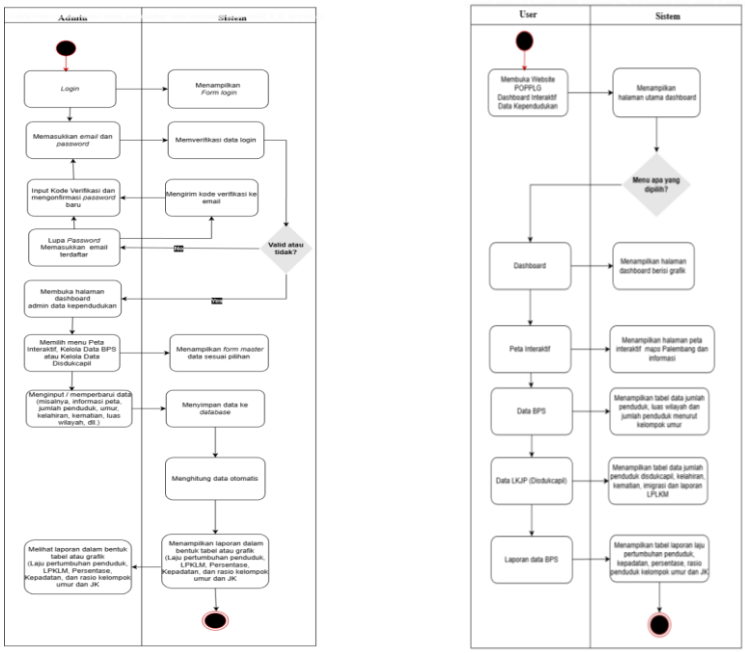


Fig 2. Use case Diagram

3.2.2 Activity Diagram

This activity diagram shows the sequence of Admin and User activities in accessing and using the system. The admin carries out the login process as authentication before managing population data sourced from BPS and Disdukcapil, as well as generating reports in the form of graphs and tables. Meanwhile, Users can access the dashboard to view population information, filter data, and view reports without being able to change the data [14]. The following activity diagram shows the flow of Admin and User activities in the system.



(a) (b)

Fig 3. Activity Diagram. (a) Admin dan (b) User

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3.2.3 Class Diagram

Chart classes include key classes such as Admin, User, Population Data, and Reports, along with the attributes and methods that support the process of managing data and presenting population information. Relationships between classes are designed to support the process of authentication, data management, and presentation of reports in the form of graphs and tables [14]. The following class diagram illustrates the class structure and the relationships between classes in the system.

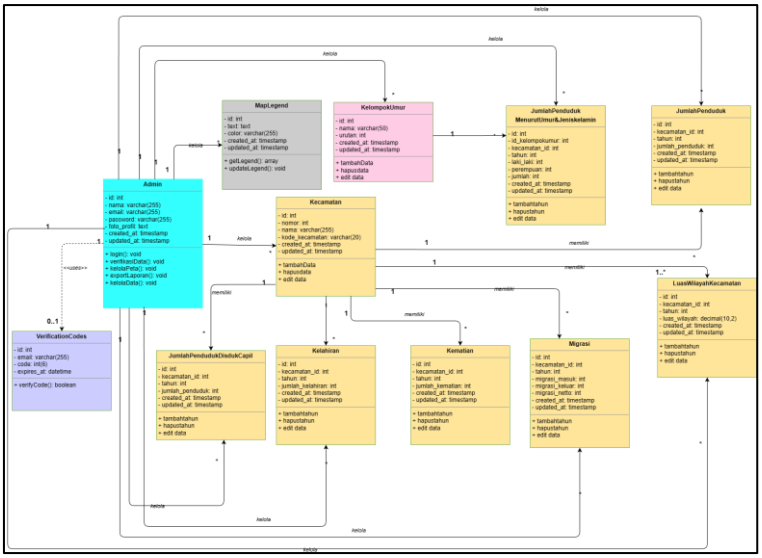

Fig 4. Class Diagram

3.3. Development

In the development stage, the Interactive Dashboard was successfully implemented web-based using the Next.js framework as the backend as well as server-side rendering, React and TypeScript for the user interface, and MySQL as the database. System development is divided into two main parts, namely the dashboard admin and the user dashboard [15].

3.3.1 Admin

1. Login and Admin Dashboard

The Admin Dashboard provides a variety of system features including a login page, profile management, and a main dashboard page that displays a summary of population statistics. In addition, the dashboard is equipped with an interactive map feature that allows admins to see the distribution of population data by sub-district area. Admins can also access the report page that presents information in the form of graphs and tables, including population growth rate, population density, percentage of population, and gender ratio. To support advanced analysis needs, the system provides report export features in CSV and XLS formats. The view of the Admin login page is shown in Fig 5.

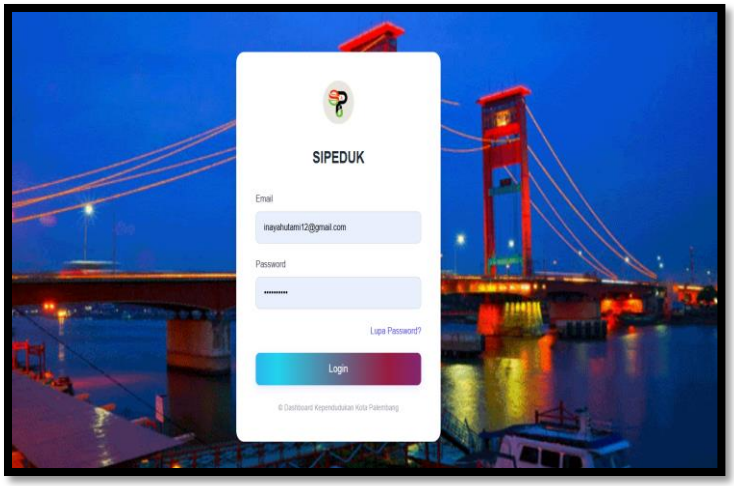

Fig 5. Admin Login

The view of the Admin dashboard showing a summary of population statistics is shown in Fig 6.

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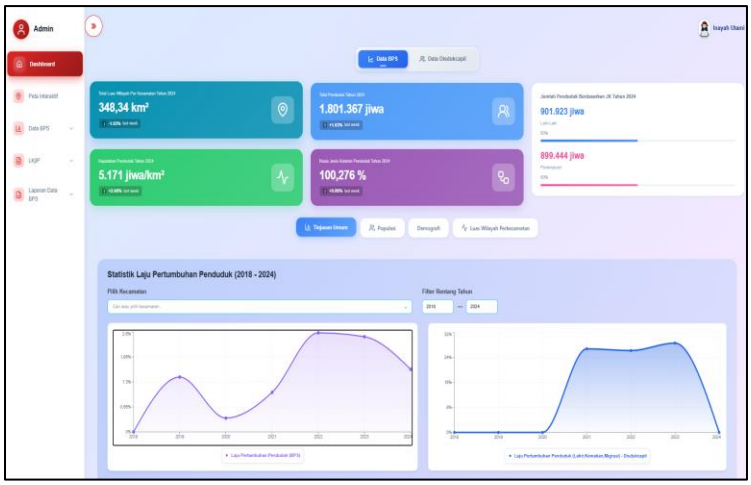

Fig 6. Dashboard Admin

2. Admin Interactive Map

On the interactive map page, admins can view the district-based population distribution and update demographic information through admin mode, ensuring accurate and up-to-date management of spatial data. Source: ArcGIS Web Map. The interactive map view on the Admin side is shown in Fig 7.

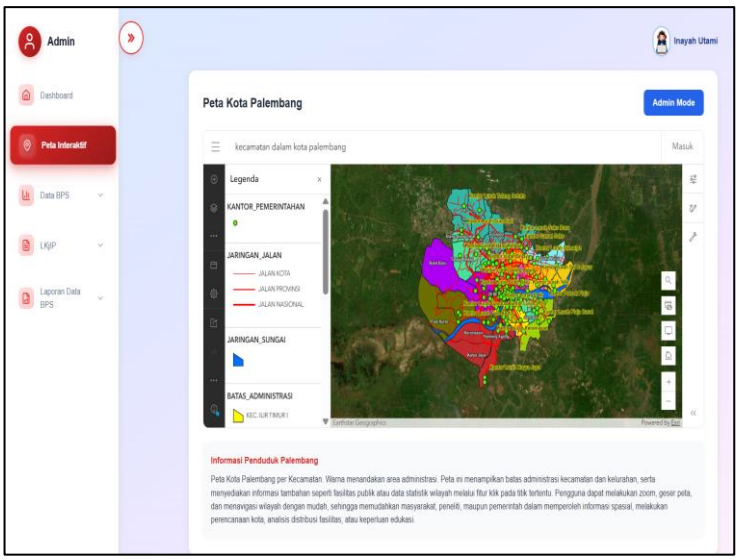

Fig 7. Admin Interactive Map Information Management

3. Admin Data Management

The Population Data Management page, as shown in Fig 9, is used by the Admin to manage all population data sourced from BPS and Disdukcapil. On this page, Admin can manage data on the number of BPS residents, BPS population age groups, the number of Disdukcapil residents, as well as Disdukcapil birth, death, and migration data with the same display and management flow. This page comes with data search, editing, report export, and automatic indicator calculation features. The BPS data managed on this page is processed by the system to produce population reports in the form of population growth rate, population density, population percentage, and population ratio. Meanwhile, Disdukcapil data covering births, deaths, and migration is processed automatically to produce population growth rate reports based on birth, death, and migration components. The population data management page on the Admin side is shown in Fig 8.

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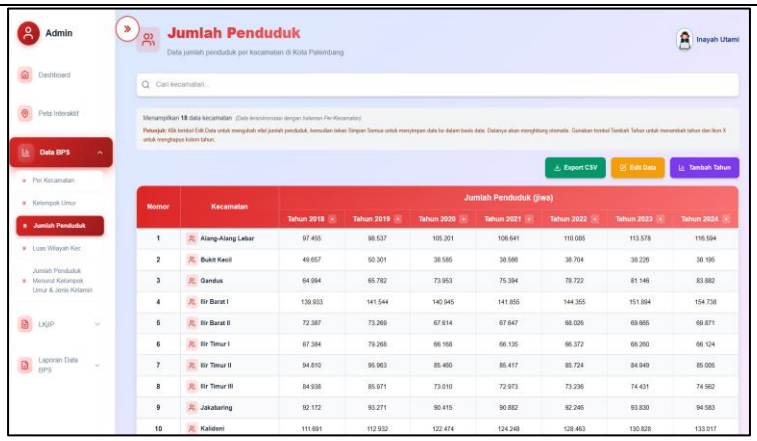

Fig 8. Dashboard Admin Data Management

3.3.2 User

1. Home User

The SIPEDUK User Home Page provides an explanation of population data, available datasets, interactive maps of Palembang, and a popular question section to help users quickly access and understand demographic information. The display of the home page of SIPEDUK users is shown in Fig 9.

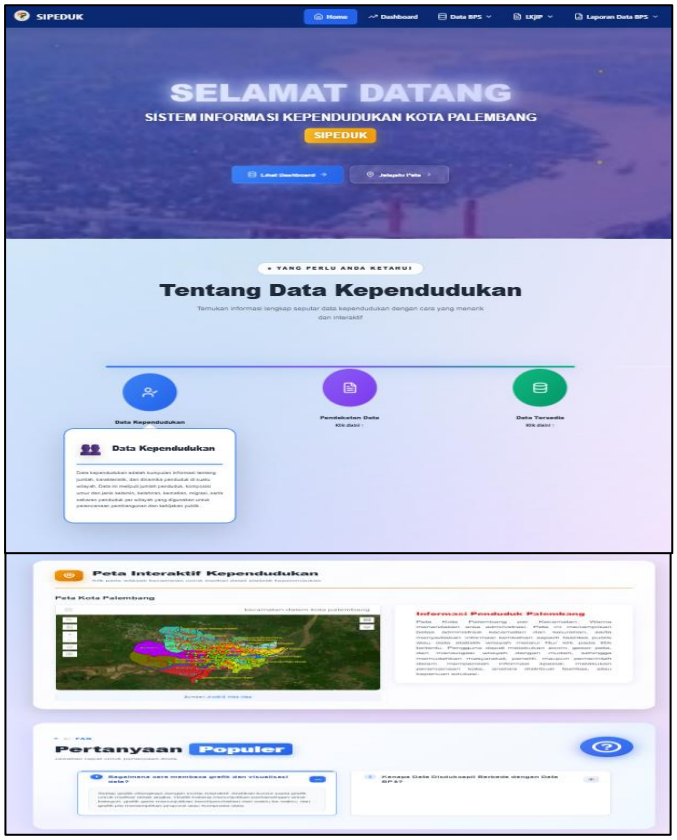

Fig 9. Home Dashboard User

2. Dashboard User

On the other hand, the system displays the main dashboard, population data, and reports in the form of graphs, tables. Users can take advantage of the filter feature by year and sub-district to conduct a simple analysis of the population dynamics of Palembang City. This visual presentation makes it easy for users to understand patterns and trends of data changes compared to static table presentations. The dashboard view on the user side is shown in Fig 10.

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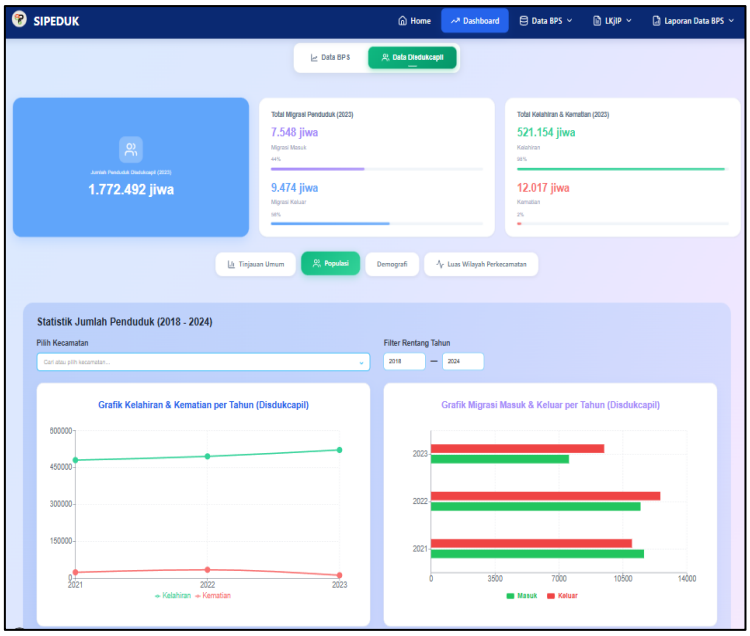

Fig 10. Dashboard User

3. Data Dashboard User

The Population Data page on the user side displays data sourced from BPS and Disdukcapil in the form of an informative and easy-to-understand table. Disdukcapil data, such as birth data, is presented per sub-district without the need to select a specific year, while BPS data is displayed in a structured manner to make it easier for users to understand population conditions. The view of the population data page on the user side is shown in Fig 11.

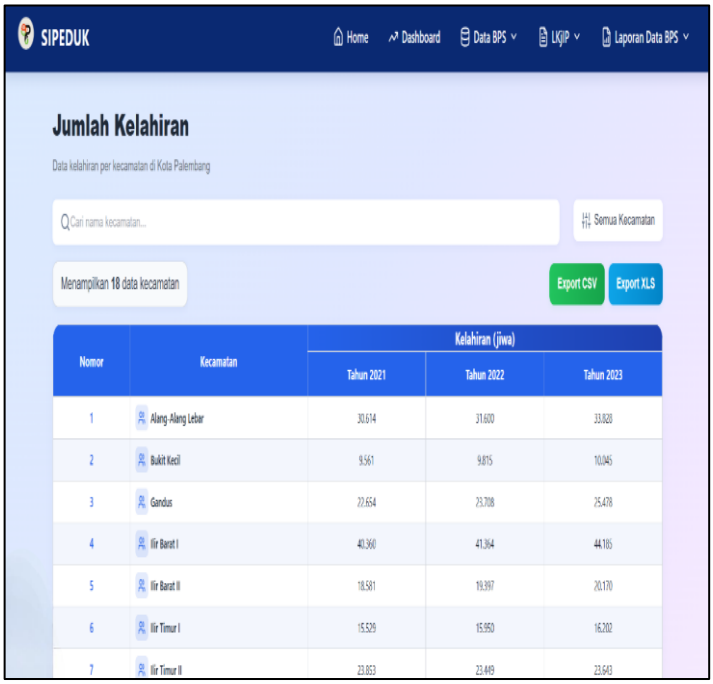

Fig 11. Data Dashboard User

3.4. Testing

The testing stage is carried out using the Black Box Testing method to ensure that all system functions are running as needed [16]. These tests include login features, data management by admins, graphical presentations, interactive maps, data filters, and user-side population reports.

The functional testing of the system was carried out using the black-box testing method, the results of which are shown in Table 2 as follows :

Table 2. Black Box Test Results

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Activities	Skenario	Results
Login Admin	Log in with valid data	Successfully logged in
Login Admin	Login with invalid data	Error message appears
Forgot Password	Registered email input	Verification code sent
Code Verification	Valid code input	Successfully proceed to password reset
Set Password Baru	Password input and confirmation	Password updated successfully
Update Admin Profile	Save profile changes	Saved profile data
Logout Admin	Click the login button	Return to the login page
Export Data	Export CSV/XLS	The file was downloaded successfully
Manage Data	Add, edit, delete data	Data processed successfully
Filter Graphic	Change the year/ filter Sub-district	Graph changes according to filter
Interactive Map	Select a sub-district	Region data displayed
Population Report	Open the report	Graphs and tables appear
Dashboard User	Access the dashboard	Complete data
FAQ	Go to the FAQ menu	Answers show automatically

The test results show that all system functions can be executed properly and according to the specified test scenario, both on the admin and user sides. No functional errors were found in key features of the system during the testing process.

3.5. Evaluation

The evaluation stage is carried out by reviewing the test results and user feedback on the developed system. The results of the evaluation showed that the interactive dashboard produced was able to improve the ease of access and understanding of population data. The presentation of data in the form of interactive graphs and maps is considered more informative and helps users in the process of analyzing population data compared to the presentation of conventional tables.

3.6. Discussion

The results of this study confirm previous findings that interactive dashboards improve the effectiveness of population data analysis compared to static table-based data presentation [7]. This result is important because population data analysis requires not only data availability but also data clarity and consistency to support policy formulation [1]. Before the implementation of the integrated dashboard, population data from BPS and Disdukcapil were accessed separately, which limited users' ability to perform comprehensive analysis across different data sources.

Unlike previous studies that generally relied on a single population data source [7], this study integrates de facto population data from the Central Statistics Agency (BPS) and de jure administrative data from the Population and Civil Registration Office (Disdukcapil) into a unified dashboard platform. This integration reduces data fragmentation and enables a more holistic understanding of population conditions.

The integration of these data sources has a direct impact on decision-making processes, as policymakers can access harmonized population information within a single system to support more accurate planning, evaluation, and formulation of regional development policies [2]. Therefore, the developed system not only improves data presentation but also strengthens the role of population data as a reliable foundation for data-driven decision-making at the local government level.

3. CONCLUSION

This research succeeded in developing an interactive dashboard for the analysis of population dynamics in Palembang City by integrating de facto population data from the Central Statistics Agency (BPS) and de jure data from the Population and Civil Registration Office (Disdukcapil) using the Agile Development method. The developed dashboard is able to present population data in the form of graphs, tables, interactive maps, and data filtering features that make it easier for users to understand patterns and changes in population data. The test results using the black-box testing method show that all system functions are running well and according to user needs. Thus, this interactive dashboard can be an effective supporting medium in the presentation and analysis of population data and help data-based decision-making in the government and community.

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