Processing Student Data Using a Data Warehouse

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ABSTRACT

Lectures are activities carried out by a higher education institution. This activity involves several elements, including students, academics and lecturers. The result of the lecture process is the emergence of grades for each student according to the courses they take. In each semester, an evaluation of the lecture process can be carried out, including obtaining an index of the quality of lecturers and students. This information can be used by management in making policies regarding the lecture process in the future. Data warehouse technology is needed to manage all values and display them in a reporting system for management. Data warehouse technology is needed so that the information displayed can be presented in multi-dimensional form related to students, lecturers and grades.

KEYWORDS: Data warehouse, reporting, student,

1. Introduction

Nowadays, the use of information technology that is integrated with work processes in an organization has become an absolute necessity. This is due to the need for the organization to improve its ability to analyze the problems it faces and make decisions. The availability of complete, correct and accurate data and information has become a basic requirement for the survival of an organization.

Data warehouse is a technology that is able to answer the above needs. Data warehouses have been widely used by organizations to manage data which is always increasing all the time.

Data analysis has become an important need to increase the competitiveness of a business organization or company. Entrepreneur-style decision making which tends to rely on intuition is becoming less relevant amidst increasingly complex competition, so that management can make decisions based on actual facts, and not just rely on intuition and quantitative experience. The need for information to support decision making is not only for the business world. In the world of education, a system is needed that is able to support management in the decision-making process. The general form of the role of information technology in the world of education includes an Academic and Student Affairs Information System.

Academic and student information systems are one of the benchmarks for the level of success in providing education at a college or university. The quality of higher education organizations as assessed by the use of information technology and the use of information system technology can influence competitiveness in various aspects of higher education assessment, both nationally and internationally.

A university needs to provide services to stakeholders, including students. Examples of services provided to students include payment administration, course registration administration, lecture administration, and graduation administration. An integrated information system is certainly needed to speed up these service activities. Data from academic activities will continue to increase from year to year and make the database size bigger. In order not to burden the existing transaction processing system, in time old data needs to be moved to a data warehouse.

A data warehouse will provide reports that are dynamic and can be viewed from various dimensions. The resulting report will also

have the ability to be further detailed or summarized. Without a data warehouse, the reports produced will be more static in accordance with those provided by applications at the management information system level

2. General Instructions

Data Warehouse or abbreviated as DW is a relational database that is designed more for querying and analysis than transaction processing, and usually contains historical data from transaction processes and can also be data from other sources. Data Warehouse can also be said to be a summary storage place for historical data which is often taken from separate databases of departments, organizations or companies (Kimball and Caserta, 2024).

The main goal of creating a data warehouse is to unify diverse data into a single storage area where users can easily run queries, generate reports, and perform analysis. One of the benefits obtained from the existence of a data warehouse is that it can increase the effectiveness of decision making.

From the definition explained above, it can be concluded that a data warehouse is a database that interacts with each other and can be used for querying and analysis, is subject-oriented, integrated, time-variant, does not change (ad hoc) which will later be used to assist organizational or company decision making. by the decision maker.
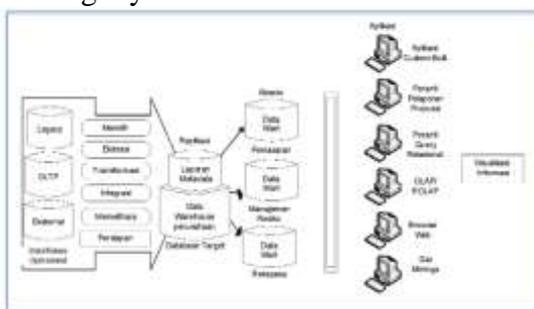

Figure 1. Data warehouse arsitektur

create this application using PHP and my sql because it is very easy and there are several features that are very understandable

2.1 Research and method

In the 90s, a new methodology was introduced, known as agile methods. This methodology is a very revolutionary change when compared to previous methods. Agile Methods were developed because in traditional methodologies there are many things that make the development process unable to be successful according to user demands If we look, agile can mean nimble, fast, or light. Agility is a light and fast method in software development. The Agile Alliance defines 12 principles for achieving processes that fall under agility:

The highest priority is to satisfy customers through initial delivery and valuable software.

Accept changes to requirements even if they are requested at the end of development.

Provide software in progress, duration of several weeks or months, with the shortest possible time option.

Business and pastoral parties must work together every day while the pastoral operation is running.

Build projects with highly motivated individuals by providing the necessary environment and support, and trusting them completely to complete the work.

The most effective and efficient method for conveying information to the development team is direct communication (face to face).

The software being worked on is the main measure of progress.

Agile processes provide a scalable development process. Sponsors, developers, and users must maintain a constant pace of uncertainty.

Continuous attention to good planning and technique increases agility.

Simplicity to minimize the amount of work.

The best architectures, requirements, and plans emerge from independent teams.

At regular intervals, the team reflects on how to be more effective, then adjusts accordingly.

Agile is one of the newest models and has different steps from other software development methods. These differences

include the way of working and the steps in the Agile model. Apart from that, the Agile model also has several features when carrying out software development, including:

Fast iteration and regular delivery of working software ensures customer satisfaction.

Late changes can be resolved easily and are also accepted openly.

Development is measured based on software implementation

Customer and user communication is emphasized face to face.

Every meeting with team members is conducted face to face.

Every member of the development team is committed and highly motivated, competent and trustworthy.

The Agile model was initially developed because in traditional methodologies there were many things that made the development process unable to work well according to user requests. Thus, the Agile model certainly has advantages or disadvantages compared to other methods.

Figure 2. model certainly has advantages

The advantages of the Agile model for software developers include increasing customer satisfaction, being able to review customer ratios regarding software that is created early, reducing the risk of failure in software implementation from a non-technical perspective and the value of losses, both material and immaterial, is not too large if a failure occurs.
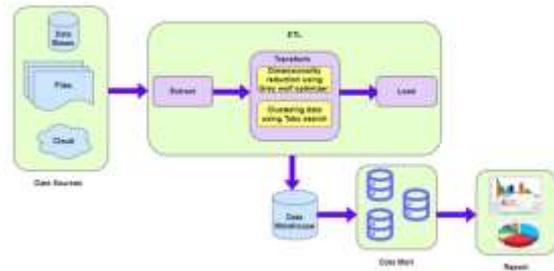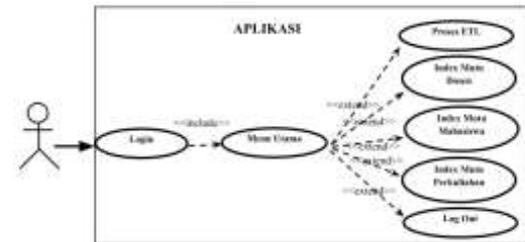

Figure 3. Agile Model

2.2 Result

Figure 4. Aplication

At this stage, an analysis of the required reports is carried out based on interviews conducted with management. The report required is in the form of information as a basis for decision making regarding lecture activities

a. Lecturer Quality Index Report
b. Student Quality Index Report
c. Lecture Activity Index Report
d. Existing Index Database Report

Tabel 1. Student quality

This sample menu is intended to carry out the Extract – Transform – Loading (ETL) process from the existing database to the data warehouse. Users select the academic year and semester that will be processed,

Input: Data from various sources

Output: Dimensionally of data is reduced (Select only best position of fitness value)

Step 1. Generate dimension search space by randomly initializing the population of grey wolf, represented by M agents with its position.

Step 2: Initially, the index value of iteration $t = 0$ and maximum iteration is t_{max}.

Step 3: while it does not reach t_{max} iteration do

Step 4: Evaluate the first best fitness values of α, second best fitness value β, third best fitness value δ.

Step 5: Calculate the search coefficient by using

$$p_i^d(t) = p^d(t)(2r_{i1}^d - 1),$$
$$q_i^d(t) = (2r_{i2}^d), l \in \{\alpha, \beta, \delta\} \qquad (2)$$

Here r_{i1}^d and r_{i2}^d are distributed uniformly within the range of random numbers $0 \le r_{i1}^d \le 1$, $0 \le r_{i2}^d \le 1$, $d = 1,2,\dots,n$. The coefficient $p^d(t)$ are linearly decrease from 2 to 0 and increase the iteration number.

$$p^d(t) = 2[1 - (t-1)/t_{max} - 1], d = 1,2,\dots,n, \qquad (3)$$

Step 6: For each wolf do

Step 7: The wolf (agent) is moved to new position and update its position by using:

$$w^{ld}(t+1) = w^{ld}(t) - p^d(t)r_i^{ld}(t), d = 1,2,\dots,n, \text{ and } l = 1,2,\dots,N, l \in \{\alpha, \beta, \delta\}. \qquad (4)$$

The updated position of wolf is obtained by arithmetic mean value of α, β, δ wolf is :

$$w_i^t \left((t+1) = w^{\alpha d}(t+1) + w^{\beta d}(t+1) + w^{\delta d}(t+1)\right)/3 \qquad (5)$$

The vector solution of Eqs (5) can be defined as

$$w_i^t \left((t+1) = w^\alpha(t+1) + w^\beta(t+1) + w^\delta(t+1)\right)/3 \qquad (6)$$

Step 8: the iteration index value t is incremented and it continues until it reaches t_{max}.

Step 9: return w^α.

Figure 5. Formula

This formula will work based on what is implemented in PHP

And result after that

Tabel 2. Result

Kode Mata Kuliah	Nama Mata Kuliah	SKS	Huruf Mutu	Angka Mutu	Nilai Mutu
KPA 101	ILMU DASAR KEPERAWATAN	5	A	4	20
KPA 102	ILMU KEPERAWATAN DASAR I	4	A	4	16
KPA 103	AGAMA	2	A	4	8
KPA 104	KEWARGANEGARAAN	2	A	4	8
KPA 105	ILMU KEPERAWATAN DASAR II	4	A	4	16
KPA 106	FARMAKOLOGI	2	B	3	6
	Jumlah	19			74
	Index Prestasi Semester				3.89
	Sub-Total				37.4

6. Conclusion

In this writing we have proposed using ETL or data warehouse to speed up the reporting process so as not to hamper the decision making process. In this ETL process it becomes faster because it separates the data that is really needed for the report being used.

References

[1] Kimball, R., & Ross, M. (2024). Relentlessly practical tools for data warehousing and business intelligence.

[2] Aisyah, Y., & Anwar, S. (2023). Pembuatan Data Warehouse secara Berjenjang dari Data Transaksi dengan ETL Script PHP. Techno. Com, 22(3), 609-621.

[3] Fawzy, A., Tahir, A., Galster, M., & Liang, P. (2024). Data Management Challenges in Agile Software Projects: A Systematic Literature Review. arXiv preprint arXiv:2402.00462.

[4] Dinesh, L., & Devi, K. G. (2024). An efficient hybrid optimization of ETL process in data warehouse of cloud architecture. Journal of Cloud Computing, 13(1), 12.