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**SCHOOL INSTITUTION DATA ANALYSIS APPLICATION BY FINDING
INPUT ERRORS IN THE CENTER OF THE MINISTRY OF RELIGION**

THESIS REPORT

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**DEPARTMENT OF INFORMATICS
FACULTY OF COMPUTER SCIENCE
UNIVERSITAS MERCU BUANA
JAKARTA
2021**

SCHOOL INSTITUTION DATA ANALYSIS APPLICATION BY FINDING INPUT ERRORS IN THE CENTER OF THE MINISTRY OF RELIGION

Thesis Report

Submitted to Complete Terms
Completed a Computer Bachelor Degree

Created By:
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DEPARTMENT OF INFORMATICS
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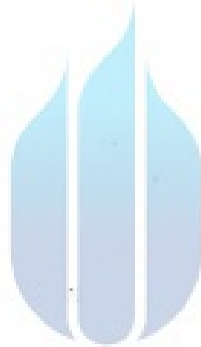2021

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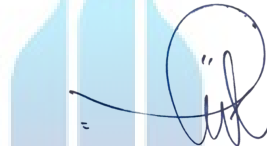# COMMITTEE APPROVAL SHEET

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This Thesis has been examined and tried as one of the requirement to obtain a Bachelor's Degree in the Informatics Engineering Study Program, Faculty of Computer Science, Universitas Mercu Buana.

Jakarta, 2 February 2022

Approved

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Defense Committee 2

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Jakarta, 2 February 2022

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ABSTRAK

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Judul	:	School Institution Data Analysis Application by Finding Input Error in The Center of The Ministry of Religion

Manajemen data sangat penting bagi sebuah organisasi swasta atau pemerintah. Pengelolaan data dapat menjadi ketergantungan pada sistem informasi karena dapat mempermudah kinerja perusahaan. Penulisan ini dilatarbelakangi oleh kesulitan dalam pengolahan data sekolah oleh Sub Koordinator Sistem Data dan Informasi Madrasah, GTK dan PTKI, hal ini dikarenakan masih banyaknya data yang salah dimasukkan oleh instansi sekolah terkait. Hal ini tentunya diatasi dengan menganalisa data daerah dan atribut setiap 6 bulan sekali, namun hal ini menyebabkan ketidakefektifan karena harus menganalisa data dari awal dan memakan waktu yang lama. Oleh karena itu solusi dari permasalahan tersebut adalah dengan membuat sebuah aplikasi yang dapat menganalisa data secara otomatis. Metode pengembangan perangkat lunak/aplikasi dalam masalah ini adalah metodologi agile, menggunakan python sebagai bahasa pemrograman, dan PyQt5 sebagai Graphic User Interface. Setelah aplikasi dibangun dan diuji, maka dapat disimpulkan bahwa manfaat dari aplikasi ini dapat memberikan keefektifan dalam menganalisa. Namun masih memiliki kekurangan, dimana aplikasi ini hanya dapat menganalisa dataset "Lembaga_Profile" dan "Lembaga_akreditasi" untuk saat ini. Namun dengan metode agile, kita dapat mengevaluasinya dan menerapkan hasil evaluasi uji coba.

Kata kunci:
Manajemen data, Metodologi Agile, Python, PyQt5

ABSTRACT

Student Name	:	Faiz Athalah Wisdi
Student Number	:	41518010084
Counsellor	:	Dr. Mujiono Sadikin, M.T.
Title	:	School Institution Data Analysis Application by Finding Input Error in The Center of The Ministry of Religion

Managing data is very important for a private or government organization. Data management can become a dependence on information systems because it can facilitate company performance. This paper is motivated by difficulties in processing school data by the Sub-Coordinator of Madrasah Data and Information Systems, GTK and PTKI, this is because there is still much incorrect data entered by the relevant school agencies. This is of course overcome by analyzing regional and attribute data every 6 months, but this causes ineffectiveness because they must analyze data from the beginning and take a long time. Therefore, the solution to this problem is to create an application that can analyze data automatically. The software/application development method in this problem is an agile methodology, using python as a programming language, and PyQt5 as a Graphic User Interface. After the application has been built and tested, it can be concluded that the benefits of this application can provide effectiveness in analyzing. However, it still has drawbacks, where this application can only analyze the "Lembaga_Profile" and "Lembaga_akreditasi" datasets for now. But with the agile method, we can evaluate it and apply the results of the testing evaluation.

Key words:
Data Management, Agile Methodology, Python, PyQt5

PREFACE

Praise and gratitude we pray to the presence of Allah SWT, for the abundance of His mercy and grace, so that the author can complete this final project.

The author realizes that without the help and guidance of the Advisory Lecturer and various parties, this Final Project could not be completed until now properly. Therefore, the authors would like to thank:

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Finally, the writer realizes that this final project is still far from perfect due to the limited knowledge and experience. Hopefully this final project can provide benefits and increase knowledge than the author and dear reader.

Jakarta, December 21, 2021

Faiz Athalah Wisdi

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Abstract

Managing data is very important for a private or government organization. Good data management relies on information systems because it can facilitate and support company performance. This paper is motivated by difficulties in processing the school data by the Sub-Coordinator of Madrasah Data and Information Systems, Teachers and Educational Workforce (GTK) and Islamic Religious Higher Education (PTKI), this is because there is still much incorrect data entered by the relevant school agencies. This is of course overcome by analyzing regional and attribute data every 6 months, but this causes ineffectiveness because they must analyze data from the beginning and take a long time. Therefore the solution to this problem is to create an application that can analyze data automatically. The software/application development method in this problem is an agile methodology, using python as a programming language, and PyQt5 as a Graphic User Interface. After the application has been built and tested, it can be concluded that the benefits of this application can provide effectiveness in analyzing. However, it still has drawbacks, where this application can only analyze the "Lembaga_Profile" and "Lembaga_akreditasi" datasets for now. But with the agile method, we can evaluate it and apply the results of the testing evaluation.

Key Words: Data Management, Agile Methodology, Python, PyQt5

1   Introduction

The large number of school institutions in Indonesia is a complicated matter for the Ministry of Religion in managing and processing the data. Errors in data input by institutions in each region are the root of the problem of this study. Due to the large number of input data errors, developing an application that can find data errors in each input and analyze them especially in this dataset is the solution to solve this problem. Data analysis in organizations becomes a process of systematically applying statistical and/or logical techniques to describe and illustrate, summarize and summarize, and evaluate data [1].

Every organization realizes that data is very important in supporting business activities. Moreover, if the data is processed and presented, then it plays a very important role in decision making for management. However, in reality there are still many organizations that are still experiencing difficulties in managing data so that the presentation of the required information is slow [2]. Such is the case at the Ministry of Religion.

In other words, it requires special expertise in collecting, storing and managing and processing it properly to produce information. Not when data or information is needed, then moving to collect data, looking here and there, and of course the results are not optimal. As a result, a decision to be taken becomes delayed, or is not supported by adequate and accurate data.

The biggest asset in a company, business, organization or any type of business is human resources (HR) [3]. Therefore, managing or managing HR data is very important because good data collection can support the progress of an organization.

Based on the above background, the formulation of the problem in making this application is how to increase the effectiveness of the Ministry of Religion workforce in processing school institution data in all regions in Indonesia, how to reduce data entry errors made by institutions or schools in Indonesia, and can they analyze data and outreach to institutions to reduce data entry errors which are a major problem.

To encourage management to improve the quality of the organization, information systems are one of the best dependencies and are recommended. [4] The benefits of this application for the author is knowing the various school institutions in Indonesia and knowing the implementation of Data Analysis in the field of education. Meanwhile, the benefit for the Ministry of Religion is that it can become a reference for the Sub Coordinator of Madrasah Data and Information Systems, GTK and PTKI in the form of predicting various types of data input errors and their area so as to increase the effectiveness of officers in processing data and can minimize data errors in the Central Ministry of Religion.

2 Literature Review

I. Fatema and K. Sakib [5], this paper describes what factors affect the effectiveness of agile methods in the strength of teamwork that can facilitate the software development process. The method used in this paper is to identify the factors that affect productivity, it has an impact on increasing teamwork in the development of information systems. The next article is from M. Wiesche [6], this paper discusses the forms of interrupts generated when using agile methodologies. This paper conducts an exploratory study of an agile software development team. They analyzed (1) programming-related work barriers, (2) interaction-related interrupts, and (3) interruptions caused by the external environment.

B. Kwon and S. Lee [7], This research uses conventional methods as a method for detecting data errors. This research has a "similar" method and objective. The method is using the conventional method, and the objective is to detect erroneous data, but in this research, it uses novels as a reference for data to be detected. The next research is by T. Xiong, M. Pan, Y. Yu, and D. Lou [8], this research is detecting data flow errors across processes in business process collaboration, this research used single process method and focuses on a subset of the elements of the BPC model. Also, this research uses the similar objective, namely to measure data for errors, but this research applies detection to the flow of message communication and data exchange.

V. P. Munteanu and P. Dragos [9], This paper analyzes the main differences between traditional agile and project management methodologies, and identifies some of the main advantages and challenges of software development. This paper describes the differences between agile and project methodologies and explores the benefits and challenges of software development. The last journal is by V. B. Thati, J. Vankeirsbilck, J. Boydens, and D. Pissoort [10], This paper discusses the detection of data failures. However, this paper presents literature for review and analysis. In this journal, the authors present a literature review on techniques for detecting and recovering from data flow failures in embedded systems.

3 Dataset

The data used is obtained from the Ministry of Religion of the Republic of Indonesia. The data year used in this study is 2021. Using two datasets, namely the "Lembaga_Profile" and "Lembaga_Akreditasi". The "Lembaga_Profile" dataset is a dataset that contains information about a madrasa/school, the attributes used are: madrasa name, madrasa status, study time, various majors, NPWP, institutional address, institutional contact, satker code, school type, and sk number. The "Lembaga_Akreditasi" contains the accreditation value of the school in question, the attributes used are accreditation status, and accreditation_value. The data used is very large, amounting to 83000 rows. Regarding the dataset format in this study, we use excel, so the file format of this dataset is xlxs. Before being used, this dataset must be preprocessed first, by removing the dots and commas contained in the data.

Table 1 Example Dataset (Lembaga_Profile)

lembaga_profile_id	nsm	npsn	nama_madrasah
e9b47caf-93b2-4b4d-95e8-483464ed2c00	111235040049	60714507	MIS ROUDLOTUS SALAFIYAH
fd268b1b-ff07-4b3b-8f4e-f0567587daaa	131232040020	60728043	MAS YAPISA
1b3b657f-917e-4b73-8af2-fa050d68de2c	101232020272		RA AL FALAH

| d2687793-1eed-441a-ac64-448358dcbc44 | 111232060137 | 60708222 | MIS AL HAMIDIYAH CIPANCUR |
| afcd51ba-339a-4460-b0e2-0cef076680f9 | 131252030062 | 50222526 | MAS NW PRINGGAJURANG |

Table.1 shows an example of the dataset (Lembaga_Profile) used. In the example dataset above, only some of the attributes are displayed. An example of incorrect data that must be validated is that the NPSN column should contain numbers and cannot be empty or must not be filled with the number 0. But we can see in the table above that one of the data is empty. It is the task of this application to detect these input errors.

3.1 Validation Rule

3.1.1 Attribute Rules for Data Validation (Lembaga_Profile Dataset)

Table 2 Lembaga_Profile Data Validaiton Rule

Attribute Name	Validation Rule
lembaga_profile_id	Validate if there is any data with blank or 0
nsm	make sure that the number is 12
npsn	make sure that the number is 12
nama_madrasah	Validate if there is any data with blank or 0
status_madrasah	Validate if there is any data with blank or 0, and make sure the data is filled by "Swasta" and "Negeri"
waktu_belajar	Validate if there is any data with blank or 0, and make sure the data is filled by number (1, 2, and 3)
jurusan_ipa	if the nsm is start with 131, then it should be at least filled one of this four attributes
jurusan_ips	
jurusan_bahasa	
jurusan_agama	
npwp	It should be a number and should 15 number
lokasi_jalan	Validate if there is any data with blank or 0
lokasi_rt	Validate if there is any data with blank or 0, it should be a number and maximum 3 digits
lokasi_rw	Validate if there is any data with blank or 0
lokasi_kelurahan	Validate if there is any data with blank or 0, It should be a 4 digits number
lokasi_kecamatan	Validate if there is any data with blank or 0, It should be a 2 digits number
lokasi_kabupaten	Validate if there is any data with blank or 0, It should be a 2 digits number
lokasi_propinsi	Validate if there is any data with blank or 0, It should be a 2 digits number
lokasi_kodepos	It should be a number and should 5 number
lokasi_kord_lintang	it should be number between -11 until 6
lokasi_kord_bujur	it should be number between 95 until 141
lokasi_khusus	DATA NOT VALIDATED
kontak_telp	Validate if there is any data with blank or 0
kontak_fax	DATA NOT VALIDATED
kontak_website	DATA NOT VALIDATED
kontak_email	Email Validation
kode_satker	It should be 6 number
nomor_dipa	DATA NOT VALIDATED
m_penempatan_dipa_id	DATA NOT VALIDATED
m_jenis_bahasa_id	DATA NOT VALIDATED
m_kategori_madrasah_id	Validate if there is any data with blank or 0
m_kategori_geografis_id	Validate if there is any data with blank or 0

m_kategori_wilayah_id	Validate if there is any data with blank or 0
lembaga_jenjang	DATA NOT VALIDATED
created	DATA NOT VALIDATED
createdby	DATA NOT VALIDATED
updated	DATA NOT VALIDATED
updatedby	DATA NOT VALIDATED
lokasi_kelurahan_desc	Validate if there is any data with blank or 0
lokasi_kecamatan_desc	Validate if there is any data with blank or 0
lokasi_kabupaten_desc	Validate if there is any data with blank or 0
lokasi_propinsi_desc	Validate if there is any data with blank or 0

Table 2 describes some of the validation rules applied to the "Lembaga_Profile" dataset. This dataset contains information about institutions/schools registered with the ministry of religion. This dataset has more data than the "Lembaga_Akreditasi" dataset, so the validation rules applied are more numerous and more complicated.

3.1.2   Attribute Rules for Data Validation (Lembaga_Akreditasi Dataset)

Table 3 Lembaga_Akreditasi Data Validaiton Rule

| Attribute Name	Validation Rule
Semester	DATA NOT VALIDATED
tahun	DATA NOT VALIDATED
aktif	DATA NOT VALIDATED
nomor_sk	Validate if there is any data with blank or 0
status_akreditasi	It should be filled by (A, B, C, and TT)
Nilai_akreditasi	Validate A(>=91), B(81-90), C(71-80), other than that it is written TT

Compared to the "Lembaga_Profile" dataset, the "Lembaga_Akreditasi" dataset has fewer attributes, as can be seen from Table.3. This affects the validation rules being applied less than the "Lembaga_Profile" dataset. The two validation rules of this dataset have been carefully discussed by the sub-coordinator of data and information systems of the ministry of religion. Therefore this rule has been well verified by experienced people on this dataset.

4   Method

4.1   Application Development Method

In building a software, it takes a method in order to produce a good product and achieve the required goals. The agile method is one good solution for software development. Currently there are many limitations in implementing the method, the fact that many projects are not in line with development methodologies and other management processes, this causes a confusing progress [11]. Not only that, the lack of understanding of agile processes is also an obstacle in applying this method. Organizations in this position are required to adapt to changes using this method [12].

Agile method is defined as an alternative method to the Waterfall method which is linear and can be changed in the middle of the development process. This process adopts an iterative process, so in the development of this method there is no stopping, because the needs are definitely innovating and always changing. The first step to create this application is to apply an application creation method. Because this application is intended for the Central Ministry of Religion, the agile methodology is used in order to create a good and useful application.
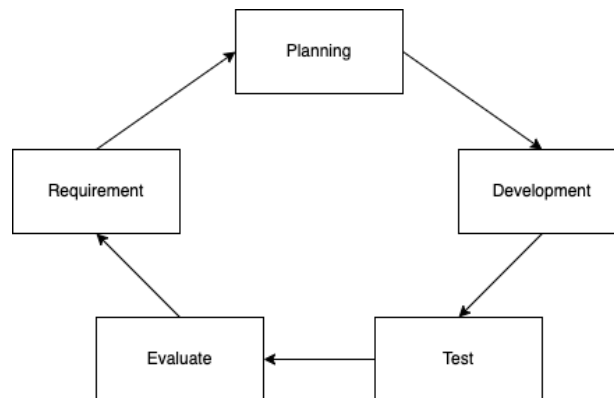
Figure 1 Agile Software Methodology

The basis of this method is the principle of short-term system development with a rapid rate of adaptation to any changes, as depicted in Figure.1. The main point of Agile Software Development is teamwork [13]. This method begins with finding the needs that must be sought, then planning with the sub-coordinator of data and information systems of the Ministry of Religion, followed by application development. After the application is built, it is continued with testing and interviewing the advantages and disadvantages of the application made, finally evaluating the errors and advantages obtained. It doesn't stop there, after evaluation, we can repeat the cycle of agile methodology with new improvements.

4.2 Initial Problem

The initial problem that the author faced was when the head of data and public relations at the Ministry of the Republic of Indonesia complained that there was still a lot of wrong input data, but analyzing the problem took a long time and was less effective. Incorrect data input causes disruption to the performance of employees. Therefore, this application was built to solve these problems and minimize them.

4.3 Functional Requirement Analysis

The main function to overcome the solution in this research is that the user can identify and identify data entry errors and display the area of the agency concerned, as well as display the overall graph. Apart from that the user can also find out this is the number of attribute data errors because this application can calculate it.

4.4 Programming Language and GUI

This software is made using the python programming language, it contains several validations to analyze error data. Python is a programming language that has a syntax or language that is neatly organized and this language is also capable of completing any task [14]. PyQt5 is used in this paper as a graphical user interface in order to create a seamless experience for the user. We as developers must pay attention to the ease of users in interacting with the software to solve their problems [15]. PyQt is a Python binding of the Qt cross-platform GUI toolkit, implemented as a Python plug-in. That is, we can create GUI Desktop applications using Python by using PyQT.

4.5 System Design

In designing this application system, UML (Unified Modeling Language) is used, which is a modeling method that is carried out visually, this method is used as a medium for designing object-oriented systems. The type of UML Diagram used to design this application is an Activity Diagram.
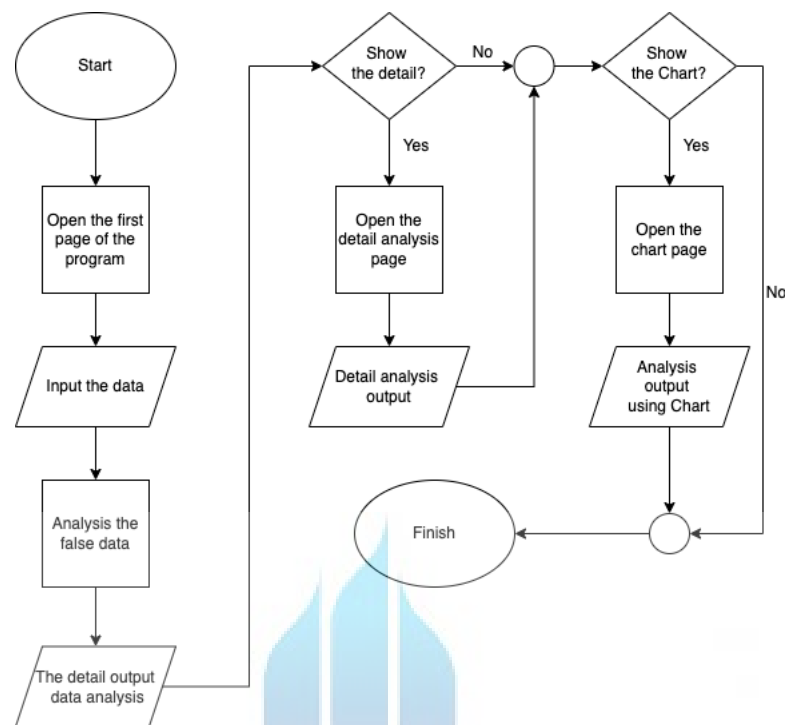
Figure 2 Activity Diagram

The activity diagram on Figure.2 explains about the flow of activities of a system where a user of this application can see an analysis of the data that is input. Start by opening the application that has been created. After that, it is continued by inputting and selecting the data to be analyzed. Next, the user is immediately shown the results of the data analysis. Not only that, users can also choose to see what errors are detected by the application, and users can also view an analysis of the data errors using graphs. The graph used is a bar graph and displays the number of errors detected based on the attributes and regions of each school.

5 Results and Discussion

5.1 Home Interface

Figure 3 Home Page

On this page (Figure 3) the user is directly shown a page to analyze the data. Also, this page (Figure 3) asks the user to input the type of data (Lembaga_Akreditasi) and (Lembaga_Profile). The two fields as can be seen from Figure 3 are used to input datasets. To input the dataset, the user must press the "Browse" button. Not only that, this page (Figure 3) also contains an empty box that can display the results of the analysis performed. Finally, at the bottom of the page (Figure 3), users can see the details of the errors detected by the application and analyze the results in the form of graphs. When the analysis has been carried out the user can view the details and analysis of the graph by pressing the buttons at the bottom, namely "Detail" and "Grafik".

5.2 Insert Data

Figure 4 Insert Data

We can see in Figure 4, if we click the "Browse" button, the application immediately brings up the computer's document folder. After that the user is asked to select the data to be analyzed. The data used must be in the form of "xlsx" and must match the type of data to be analyzed.

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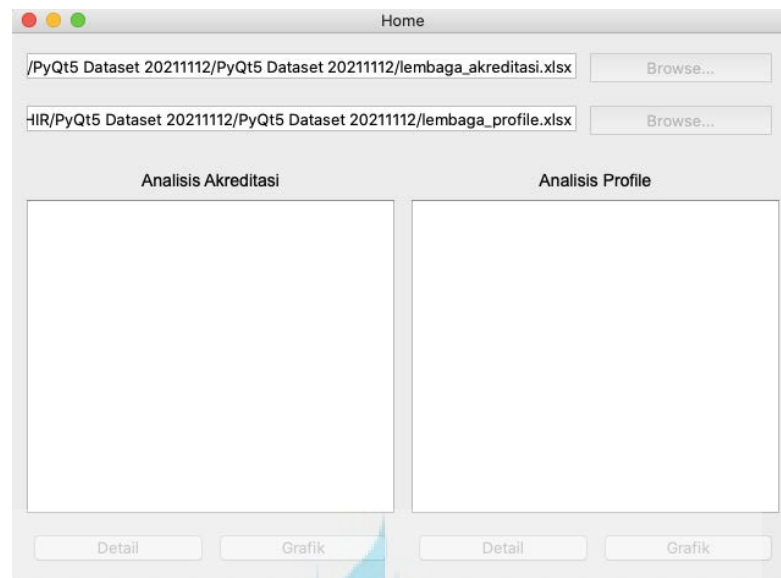
Figure 5 Data Entered & Analyzing

After the data is entered, the application automatically analyzes the data in the background of the application. In Figure 5 we can see that the application is running and analyzing the dataset in the background. This process is a little time consuming because the data analyzed amounted to 83000 for one xlsx data.
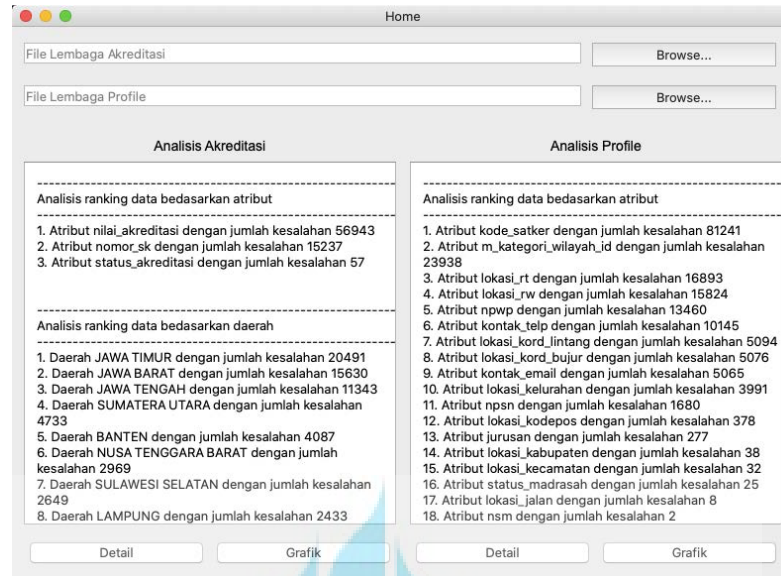
5.3 Analysis Result

Figure 6 The Analysis Result

After the analysis is complete, the application immediately displays the results of the number of analyzes carried out as shown in Figure 6. The analysis contains the number of data errors based on the attributes and regions of each school. The results of the analysis apply to both types of data, namely "Lembaga_akreditasi" and "Lembaga_Profile". We can see from the results of the analysis on the accreditation dataset (Figure 6) that the accreditation value attribute is one of the highest of the 3 validated attributes. On the other hand, East Java was ranked first in making input errors, followed by West Java and Central Java. In contrast to the accreditation dataset, the Kode_satker attribute is the attribute with the most errors being detected in "Lembaga_Profile" dataset. However, in the analysis by region, the ranking is still the same as the accreditation dataset, namely East Java is ranked first, followed by West Java and Central Java.

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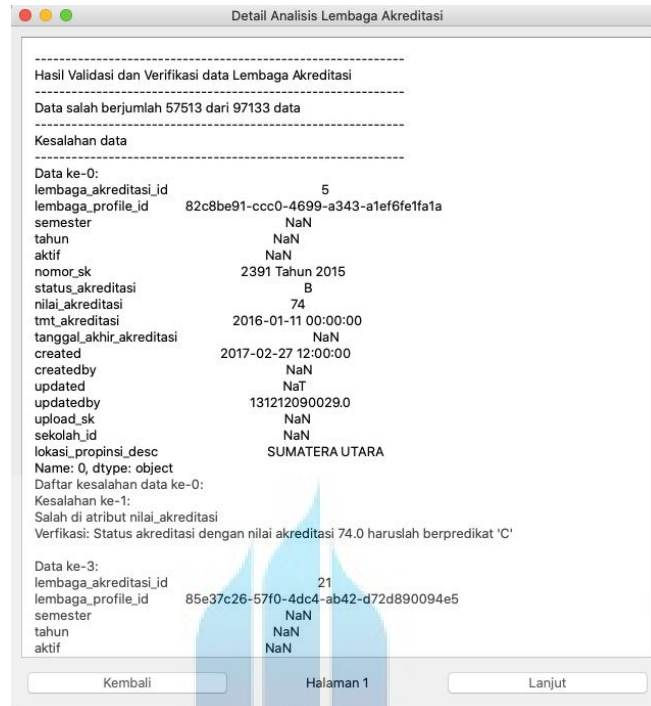
5.4   Detail Analysis Interface

Figure 7 Detail Analysis Page

At the bottom of the home page (Figure 6) there is a "Details" button that functions to display details of errors detected by the application and bring up a popup window like Figure 7 above. This page (Figure 7) displays the data types and details of where the errors are detected by the application. On the detail page (Figure 7), at the bottom there are "Kembali" and "Lanjut" buttons that function to view the previous and next pages of detailed analysis.
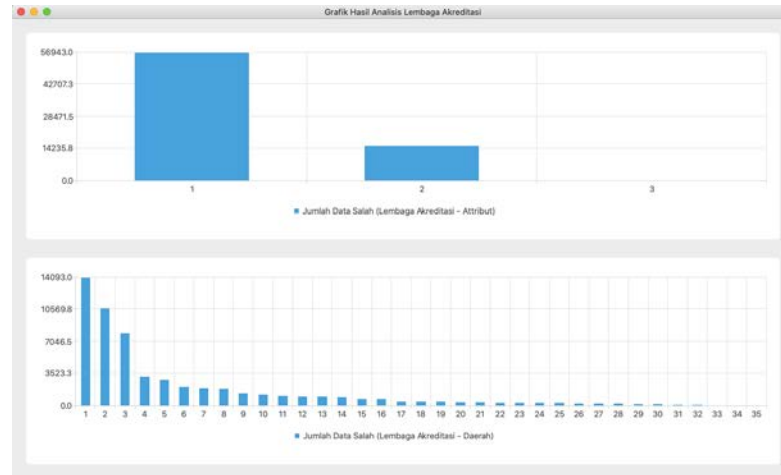
5.5 Chart Analysis Interface

Figure 8 Chart Analysis Page

Not only the detail page, at the bottom of the home page (Figure 6) there is also a "Graphic" button that functions to display the analysis results detected by the application in the form of a graph. Then if the button is clicked it shows up a popup window as can be seen from Figure 8. This page (Figure 8) was created at the request of the Sub-Coordinator of Madrasah Data and Information Systems, GTK and PTKI of the Ministry of Religion to see the overall results of the analysis using charts.

5.6 Testing

Table 4 Black Box Testing

No	Testing Name	Expected Result	Result Obtained
		Black Box Testing	
1	Browse Button	Browse button opens the computer file and the user can input the dataset you want to analyze.	Positive
2	Analysis Box	Analysis box displays the analysis results from the related dataset	Positive
3	Detail Button	Details button pops up the details page.	Positive
4	Grafik Button	Grafik Button pops up the graph page.	Positive
5	Detail Page	Detail Page displays the results of data analysis in a more detailed form.	Positive
6	Chart Analysis Page	Chart Analysis Page displays the results of data analysis in the form of a bar graph.	Positive

After the application is built, the next stage of testing is carried out by the sub-coordinator of data and information systems of the ministry of religion. As we can see in Table.4, it is explained that the results of application testing regarding the function of each feature. From these results we get that the application can run properly without problems. After being tested and going through several application evaluations, it was found that this application can make data analysis performance easier and faster. The drawback is that until now the application can only be used for these two datasets (Lembaga_profile and Lembaga_Akreditasi), the author uses these two datasets because there are datasets that are most

important and must be analyzed. The sub-coordinator of data and information systems of the ministry of religion said that in the future it can be developed and evaluated again so that this application can be used in all datasets.

6   Conclusion

Processing data in a company is important to support its performance. But to process it requires special skills in collecting, storing and managing and processing it properly to produce information. Not only that, processing a lot of data takes a lot of time, so manually analyzing it is still not effective. After conducting trials by the Sub-Coordinator of the Ministry of Religion of the Republic of Indonesia, the application made in this paper can provide effectiveness in analyzing. Only by entering data, the application can analyze the data automatically and produce a good analysis.

However, this application also has drawbacks, where this application can only analyze the "Lembaga_Profile" and "Lembaga_akreditasi" datasets for now. In the future, after being evaluated, this application can be developed so that it can analyze other datasets. Because this application development method is an agile methodology, it takes several revisions to produce good and precise analysis results. Agile methodology becomes a good method in developing an application, because this method is looping and continuous.

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WORKING PAPER

Summary

This thesis has 6 parts, namely literature review, analysis and design, source code, dataset, user interface, and finally testing and conclusions. Each bpart has its own explanation and function. The Literature Review Chapter contains the results of the literature study carried out related to the experiments that the author did. The literature that the author reviews is about the concepts and use cases of agile methodology, error detection applications, the importance of data management, and the use of python and PyQt5.

Furthermore, Analysis and Design, this section contains the outline and stages carried out in this report. At this stage, it is explained how the research is carried out using the agile development method.

then part 3, namely Source Code, in this part all the code used in application development is shown. The fourth is the Dataset Chapter, this part explains what data is used in the experiment. This section also describes the validation rules used for each attribute in each dataset.

The User Interface chapter describes the various views produced by the application created. This chapter also explains how the user uses the application.

The last part is Testing and Conclusions, this chapter explains the results of the tests carried out and concludes the benefits and drawbacks of the applications that have been made.