Monolithic Architecture Integrated Web Application School Educational Management Information System

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Abstract. The implementation of a school education management information system (MIS) will help ensure the continuity of the learning process in schools. School education MIS provides information to support school management decisions, assist the academic process, and distribute information to parents and the general public. The school education MIS consists of a web application for new student registration, finances, learning processes, student and teacher attendance, and school profiles. The use of a monolithic web application architecture makes it easier to process data in school education MIS. Web applications are created based on the specifications and objectives of the education management information system. The problem that will be solved in this research is how to integrate existing web applications into the school education management information system. So that these web applications can be integrated well, a monolithic architecture is used. Using this architecture does not require large resources and costs, so it is easy to implement in schools.

Keywords: school education MIS, web application, monolithic architecture

1   PREFACE

By the Minister of National Education Regulation (Permendiknas) No. 19 of 2007 concerning Education Management Standards, every school is obliged to develop a school education management information system (MIS) [3]. The development of this system aims to improve academic quality and school management. From the school management perspective, school education MIS provides information used to support decisions [5]. In the learning process between teachers and students, school education MIS is used as a learning tool both online and offline. School education MIS also used by parents and the community to obtain information from schools.

The school education management information system consists of several sub-systems depending on the school's needs. A new student admission system that functions as new student registration. An attendance application is used to record student and teacher attendance during the learning process. E-learning is used to support the offline learning process between students and teachers. A financial information system that will record student tuition payments. One of the components a school education MIS is a web application. By using web applications with information technology, information processing will be more effective and efficient [2]. Data will

be stored in a structured manner in database tables so that it is easy to access. The use of the internet makes it easier for teachers, students, parents, and the community to access information at school.

Each web application in the school education MIS has different characteristics and functions depending on the school's needs. When using daily activities, the school education MIS web application will work together with each other even though the web application is individual. In the process of developing web applications that have different specifications and functions, an architecture is needed that integrates existing web applications into the education management information system. The chosen architecture should be MIS, easy to repair. and able to adapt to changing user needs.

Monolithic architecture is an architecture that is widely used in small- to medium-scale software development and does not require large resources [9]. The advantages of this architecture are that it is easy to develop, easy to deploy, and easy to scale. Monolithic architecture has three layers, namely: the interface, which functions as a connecting medium between the user and the application; business logic; a layer that functions as application data processing; and the data interface, which functions as a connecting medium between the application and the database.

In this research, we developed a web application for the school education MIS at TKIT Cahaya Rizki Mandiri in the Kenten area of Palembang City. Web applications have a monolithic architecture. Not all educational school MIS web applications will be developed; the web applications that will be created will be in the form of school profiles, new student registration, teacher-student attendance, and school finances. The choice of the form of this web application was based on the needs of TKIT Cahaya Rizki Mandiri.

An educational management information system is needed by schools to support management decision-making, distribute information, and assist teachers and students in the learning process. This system consists of subsystems such as school profile applications, student-teacher attendance applications, financial applications, and academic applications. Developing a school education MIS will certainly require large resources, and this will be a problem for schools that have limited funds. The problem that will be examined in this research is how to collaborate these various applications into an integrated educational management information system that is developed with resources that are not too large.

2   BASIC THEORY

2.1   System Architecture

Application architecture models how each component of the system can work together to achieve unity. Architectural design is the first stage in the software design process. The process of bridging the relationship between design techniques and requirements analysis The output of the architectural design process is an architectural model that describes how the system is composed of a set of components that interact with each other.
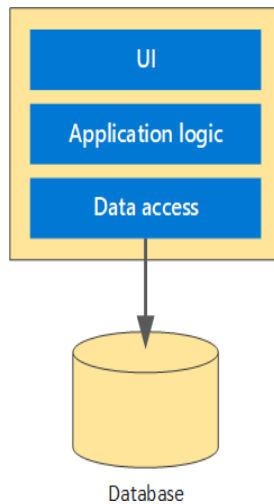
2.2   Monolithic architecture

Fig. 1. Monolithic architecture

Monolithic architecture is an architecture that describes an application that runs all the services on one server so that one server will handle all the services in the application. Each application will run simultaneously because all application modules are wrapped in a large application. A monolithic architecture will combine the entire system program code into one application. All interfaces, business, and database logical access are packaged together into a single application artifact and deployed to the application server.

In a monolithic architecture, one program does everything. Including displaying the user interface, accessing data, processing customer orders, printing reports, and performing other applications that need to be done.Advantages of Monolithic Architecture :

1. Easier development

   The monolithic approach can be said to be the traditional way of developing software. A team can quickly build new features because there aren't a lot of stacks or tools to learn. For example, if the stack currently controlled by the majority of team members is PHP, the team may decide to build a monolithic application based on PHP. The process of transferring knowledge between team members can be easier because the application is built using the same stack.

2. Testing and debugging are easier.

   Monolithic architecture also allows us to test the system more easily. This is because the application features and components are in one code, so they can communicate directly   without   requiring   special   protocols.   This   is   different.

with microservices that need to prepare related services and think about how to communicate between one service and another.

3. Deployment is MISpler

  The monolithic application deployment process is much MISpler because all features and components are in the same code. This is different from the microservice approach, which requires thinking about a deployment strategy for each service being run.

2.3   Management Information System

Management Information Systems (MIS) is a group of people, a set of guidelines and instructions for data processing equipment (a set of elements), selecting, storing, processing and retrieving data (operating data and goods) to reduce uncertainty in decision making (seeking a common goal), by generating information for managers at a time when they can use it most efficiently (generating information according to reference times).

  [4] stated that MIS is a system created to carry out data processing that will be used by an organization. When people hear the term MIS, they usually imagine a computer system. In this case, MIS existed before computers were created. In the literature, there is no common use of the term MIS. MIS in English means Management Information Systems Management of Information Systems or Information Processing Systems or just Information Systems.

2.4   Understanding Education Management Information System

In essence, the Education Management Information System is an information system for the management needs of educational institutions, in this case schools/madrasas, namely TK/RA SD/MI, SMP/MTs, and SMA/MA. the Education Management Information System was developed in an integrated manner starting from the operational process of registering new students, the academic process, and financial management, to the operational process of students becoming alumni.

  Education Management Information System is a school/madrasah operational process. The education Management Information System is also designed by JARDIKNAS standards. All reporting needs from schools/madrasahs to the Regional Education Service or for the needs of the Ministry of National Education can be done easily. With Education Management Information System, education management becomes easier and more controlled. In the face of globalization, information systems are increasingly needed by educational institutions, especially in improving the smooth flow of information within educational institutions, quality control, and creating alliances or cooperation with other parties that can increase the value of these educational institutions.

2.5   Web Application

Web software was initially designed as an information medium, and then developed into an application medium [6]. Web applications are now complex software systems,

providing interactive, data-intensive, and customizable services, can be accessed via different devices, and provide facilities for user transactions to take place and usually store data in a database.

Web applications can be defined as [6]: "a software system based on technology and standards from the World Wide Web Consortium (W3C) that provides specific web resources such as content and services, through a user interface (user interface) known as a web browser (web browser)".

3 RESEARCH METHODOLOGY

This section will explain the activities carried out while conducting research. Each activity carried out will also explain the tools used, methods, and desired results.
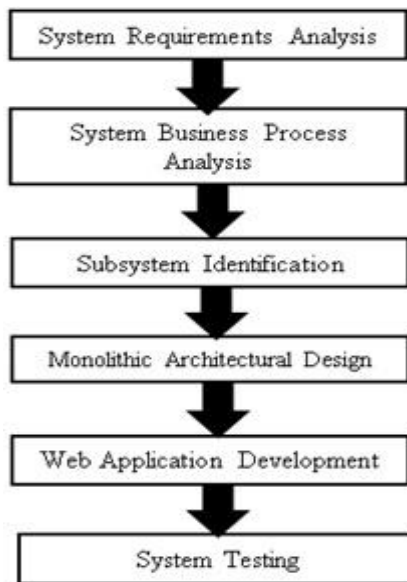

Fig. 2. Research stages

The first stage carried out in this research was to carry out a system requirements analysis. The method used at this stage is conducting observations at TKIT Cahaya Rizki Mandiri and conducting interviews with TKIT Cahaya Rizki Mandiri managers. The results of the first stage are the school education MIS specifications required by TKIT Cahaya Rizki Mandiri.

System Business Process Analysis The way to carry out a business process analysis is the same as the way to carry out a system requirements analysis. What is different at this stage is the output produced. At this stage, the output is produced by the workflow that occurs in the business processes at TKIT Cahaya Rizki Mandiri.

Subsystem Identification, Subsystem identification is carried out to determine what information systems will be created in the TKIT Cahaya Rizki Mandiri school education MIS. This identification process is obtained based on the results of the needs

in the previous stage. Not all information systems will be created. The information system was created according to urgent needs by considering the resources at TKIT Cahaya Rizki Mandiri. The information system that will be developed is in the form of a web application.

Monolithic Architectural Design After obtaining the education management information system subsystem that will be created, the next stage is designing the web application architecture. The web application architecture that will be created is in the form of a monolithic architecture. The architectural design uses Star UML tools. The results obtained at this stage are in the form of an educational management information system design.

Subsystem Web Application Development The web applications that will be created on the education management information system at TKIT Cahaya Rizki Mandiri are new student admission applications, student attendance applications during the learning process, student tuition payment applications, and school profile applications. The web application will be created using the PHP programming language using the Code Igniter framework and the DBMS using MySQL.

Subsystem Integration The web applications that have been created are integrated into one unit to form a large web application to form an education management information system. Integration is carried out by using the database in the MySQL DBMS together. Using one unified database will make it easier to develop web applications.

The TKIT Cahaya Rizky Mandiri school education MIS web application that has been developed has been tested for its specifications to see whether it meets the user's needs. The first test uses the Black Box method by creating scenarios by entering various types of data into forms on the school education MIS web application. The second test uses the SiteSort application to determine the compatibility of the web application, and whether it can be accessed by various browsers.

4   RESULT

4.1   System Description

The school education management information system created in this research is a school information portal web application for accepting new students, monitoring student attendance, and paying student tuition fees every month. The school information portal web application contains school information that will be distributed to the community. The information that will be distributed includes the history of the founding of the Cahaya Rizki Mandiri IT Kindergarten, mission, vision, organizational structure, school activities, photos of school activities, teacher profiles, and announcements.

To register as a TKIT Cahaya Rizki Mandiri student, parents of prospective students do not need to come directly to the school. Registration can be done using the new student registration application. Student attendance will be recorded via the student attendance application. Student attendance is recorded by the class teacher. The final application that will be made is for recording student tuition payments.

4.2   School Education MIS Specifications

1. System Functionality Requirements

- The system is capable of setting up applications
- The system can manage school activity data
- The system can manage school announcements.
- The system can manage school profile data.
- The system can manage files
- The system can manage teacher profile data
- The system can receive input from users
- The system is capable of registering prospective students.
- The system can manage the biodata of prospective students
- The system can manage the status of prospective students.
- The system can create new student registration reports.
- The system can record student attendance data.
- The system can manage student attendance status.
- The system can create student attendance status reports.
- The system can manage student data. The system can record student tuition payments.
- The system can manage student tuition payment status
- The system can create student tuition payment status reports.

2. Non-Functional System Requirements
- The system is attractive and easy to use by users.
- Response time for each action is less than ± 1 second.

4.3   School Education MIS Monolithic Architecture

Sub-systems in the form of web applications in the school education management information system are connected to form a complete system. The connecting medium between these web applications is a database. All these applications use one database, namely academic. Sharing one database is the principle of monolithic architecture. There is one thing that each web application has in common, namely that it uses the same data, namely TKIT Cahaya Riziki Mandiri student data in the student table in the database.
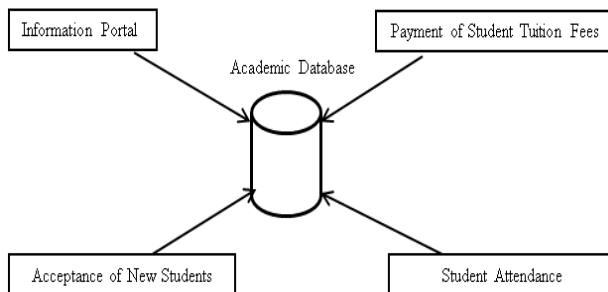
Figure 3 shows the monolithic architecture of the TKIT Cahaya Rizki Mandiri School MIS web application. The use of web applications in the School Education MIS starts with announcements regarding the acceptance of new students. Prospective participants who wish to become students at TKIT Cahaya Rizki Mandiri can register via the New Student Admissions web application. If the class quota is met and the prospective student meets all the requirements, the status of the prospective student changes to TKIT Cahaya Rizki Mandiri student. Every student who takes lessons in class is required to fill out the attendance web application. The tuition payment web application is used to record student payments every month.

Characteristically, each TKIT Cahaya Rizki Mandiri school education MIS web application has its data according to its function. The school education MIS has one academic database to store data. This database is used jointly by all TKIT Cahaya Rizki Mandiri school educational MIS web applications. In the academic database, there is one student table, which is used jointly by all web applications. Every web application requires student table data. Using student table data together with the TKIT Cahaya Rizki Mandiri Education MIS provides the advantage of preventing data redundancy, saving resources, and making design easier.

4.4   School Education MIS Web Application

Fig. 4. Registration Form on the PPDB Web Application

One of the pages of the TKIT Cahaya Rizki Mandiri school education MIS web application form is shown in Figure 4, namely the registration form for prospective new students. On this form, prospective students can register at TKIT Cahaya Rizki Mandiri. Registration can be done anywhere and can be accessed via various electronic devices. After registering, prospective students can complete their student biodata and make payment. If the class quota is met, the prospective student will become a TKIT Cahaya Rizki Mandiri student.

4.5   Black Box Testing Method

To find out the specifications of the TKIT Cahaya Rizki Mandiri school MIS web application, testing was carried out using the Black Box method. Testing of this method is carried out by creating scenarios on forms in the web application. The first scenario is carried out by entering data by the form specification data, and the second scenario is carried out by entering data that does not comply with the form specification data. The form output results are compared with the design results to determine whether they are appropriate or not. One example of the results of testing the Black Box method on the PPDB registration form is presented in Table 1.

Table 1. Testing the functionality of the PPDB Registration form

No	Item Test	Expected results	Actual results	Information
1	Prospective students do not enter data according to the registration form data specifications	The system displays an error message: "The data entered is incorrect"	The system displays an error message: "The data entered is incorrect"	The aim is to find out whether the system is able to handle data that does not comply with specifications
2	Prospective students enter data according to the registration form data specifications	The system displays an error message: "You have successfully registered"	The system displays an error message: "You have successfully registered"	The aim is to find out that the data is in accordance with the registration form specifications and is stored in the database

4.6   Compatibility Testing

This second test was carried out using the SiteSort application to find out whether the school education MIS web application could be accessed by various browsers. This testing is important because the users of this web application are diverse and use various types of browsers when accessing the web application. The browsers tested were: Microsoft Edge, Mozilla Firefox, Google Chrome, and Opera. From the results of this test, it was found that all browsers were able to operate the web application well.

5   CONCLUSION

The results of this research can lead to several conclusions:

1. School education MIS helps business processes effectively and efficiently at TKIT Cahaya Rizki Mandiri. School data is well organized, making it easier for school management to make decisions. The general public can also easily get information related to school student activities.
2. The monolithic architecture used in the school education MIS is simple, making it easier to build the school education MIS. Apart from that, using a monolithic architecture does not require large resources.
3. The results of application testing show that the School Education MIS web application specifications run well and are by user needs. Web applications can also be accessed by many internet browsers, such as Microsoft Edge, Mozilla Firefox, and Google Chrome.

6   RECOMENDATION

For further research, it is hoped that we will apply the usability factor to the school education MIS web application. By applying these quality factors to various school education MIS users, it is easier to use them.

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