



Data Warehouse Design on Student Data, Faculty of Computer Science, UKIM

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Abstract

The development of science and information technology cannot be separated from the role of universities as one of the institutions of secondary education. A university, especially within the scope of a university, certainly has a diverse number of students. Moreover, if the university has good quality of education and teaching quality, it will have an attraction for prospective students who want to continue their studies at university. The high number of students in a university, especially certain faculties, often results in hampered in the process of managing and analyzing student data. This research aims to design a Data Warehouse on student data of the Faculty of Computer Science, UKIM. This is done to facilitate the process of managing and analyzing student data of the Faculty of Computer Science. The Waterfall method is used in this study as a reference in designing a Data Warehouse. The results of this research can help the Faculty of Computer Science in terms of managing and analyzing student data.

Keywords: Data Warehouse, Student Data, Faculty of Computer Science UKIM, Waterfall

1. Introduction

Science that develops over time certainly has an impact on all fields of life, especially education. Education is one of the fields that has significant benefits. Higher education is a secondary education institution that helps students a lot in achieving their goals through in-depth learning about a field of study. A university certainly has a diverse number of students who are influenced by the quality of education and the quality of its teachers [1].

The Indonesian Christian University of Maluku (UKIM) is one of the private universities in Ambon City, Maluku Province. UKIM has 7 (seven) Faculties and 1 (one) Postgraduate Program [2]. The Faculty of Computer Science is one of the faculties in UKIM that has an increase in the number of students every year. The increase in the number of students certainly affects the process of managing and analyzing student data. There needs to be a technology that can help related parties in managing and analyzing student data. Designing a Data Warehouse can be a solution to solve this problem.

Data Warehouse is a collection of data that is integrated with each other, in this case it can simplify the process of managing and analyzing data and is useful in the strategic decision-making process [3]. The increase in the number of students at the Faculty of Computer Science UKIM every year certainly results in the inhibition of the process of managing and analyzing student data. There needs to be a technology that can help solve this problem. This research aims to conduct a Data Warehouse Design on Student Data of the Faculty of Computer Science, UKIM. This research is expected to be one of the new technologies for the Faculty of Computer Science in terms of managing and analyzing student data and can be presented interactively in the form of a dashboard.

2. Literature Review

There are several studies that discuss Data Warehouse, research conducted by Muhammad Firdaus Zulkarnain, et al entitled "Perancangan dan Implementasi Data Warehouse Penjualan (Studi Kasus: Northwind Sample Database)". This research aims to predict product sales so that it can be used for decision-making and analysis [4].

The research was also conducted by Said Fadlan Ansharia and Sujacka Retno entitled "Penerapan Metode Nine-Step Kimball Dalam Pengolahan Data History Menggunakan Data Warehouse dan Business Intelligence". This research aims to manage data more neatly, process data for the business needs of each stakeholder or division, and present reporting related to the transaction or sales process (one of which is in the form of graphs) [5].

The research conducted by Nia Adila and Andri entitled “Desain Dan Implementasi Data Warehouse Pada Perpustakaan Daerah Provinsi Sumatera Selatan”. The purpose of this research is to provide the right alternative, where data warehouse is used to integrate old data history information and new library data as well as summaries containing information that is important to make business decisions without having to explore the whole data [6].

The next research conducted by Tri Purwani, et al entitled “Dashboard Untuk Visualisasi Data Penjualan Barang Pada Toko Puppets Skateboard Semarang Menggunakan Tableau”. This research aims to optimize the process of making sales reports and decision-making with Tableau at the Semarang Skateboard Puppets Shop [7].

Several previous studies have the same goal in terms of using Data Warehouses for data management and analysis. In contrast to previous research, this study uses the waterfall method as a reference for researchers in developing these two technologies. This method is used so that the process of this research is structured and can produce good results.

3. Research Methodology

This study uses the waterfall method as a guideline for researchers in designing Data Warehouse and implementing Tableau on student data of the Faculty of Computer Science, UKIM. The Waterfall method is shown Fig 1.

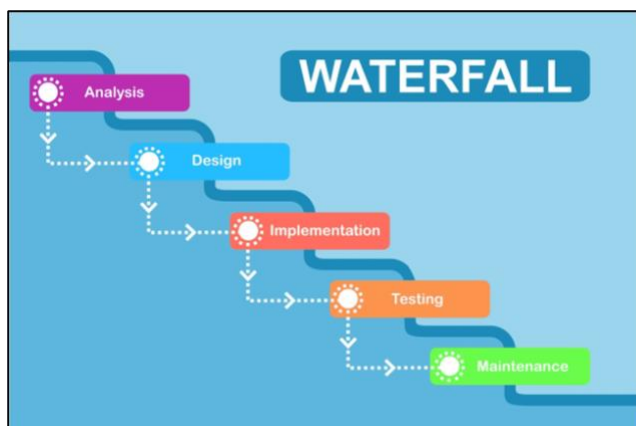


Fig 1. Waterfall Method [8]

1. Analysis
At this stage, the researcher will analyze what data is needed to support this research.
2. Design
After analysis, the researcher will make a display design in accordance with the design and implementation process that will be carried out.
3. Implementation
At this stage, a Data Warehouse will be developed that focuses on student data of the Faculty of Computer Science, UKIM and creates a dashboard display that shows the results of the Data Warehouse design that has been made.
4. Testing
After it is designed and implemented, of course, testing must be carried out in order to find out the overall results obtained after the data is processed in accordance with what is expected. The tests carried out in this study used black box testing.
5. Maintenance
The last stage is used if there are still shortcomings or errors when the test is carried out, it will be corrected at this stage.

4. Results and Discussion

The following are the results and discussion of this research which are divided into the results of the data collection stage and the results of the dashboard creation stage.

1. Data Processing Results
Initial data is useful to provide an understanding of what will be analyzed. In this study, data was obtained directly through the academic section of the Faculty of Computer Science and data obtained in excel format. The data criteria that will be used include personal data and student academic data. The data that has been obtained can be seen in Fig 2.

Fig 2. Student Data

Furthermore, the data in the form of excel is entered into the MySQL database so that it is easy to use in making the program. The data that has been entered into the database can be seen in Fig 3.

Fig 3. Data in MySQL Database

2. Dashboard Display Design

The following is the design of the system to be built. The design is shown in Fig 4.



Fig 4. System Display Design

3. Dashboard View Results

The creation of a dashboard is made in the form of a simple web as a medium to display the data that has been processed. The dashboard will also make it easier for users to access student data that has been processed beforehand. The Dashboard Login view can be seen in Fig 5.



Fig 5. Login View

Users can access the system by logging in first using the username and password that has been registered beforehand. After logging in, the system will automatically log in to the homepage. The home view can be seen in Fig 6.

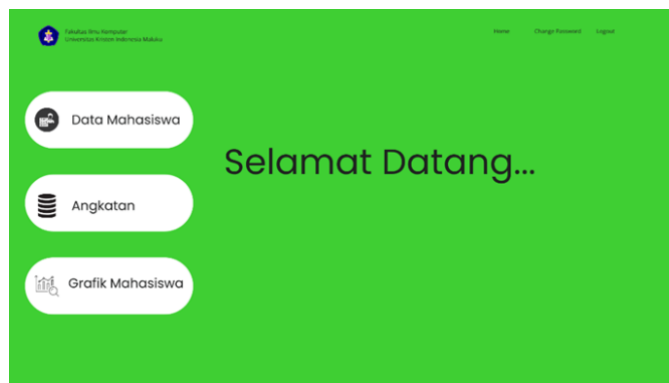


Fig 6. Tampilan Beranda

The homepage on this system contains several features that can make it easier for users to display data, such as: Student Data, Batch Data and Student Graph. The display of student data can be seen in Fig 7.

| NPM | Nama | Angkatan | Status |
|---------------|------------------------|----------|--------|
| 8110100100001 | Abraham Mulya Sitohang | 2021 | aktif |
| 8110100100002 | Adi Pratomo | 2021 | aktif |
| 8110100100003 | Adi Pratomo | 2022 | aktif |
| 8110100100004 | Adi Pratomo | 2021 | aktif |
| 8110100100005 | Adi Pratomo | 2021 | aktif |
| 8110100100006 | Adi Pratomo | 2021 | aktif |
| 8110100100007 | Adi Pratomo | 2022 | aktif |
| 8110100100008 | Adi Pratomo | 2021 | aktif |
| 8110100100009 | Adi Pratomo | 2021 | aktif |
| 8110100100010 | Adi Pratomo | 2022 | aktif |
| 8110100100011 | Adi Pratomo | 2021 | aktif |
| 8110100100012 | Adi Pratomo | 2021 | aktif |
| 8110100100013 | Adi Pratomo | 2021 | aktif |
| 8110100100014 | Adi Pratomo | 2021 | aktif |
| 8110100100015 | Adi Pratomo | 2021 | aktif |

Fig 7. Student Data Display

The Force Data display is shown in Fig 8.

| Kode | Angkatan |
|------|---------------|
| 19 | Angkatan 2019 |
| 20 | Angkatan 2020 |
| 21 | Angkatan 2021 |
| 22 | Angkatan 2022 |
| 23 | Angkatan 2023 |
| 24 | Angkatan 2024 |

Fig 8. Force Data Display

Student Graph View, shown in Fig 9.



Fig 9. Student Graph

4. Testing

After the system is completed, testing will be carried out. The test carried out is the blackbox test. This test aims to ensure that the features in the system are running properly. This test is carried out by comparing the test results with the expected results. The results of the blackbox test are shown in Table 1.

Table 1 : Hasil Pengujian Blackbox

| No | Testing | Validation | Input | Test Results | Status |
|----|-----------------------------------|--|--|---|--------------|
| 1 | Testing Login Forms | Verify <i>username</i> and <i>password</i> | <i>Username</i> and <i>Password</i> are correct <i>Incorrect username</i> and <i>password</i> | Login Success Failed login | <i>Valid</i> |
| 2 | Testing <i>Add Student Data</i> | Select the Student Data link or menu | The admin inputs the student's data and will be stored in the <i>database</i> | The process of adding student data was successful. | <i>Valid</i> |
| 3 | Student Data Edit Testing | Select the Student Data link or menu | The admin edits the student's data and it will be stored in the <i>database</i> | The process of editing the department's data was successful | <i>Valid</i> |
| 4 | Batch Data Delete Testing | Select the Link or Force Data menu | Admin deletes data in tables on the system | The Student Batch Delete Process Was Successful | <i>Valid</i> |
| 5 | <i>Drill Down Table Force</i> | Data Angkatan | Choosing one of the batches | The table successfully displays student data by class | <i>Valid</i> |
| 6 | Graph Number of students by Class | Select the Link or Force Data menu | Graphics can perform well | Graphs are displayed with the corresponding data | <i>Valid</i> |

5. Conclusion

Based on the research that has been carried out, it can be concluded that the Data Warehouse Design has shown satisfactory results. This can be seen from the system display in this report as well as the test results from users who stated that all features have run as they should. For future research, it can be created the same Data Warehouse but with an expanded scope of data, for example covering all student data in UKIM.

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References

[1] M. T. Hidayatullah, M. Asbari, M. I. Ibrahim, and A. H. H. Faizd, "Urgensi Aplikasi Teknologi dalam Pendidikan di Indonesia," *J. Inf. Syst. Manag.*, vol. 2, no. 6, pp. 70–73, 2023, [Online]. Available: <https://jisma.org/index.php/jisma/article/view/785>

[2] "Universitas Kristen Indonesia Maluku." Accessed: Jun. 01, 2024. [Online]. Available: <https://ukim.ac.id/>

[3] E. Saputra, "Permodelan Data Warehouse Untuk Penjualan Ban Menggunakan Online Analytical Processing (OLAP)," *J. Ilm. Inform. dan Ilmu Komput.*, vol. 2, no. 1, pp. 12–18, 2023, doi: 10.58602/jima-ilkom.v2i1.13.

[4] N. P. N. Ardiyanti, M. F. Zulkarnain, I. W. W. K. Sandi, I. D. N. T. Hendrawan, and I. B. M. Mahendra, "Perancangan dan Implementasi Data Warehouse Penjualan (Studi Kasus: Northwind Sample Database)," *JELIKU (Jurnal Elektron. Ilmu Komput. Udayana)*, vol. 10, no. 1, p. 175, 2021, doi: 10.24843/jlk.2021.v10.i01.p20.

[5] S. F. Anshari and S. Retno, "Penerapan Metode Nine-Step Kimball Dalam Pengolahan Data History Menggunakan Data Warehouse dan

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- Business Intelligence,” *J. Ilmu Komput.*, vol. 16, no. 1, p. 69, 2023, doi: 10.24843/jik.2023.v16.i01.p07.
- [6] N. Adila and A. Andri, “Desain Dan Implementasi Data Warehouse Pada Perpustakaan Daerah Provinsi Sumatera Selatan,” *J. Nas. Ilmu Komput.*, vol. 2, no. 1, pp. 33–50, 2021, doi: 10.47747/jurnalnik.v2i1.520.
- [7] T. Purwani, A. Wahyuni, A. P. Wicaksono, and H. D. Charunia, “Dashboard Untuk Visualisasi Data Penjualan Barang Pada Toko Puppets Skateboard Semarang,” *J. Komputaki*, vol. 7, no. 1, pp. 1–12, 2021.
- [8] Online Scholarship Competition, “Analisis Model Waterfall : Pengertian, Tahapan, Kelebihan dan kekurangan.” Accessed: Jun. 01, 2024. [Online]. Available: <https://osc.medcom.id/community/analisis-model-waterfall-pengertian-tahapan-kelebihan-dan-kekurangan-4352>