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Designing a School Payment System using the Rapid Application Development (RAD) Method (Case Study: YAPPIKA Legok Vocational School)

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ABSTRACT

YAPPIKA Legok Vocational High School is a school that plays a role in the development of science, especially in the fields of Technology and Information. The school payment system still uses manual methods, payments are still made by searching or recording in recapitulation books which takes quite a long time. This research aims to create a school payment system that illustrates the ease of the payment process so that it is more accurate, reliable, representative, and efficient, which can be used to prepare school financial reports. This research can be carried out using the Rapid Application Development (RAD) method to provide faster application development and produce high-quality results than using manual methods so that it can be designed and developed quickly, starting from Requirements Planning, Design Processing, and Implementation. The results obtained from this research are developments in time efficiency and performance for Administration in carrying out their work. This can be seen from the time used in processing a payment where the usual time for making a payment is 10-15 minutes which can now be done in a shorter time, namely 3-5 minutes, then payment recapitulation has also decreased in calculation time from 20 -30 minutes to about 5-10 minutes.

I. Introduction

Technological developments have now become part of everyday life, and because of this, we have to develop along with current technology.[1] The need for the concept of using technology is currently very much needed in everyday life. Technology has become an inherent part of life in society.[1]

As a Vocational High School in Legok District, YAPPIKA Legok Vocational School plays a role in developing science, especially in the field of Information Technology and Communication. Currently, the payment process at YAPPIKA Legok Vocational School still uses a traditional concept, in other words, the payment process is carried out manually which takes quite a long time to carry out school payment transactions.

The payment process is carried out manually, which takes quite a long time in searching for data and checking bills. This hampers the payment process which can result in reduced efficiency of the time used when payment transactions take place and human error can also occur which results in errors in the school payment process.[3]

In this case, there is a need for a study to determine a structured and more modern payment system, so it is necessary to carry out research using the Rapid Application Development (RAD) method as a guide in developing the system from conventional to more modern following current technological developments.[4] This will reduce the workload, time burden, and operational costs for YAPPIKA Legok Tangerang Vocational School.

Currently, YAPPIKA Legok Vocational School does not have the means to manage and facilitate the payment process quickly to provide the best service in a more systemized payment process, so it is necessary to create a web-based payment application that can be accessed at any time to support the administration process at YAPPIKA Legok Vocational School and can make it easier to check data that is more structured and easy for management to access.[5]

Implementing the web-based school payment system at YAPPIKA Legok Vocational School can support payment activities better and more efficiently in terms of time and better performance in the administrative environment of YAPPIKA Legok Vocational School, including data processing such as Users (Administrators, Administrative Staff, Students), Payment info, print reports, User management.[6]

II. Method

In conducting research, the author used several research methods to search for and collect data and information needed for this research, including:

A. Observation (Heading 2)

Observation is a research method carried out by the author by visiting and observing the YAPPIKA Legok Vocational School to look for data relating to ongoing school payments at the company.

B. Interview

In this case, the author conducted a question-and-answer session or direct interviews with the Administration and people involved in the school payment system at YAPPIKA Legok Vocational School to collect actual information and data that will be used in this research.

C. Literature review

The author carried out literature studies to carry out theoretical studies related to the research the author took, to collect as much information and data as possible through reference books, scientific journals, and trusted websites so that the research taken had a strong theoretical basis.

III. Results and Discussion

The School Payment System at YAPPIKA Legok Vocational School involves both the administration and the students. The primary purpose of this transaction process is to support the school's financial management, which is derived from student fees. Therefore, all payment transactions must adhere to the established procedures and regulations governing these activities.[7]

Rapid Application Development (RAD) is a state cycle strategy aimed at providing faster development and achieving better quality results compared to results achieved through traditional cycles. RAD is a combination of several structured techniques with prototyping techniques and also joint application development techniques to speed up the system/application development process. From the definition and basic concepts of RAD, it can be seen that application development using the RAD method can be done in a relatively faster time.[8]

Fig. 1 .RAD Implementation Cycle Process

RAD is an incremental software modeling process that emphasizes a fairly short development process. The RAD model is a "high-speed" adaptation of the waterfall model, where rapid development can be achieved using a component-based construction approach. If every need and within the scope of a project are well known, the RAD process allows a development team to create a "fully functional system" in a relatively short time frame. The implementation of the RAD method will run optimally if the application developer has formulated the types of needs and scope in developing the application well.[4][9]

A. Running System Analysis

Analysis of the current procedures for the school payment system at YAPPIKA Legok Vocational School is as follows:

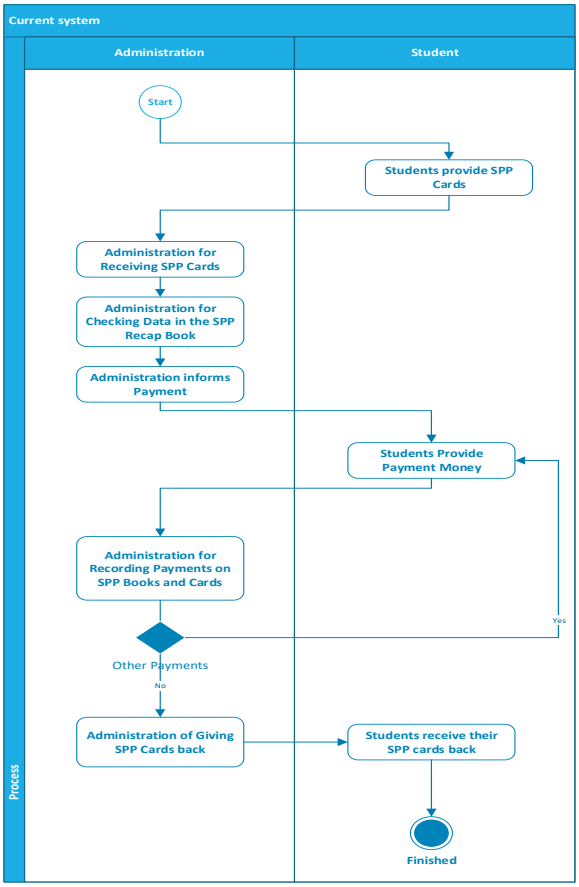

Fig. 2 .Activity Diagram of the Current system

Student

- Students come to the administration section to make payment transactions.
- Students provide payment cards to be checked by the administration department.
- Students give the amount paid to administrative staff.
- Students receive evidence recorded by administrative staff in the payment book.

Administration

- Administrative staff accepts student payment cards.
- Administrative staff checks student data in the payment book.
- Administrative staff collect student payment money.
- Administrative staff record in the payment recap book and student payment book.
- Administrative staff provide proof in the form of payment books that have been filled in by students.

B. Proposed System

The proposed system can be created based on the current system, in this case, a proposed system can be created as follows:

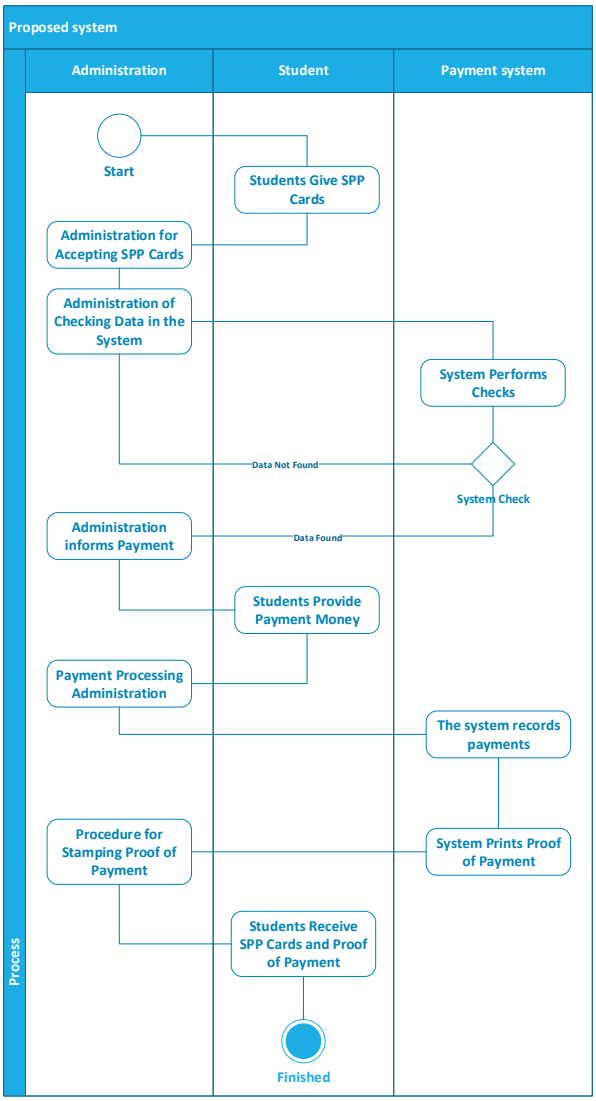

Fig. 3 .Activity Diagram of Proposed System

In Figure 3 it can be seen that the proposed system is created using a computerized system to manage school payments which can be stored in a database as a storage medium for processing data. The system is also equipped with a security system using a username and password to log in for officers to be able to process the system.

Application creation using the code igniter framework will also be carried out to apply the system to improve the existing system and develop it.[10] A framework is an abstraction in software that provides general functionality so that it can function and be modified by code created by users so that it can provide software for certain applications. CodeIgniter is a web programming framework using the PHP programming language.[11]

C. UML (Unified Modeling Language) Design

UML (Unified Modeling Language) design explains in a structured way to document and specify the development of the system that will be used.[12]

1. Use Case Diagram

A use case diagram is a diagram that describes a relationship between actors and a system. Use case diagrams can describe an interaction between one or more actors and the system to be created.[13]

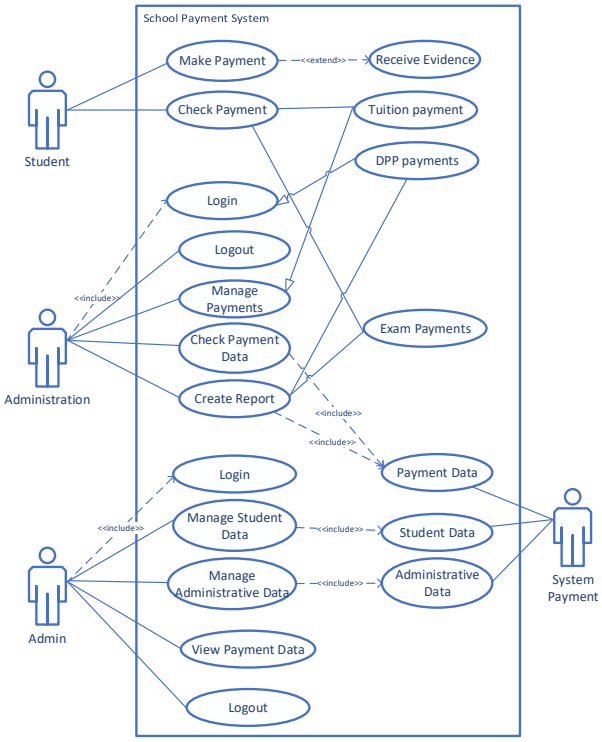

Fig. 4 .Use Case Diagram of Payment System

In this case, a use case diagram was created which describes the relationship between actors and systems in the School Payment System at YAPPIKA Legok Vocational School.

2. Class Diagram

A class diagram is a type of static structure diagram in UML that describes the structure of a system by showing the system in the form of classes, their attributes, methods, and relationships between objects.[14]

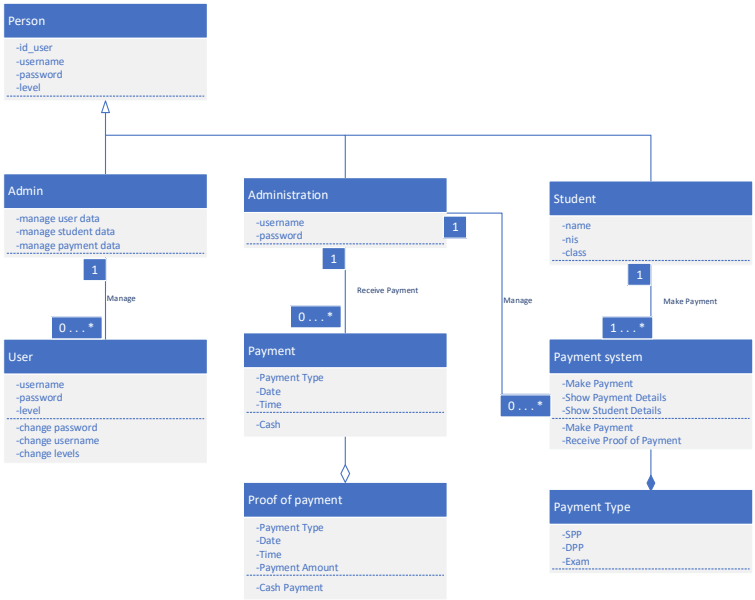

Fig. 5 .Class Diagram of Payment System

In Figure 5 above, the class diagram is depicted in a structure in the School Payment system at YAPPIKA Legok Vocational School.

D. Application Deployment

System implementation is the application of how a system works based on the results of analysis and designs that have been made previously in a particular programming language.[15] Application implementation is carried out via the website page to see the following school payment system user interface:

- *Login Page*

This login page is used by admins and officers to enter the dashboard page. Admin/officer must fill in the username and password that has been created.

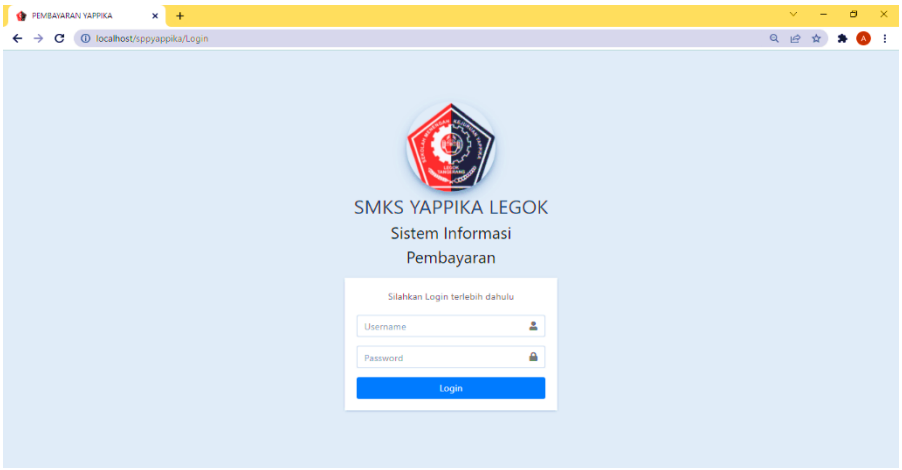

Fig. 6 .Login Page

This login page was created as security so that not everyone can enter the system carelessly. People who wish to access this website must have the correct username and password.

- *Dashboard Page*

The dashboard page of the application if you have logged in correctly so that admins and users (Administrative) can carry out computerized transactions through the application.

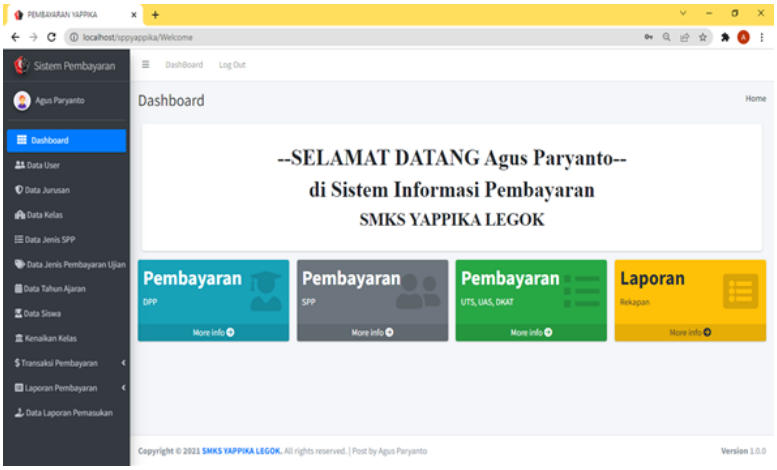

Fig. 7 .Dashboard Page

The Dashboard page contains menus that can be accessed by users to carry out tasks according to their needs.

- *Payment Page*

The tuition payment transaction menu will display a student data table with details of existing tuition payments. To make payments, admins and officers can click the "Pay Tuition Fee" button in the table data.

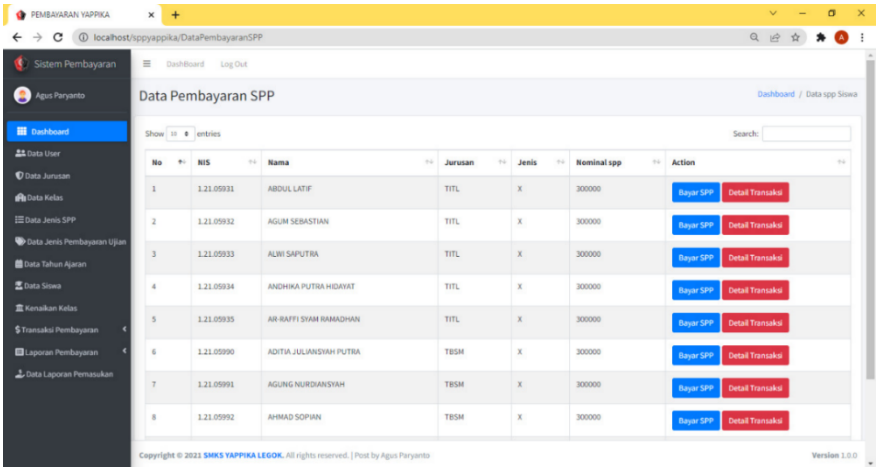

Fig. 8 .Payment Page

The image shows the student tuition payment page, on this page the user (Administrative) can carry out transactions with students according to the student data they are looking for. Transaction details can also be seen on this page.

- *Student Bill Recap Page*

Admins and officers can create a bill recapitulation report by selecting the class and school year first to determine which class the bill recapitulation report will be made for. After selecting the class and school year, admins and officers can click the "View" button to display the data.

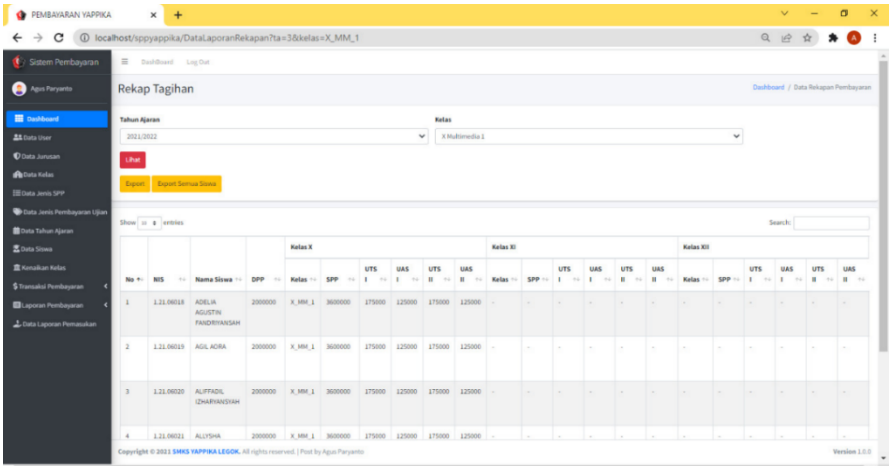

Fig. 9 .Student Bill Recap Page

On this page, users can see recapitulation data on student tuition payments, the data is organized by year to make it easier for users to know the class for which the data will be summarized.

- *Reporting Page*

The Report page contains data that will be reported as evaluation/report material to the school principal regarding incoming payment transactions.

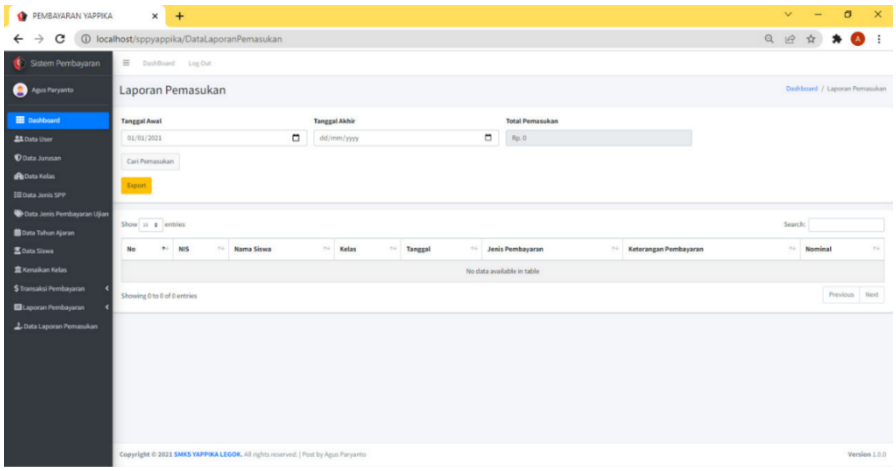

Fig. 10 .Reporting Page

Figure 10 shows the reporting page for the Administration to review transactions that occur during the student tuition payment process. The report can be downloaded and printed for reporting to the school principal.

- *Comparison* Results on Payment Systems

The results of the comparison of payment systems obtained can be seen in the following comparison table which shows data on the time needed to process school payments between the conventional system and the modern system.

Table 1. Comparison Results on Payment Systems

No	Transaction	Time Comparison		Comparison Length
		Manually	By using the System	
1	Transaction A	10 minutes 17 seconds	03 minutes 20 seconds	06 minutes 57 seconds
2	Transaction B	13 minutes 06 seconds	03 minutes 07 seconds	09 minutes 59 seconds
3	Transaction C	11 minutes 50 seconds	04 minutes 21 seconds	07 minutes 29 seconds
4	Transaction D	15 minutes 03 seconds	03 minutes 11 seconds	11 minutes 52 seconds
5	Transaction E	12 minutes 10 seconds	04 minutes 51 seconds	07 minutes 19 seconds
6	Transaction F	14 minutes 10 seconds	04 minutes 21 seconds	09 minutes 49 seconds
7	Transaction G	10 minutes 53 seconds	05 minutes 05 seconds	05 minutes 48 seconds
8	Transaction H	11 minutes 15 seconds	03 minutes 44 seconds	08 minutes 02 seconds
9	Transaction I	12 minutes 46 seconds	05 minutes 17 seconds	07 minutes 29 seconds
10	Transaction J	13 minutes 20 seconds	04 minutes 49 seconds	08 minutes 31 seconds

It can be seen in the table that the use of the system can affect the time used in the payment process compared to the process carried out manually.

IV. Conclusion

Based on the research that has been carried out on the design of this system, it can be concluded that the design of this web-based school payment system was carried out by creating a special interface using the CodeIgniter framework for the payment system which can be used as a means of carrying out school payment transactions at YAPPIKA Legok Tangerang Vocational School. The application of this payment application can be implemented by the YAPPIKA Legok Vocational School administration as a more integrated means in terms of data collection and more efficient use. This can be seen from the time used when the transaction takes place, which occurs from around 10 – 15 minutes/transaction to 3 – 5 minutes for the transaction. Making reports is also easier because you only need to download the report data in the application.

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