JurnalMantik
Volume 4, Number 3, Nov 2020, pp. 2005-2012 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik

Gross Domestic Regional Product Reconciliation and Compilation Application Development in Sulawesi Selatan

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ARTICLE INFO

Article history:
Received: 23/10/2020
Revised: 18/11/2020
Accepted: 30/11/2020

Keywords:
GDRP Discrepancy Calculation System, Web Application, Prototyping

ABSTRACT

GDRP compilation in Indonesia is carried out using a mixed method between the top-bottom and bottom-up methods. The use of these methods resulted in inevitable statistical discrepancies. Regencies/municipalities GDRP reconciliation along with province is carried out annually to maintain the value of these statistical discrepancies. The collection/compilation of main tables of GDRP of regencies/municipalities along with provinces is still carried out in the conventional way, as well as in the reconciliation process. The development of information technology and e-Government encourages the implementation of information technology to increase the effectivity and efficiency of internal operations in the government, including the compilation and reconciliation process of this GDRP. Application development with the prototyping method for the compilation and reconciliation process can be a solution to conventional methods that are still in use. The GDRP reconciliation and compilation application that was built has been used by the BPS-Statistics of Sulawesi Selatan Provinceand can be duplicated elsewhere.

1. Introduction

Compilation of Gross Domestic Regional Product (GDRP) at the regency/municipality and province levels and Gross Domestic Product (GDP) at the national level is one of the processes in the formation of GDRP and GDP figures. BPS-Statistics of Indonesia uses a mixed method between top-bottom and bottom-up methods in the compilation process[1]. The use of the mixed method has implications for variations in the types and availability of data that are owned and used in different regions. This difference can lead to statistical discrepancies when the GDRP figure is aggregated to a high above it. To maintain the value of statistical discrepancies, valuation adjustments can be made to GDRP at a lower level so that the GDRP aggregated value is consistent with the GDRP/GDP value one level above[2]. BPS compiles and consults/reconciles provincial GDRP with National GDP quarterly, while compilation and consultation/reconciliation of regency/municipality GDRP with provincial GDRP is carried out annually. The collection/compilation of the main table of GDRP and reconciliation is still using conventional methods by using Microsoft Excel with the help of Excel's macros and the collection of the main tables is still using flashdisk media or sent via email.

In the last few decades, the development of information technology has occurred rapidly. This rapid development has a significant impact on how organizations view their operational strategies[3]. Even the need for the application of information technology is indisputable in today's modern world [4]. The application of information technology is the main focus of many organizations because it has a direct impact on their organization's business model [3]. One of the organizations affected by the presence of this information technology is the government. Government efforts to utilize and apply information technology in terms of providing public services and internal improvements are also known as e-government. The implementation of e-government itself means that the government seeks to build and improve the quality of public services and increase the effectivity and efficiency of the organization's internal operations. These efforts are in line with the mission of bureaucratic reformation, namely modernizing the government bureaucracy by utilizing and implementing information technology in its optimization to support the vision of bureaucratic reformation and creating good governance [5]. One of the applications of information technology in increasing the effectivity and efficiency of internal operations at the BPS-Statistics of Sulawesi Selatan Province is by applying information technology in the reconciliation process and compilation of gross domestic regional product (GDRP) which still uses conventional methods. As far as the author's

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knowledge, there has not been a single information technology that has been implemented in the process of reconciliation and compilation of GDRP other than the conventional way, namely compilation of PDRB in the form of Microsoft Excel which is copied and pasted using flashdisk or email media then reconciliation process is carried out with the help of Excel's macros.

2. Methodology

2.1 System Development Life Cycle (SDLC)

The development of this application adopts the recommended stages in the System Development Life Cycle (SDLC), especially the prototyping method. SDLC is a process framework that is generally used in the development of application system projects within an organization. SDLC consists of descriptions of how to develop, maintain, modify, and improve the functionality of specific applications. The systems development cycle describes a methodology for improving the quality of the application and the entire development process [6]. There are several stages that are generally carried out, starting from planning, analysis, design, implementation, testing, to evaluation. In particular, the SDLC model used in the development of this application is prototyping. The prototyping model provides flexibility for users to provide input or requests related to the desired application. This is because the prototyping model provides space for application users to provide input to applications that are being built during the application development process.

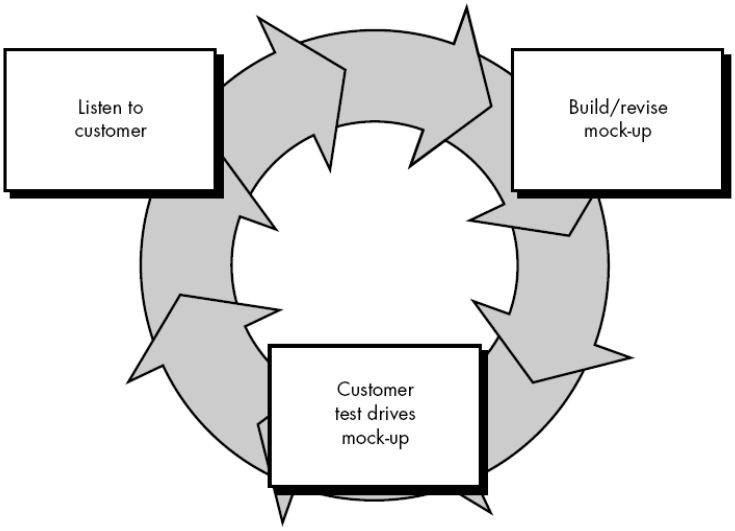

Fig 1. Prototyping Model in SDLC

The prototyping model is an iterative system development model. By using this development model, system developers can develop applications with an increase in the completeness of the system because users are directly involved in its development [7]. There are several processes in the prototyping model in SDLC. Starting from system design that begins with a needs analysis. Then do a system analysis where the requirements in the system design process can be added or removed during the system analysis process. During the prototyping process where the system is not fully completed, changes can be made. In the system design process, testing can be carried out continuously during the prototyping process so that the system design can continuously change depending on the test results. The developed application prototype is given to the user as an illustration of the system being built so that users can experiment directly and provide feedback on improvements. Users in this process play an active role in system development and suggest the improvement to be made. In the process of implementing the system, the application is created by prioritizing user experience. At the end, the system maintenance process is carried out in accordance with the agreement between the user and the system developer [8].

2.2 Web Application

Web applications or web-based applications have a huge influence on all aspects of social, business, government, and even our daily lives. The main advantage in the adoption of web-based application development, among others, is that it does not cost and effort to install, upgrade, and update. Application changes are carried out centrally so that it can be directly felt by all users and can be universally accessed using a device connected to the internet, and does not depend on the operating system used by the user [9].

The programming language used in this development is PHP. PHP is the most popular programming language and is widely used, both in the open source community and in the development industry that

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focuses on developing web-based applications [10]. With the many uses of the PHP language, many PHP frameworks were built that make it easier for programmers to create web-based applications. The use of the php framework in web-based application development has many advantages. The use of the PHP framework makes application development more organized and increases productivity. Even the PHP framework is usually supported by a support team, complete documentation, and the availability of forums to conduct discussions between framework users [11]. The framework used in this research is the Yii2 Framework. Yii2 is a PHP framework with the best rating compared to other PHP frameworks after testing using 7 evaluation criteria [12].

2.3 Calculation of Compiled GDRP

Before the GDRP figure is released, there are steps that must be taken, starting from data collection, compilation, calculation, to dissemination of the GDRP figure. One of the most awaited indicators of the GDRP figures is economic growth. Economic growth is widely seen as one of the successful implementation of development [13]. Apart from economic growth, there are several indicators that result from the GDRP figures, such as the implicit index, implicit rate, and several others. In this research, the focused is in the process of compilation and reconciliation of GDRP. The compilation and aggregation of regency/municipality GDRP will be compared with the GDRP in province level in the form of a main table of GDRP based on industrial origin and GDRP based on expenditures with several formulas so that several other GDRP indicators appear such as the internal structure that describes the contribution of industrial origin or regency/municipality expenditure components in the regency/municipality GDRP. The inter-structure describes the contribution of the industrial origin or the regency/municipality expenditure component in the province's GDRP, growth that describes the economic growth of the industrial origin or the regency/municipality expenditure component compared to the previous year, implicit index that describes the level of growth of producer prices compared to the previous year. Industrial origin or regency/municipality expenditure components in the 2010 based year, implicit rate that describes the inflation rate at the producer price level in the industrial origin or regency/municipality expenditure components compared to the previous year, and sources of growth that shows the contribution of growth in the industrial origin or regency/municipality expenditure components to the total growth of GDRP in the regency/municipality.

The formula for statistical discrepancies on industrial origin of GDP by industrial origin or component of GDP by expenditure:

$$SD_{t,i} = \frac{GDRP\ Prov_{t,i} - \sum_{k}^{n} GDRPReg/Mun_{k,t,i}}{GDRP\ Prov_{t,i}}\ x\ 100$$

SD : statistical discrepancy
t : year
i : industrial origininGDRP by industrial originorcomponentGDRP by expenditure
k : regency/municipality
n : number of regency/municipality in a province

The formula for internal structure on industrial origin of GDP by industrial origin or component of GDP by expenditure:

$$Internal\ Strucure_{k,t,i} = \frac{GDRPReg/Mun_{k,t,i}^{Curr}}{GDRPReg/Mun_{k,t}^{Curr}}\ x\ 100$$

t : year
i : industrial origininGDRP by industrial originorcomponentGDRP by expenditure
k : regency/municipality
Curr : current market price

The formula for inter-structure on industrial origin of GDP by industrial origin or component of GDP by expenditure:

$$InterStrucure_{k,t,i} = \frac{GDRPReg/Mun_{k,t,i}^{Curr}}{GDRPProv_{t,i}^{Curr}}\ x\ 100$$

t : year
i : industrial origininGDRP by industrial originorcomponentGDRP by expenditure
k : regency/municipality
Curr : current market price

The formula for growth on industrial origin of GDP by industrial origin or component of GDP by expenditure:

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$$Growth_{k,t,i} = \frac{GDRPReg/Mun^{Cons}_{k,t,i} - GDRPReg/Mun^{Cons}_{k,t-1,i}}{GDRPReg/Mun^{Cons}_{k,t-1,i}} \; x\,100$$

t : year
i : industrial origininGDRP by industrial originorcomponentGDRP by expenditure
k : regency/municipality
Cons : 2010 constant market price

The formula for implicit index on industrial origin of GDP by industrial origin or component of GDP by expenditure:

$$Implicit\ Index_{k,t,i} = \frac{GDRPReg/Mun^{Curr}_{k,t,i}}{GDRPReg/Mun^{Cons}_{k,t,,i}} \; x\,100$$

t : year
i : industrial origininGDRP by industrial originorcomponentGDRP by expenditure
k : regency/municipality
Curr : current market price
Cons : 2010 constant market price

The formula for implicit rate on industrial origin of GDP by industrial origin or component of GDP by expenditure:

$$Implicit\ Rate_{k,t,i} = \left(\left(\frac{GDRP\ Reg/Mun^{Curr}_{k,t,i} \Big/ GDRP\ Reg/Mun^{Cons}_{k,t,,i}}{GDRP\ Reg/Mun^{Curr}_{k,t-1,i} \Big/ GDRP\ Reg/Mun^{Cons}_{k,t-1,,i}} \right) x100 \right) - 100$$

t : year
i : industrial origininGDRP by industrial originorcomponentGDRP by expenditure
k : regency/municipality
Curr : current market price
Cons : 2010 constant market price

The formula for source of growth on industrial origin of GDP by industrial origin or component of GDP by expenditure:

$$Source\ of\ Growth_{k,t,i} = \frac{GDRP\ Reg/Mun^{Cons}_{k,t,i}}{GDRP\ Reg/Mun^{Cons}_{k,t}} x \left(\left(\frac{GDRP\ Reg/Mun^{Cons}_{k,t}}{GDRP\ Reg/Mun^{Cons}_{k,t-1}} x100 \right) - 100 \right)$$

t : year
i : industrial origininGDRP by industrial originorcomponentGDRP by expenditure
k : regency/municipality
Cons : 2010 constant market price

3. Result and Discussion

The development of this application consists of two levels of actors, namely province users and regency/municipality users. To generally describe the application being developed, two types of Unified Modeling Language (UML) are used, namely Use Case Diagrams and Activity Diagrams. UML is a standard model that is widely used in the application systems development industry. UML is a model that can be adapted to its use mechanism which can directly assist in making specific concepts regarding an organizational problem or a project [14]. Use case diagrams are a type of model that is very important in formulating, explaining, and documenting what the system will do. Use case diagrams can also be used as a work contract between application system developers and users. Most of the use case diagram applications take into account the large number of actors involved and the scenarios for the application to be developed [15]. Activity diagrams can describe activities, either sequentially or simultaneously, the data used or generated, and also the execution of commands in applications for several actions [16]. There is also a Use Case Diagram in the application that is made can be seen in Figure 2 and the Activity Diagram can be seen in Figure 3.

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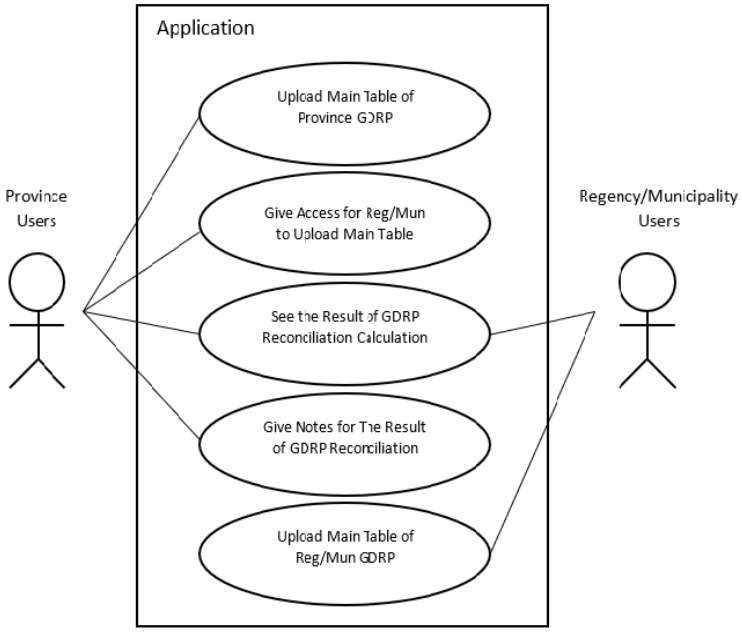

Fig 2. Use Case Diagram

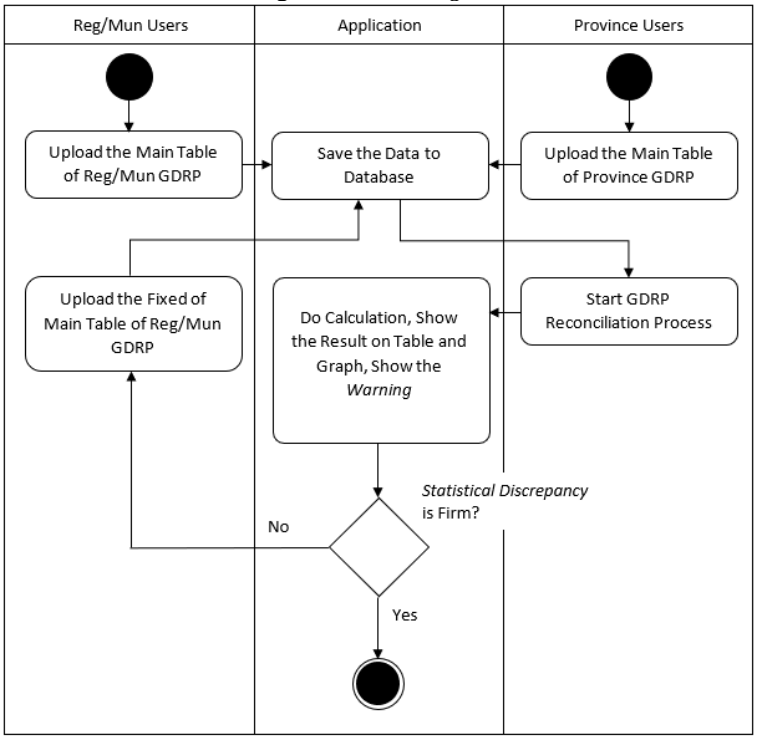

Fig 3. Activity Diagram

The results of the development in this application are in the form of a web with the default display of the user login page. The login page in Figure 4 has 3 filling options, the first is the year of simultaneous regional consultation, username, and password. For regency/municipality users, the filling of the year of simultaneous regional consultation will not affect anything in the system, but for province users, the year of simultaneous regional consultation filling will activate the year of simultaneous regional consultation setting that is allowed to upload the main table of GDRP by province and regency/municipality.

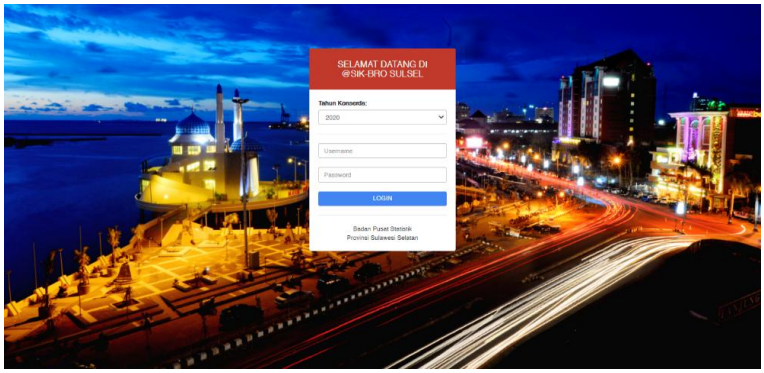

Fig 4. Login Page

When the user has successfully logged in, the user is required to upload the main table of GDRP as shown in Figure 5. For province users, they are only allowed to upload one main table of GDRP which value is final. Meanwhile, for regency/municipality users, the process of uploading the main1 table will continue per round until the results of the regency/municipality GDRP aggregation value are in accordance with the expected conditions.

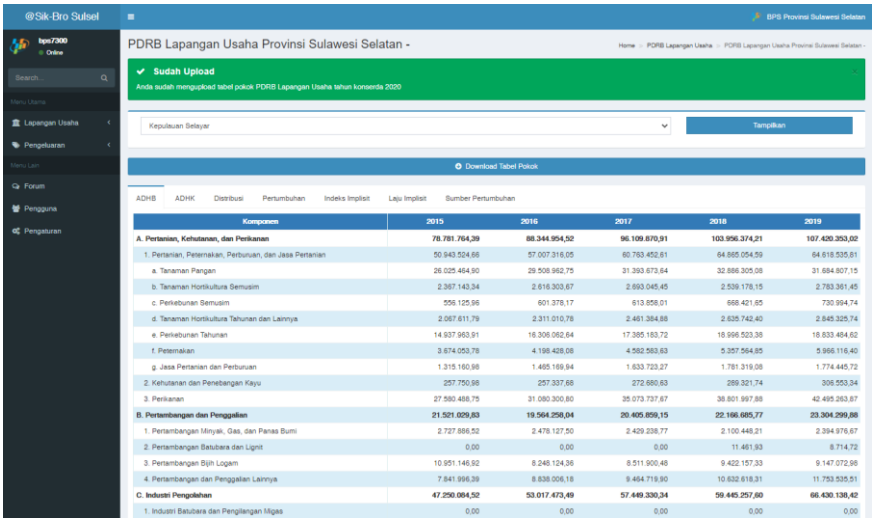

Fig 5. Upload Table Page

The result of developing a reconciliation and compilation application of gross domestic regional product is a system that can collect/compile and store the main table of GDRP so that it can be well documented. Then the compilation of the main table of GDRP which consists of two tables of GDRP at Current Market Price and GDRP at 2010 Constant Market Price is calculated each round to produce 8 tables, namely provinceGDRP at Currect Market Price which is compared with the regency/municipality GDRP at Current Market Price aggregationalong with their statistical discrepancy values, province GDRP at 2010 Contant Market Price compared to regency/municipality GDRP at 2010 Constant Market Price aggregations along with their statistical discrepancy values, internal structure tables that describe economic structures per region, inter-structure table showing the contribution of the regional industrial origin, economic growth, implicit index, implicit rate, and sources of growth. When there is a statistical discrepancy or there are numbers that need to be considered in each table, the system will give a warning in red, yellow, green, bold blue text, and so on. The results of the calculation of the 8 tables and the warning that appear are the basis for the reconciliation of the regency/municipality GDRP.

Figure 6 shows 8 tables of calculation results performed by the system from all compiled GDRP main tables. On this page, the system also displays a warning indicating that it is necessary to discuss and reconcile the GDRP figures. After reconciliation is carried out, regency/municipality users re-upload the GDRP figures in the new cycle until the expected conditions are achieved.

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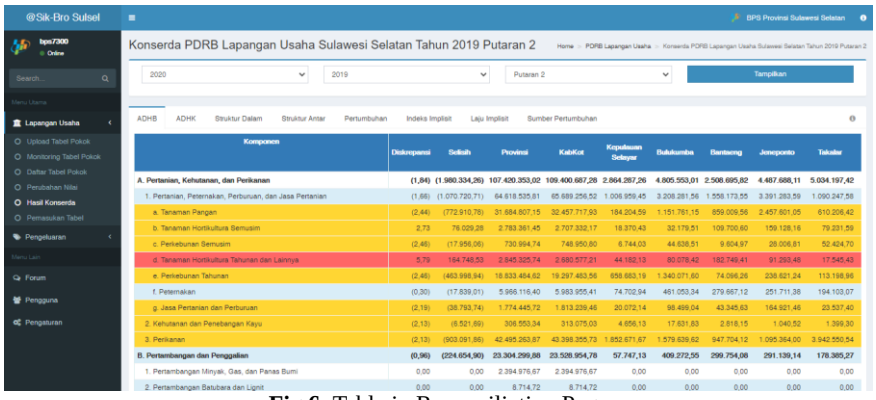

Fig 6. Table in Reconciliation Page

In addition to displaying the table, the system also displays a graph of the comparison of economic growth for each industrial origin between province GDRP and regency/municipality GDRP aggregation in the last 3 years as in Figure 7. The blue line in the graph shows the province economic growth in a particular industrial origin, while the black line shows regency/municipality aggregate economic growth in certain industrial origin. Graphs are used as additional tools in carrying out this reconciliation.

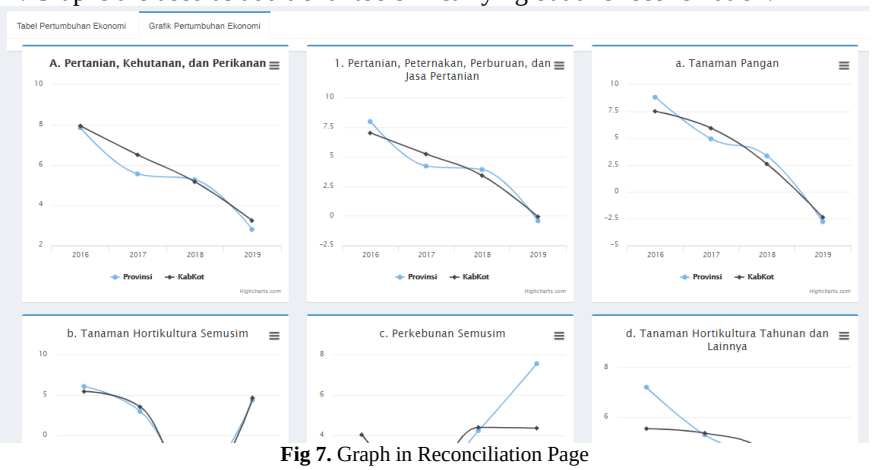

Fig 7. Graph in Reconciliation Page

To ensure that the application is running properly, black-box testing is carried out. This test is carried out on the main features of the system that have been created starting from the login process to the calculation process until the displaying a warning in the table. The test results using black-box testing in table 1 show that the main functions of the application have run well without any significant problems.

Table 1.
Result of Black-Box Testing

No.	Function	Status
1	Upload GDRP Main Table and Store It to Database	Succeed
2	Calculate the Aggreation of GDRP Along with Statistical Discrepancies	Succeed
3	Calculate the Aggregation of Internal Structure of GDRP	Succeed
4	Calculate the Aggregation of Inter-Structure of GDRP	Succeed
5	Calculate the Aggregation of Growth of GDRP	Succeed
6	Calculate the Aggregation of Implicit Index of GDRP	Succeed
7	Calculate the Aggregation of Implicit Rate of GDRP	Succeed
8	Calculate the Aggregation of Source of Growth of GDRP	Succeed
9	Show Highlight/Warning of Rows and Cells which Should be Considered to be Reconciled	Succeed

4. Conclusion

The Gross Domestic Regional Product Reconciliation and Compilation Application in Sulawesi Selatan was successfully developed and used by the BPS-Statistics of Sulawesi Selatan. This application makes the compilation process of GDRP that previously used conventional methods, namely by collecting Microsoft

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Excel file formats by copied and pasted using flashdisk media or by email to be more concise and well monitored so that the process of collecting regency/municipality GDRP tabel can be more effective and efficient. . The process of reconciling the GDRP figures, which was previously centralized at the provincial level, can now be accessed in real time/up-to-date by regency/municipality. GDRP figure reconciliation activities can be carried out anytime, anywhere, and by anyone who has the authority in this application. In addition, this application can also be accessed using a mobile device or computer.

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