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Development of Due Date Notification System for the School Payments Based on SMS Gateway and Web Service In Smk Al-Amanah

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Abstract:

Short Message Service (SMS) is the delivery of messages or information that is already being replaced by chat applications such as blackberry messenger, whatsapp, line, and kakao talk. SMS has experienced growth in terms of the use and function as Polling SMS, SMS Banking, SMS Group and SMS Gateway. SMS Gateway is one of the use of the type of SMS is currently experiencing a lot of growth, namely the presence of several open source SMS Gateway provides easy use of them is Gammu SMS Engine is an open source under the GPL license is an application devoted to build a SMS Gateway . Gammu can be used in a variety of programming languages such as PHP programming language one of them. By using Gammu SMS Gateway and apply it to the PHP programming language is expected to overcome the existing problems is by sending an SMS to the students and parents about financial matters that late payment or arrears. Vocational education institutions such as Al-Amanah not have a notification system to notify delay or delinquent tuition. Timely payments would be the expectation of the school, because the school fees are used for the construction of school infrastructure. Analysis system used in building Gammu SMS Gateway by doing using SWOT analysis method, namely strength (strengths), weakness (Weakness), opportunity (oppurtunities), and which pose a threat (threats). And the final conclusion of the completion of the notification system in doing a test using blackbox system.

Keywords — **SMS gateway, Gammu, notifications, financial.**

I. INTRODUCTION

Short Message Service (SMS) is the delivery of messages or information that has begun to be replaced by chat applications such as BBM and WhatsApp. SMS has experienced developments in terms of usage and functions such as SMS Polling, SMS Banking, and SMS Gateway.

SMS Gateway is an application system used to send or receive SMS, and is usually used in business applications, both for purposes such as promotions, information services to users, dissemination of product / service content. In addition to being used in business applications, SMS gateways have also been widely used in government / private agencies in accordance with needs such as auto reply, mass delivery / broadcast messages, and scheduled deliveries.

Educational institutions such as Al-Amanah Vocational School do not have a system notification to notify the delay / arrears of SPP money. Timely payments are certainly the hope of the school, because school fees are used for the construction of school infrastructure. The problem that arises is that there is no notification for students who are late paying or fines for SPP payments that have past due / delinquency, delinquent notification only occurs when they will take the Semester Semester Test or Final Semester Exam card. So that students sometimes neglect to make payments on time or ask parents to pay SPP money in a timely manner, there are even those who are overdue for more than one month.

II. RELATED WORK

In order to make it easier to understand the material related to the writing of scientific articles, the writer presents it simply as follows.

A. SPP Payment

According to Tirto Waluyo payment is aaction exchange something money or goods with the intent and purposethe same is done by two or more people. Whereas SPP(Contribution of Educational Development) is a mandatory contribution for studentsor students who are used by the school to facilitateall learning activities carried out by students, with timepayment is predetermined (Nur, 2010).

In the large Indonesian dictionary the definition of payment is:payment process, method, payment. Then understandingmonthly SPP payment is the process of paying tuition fees maderepeatedly, once in a month. SPP is a routine contribution schools where payments are made every month. SPP is one form of obligation for each student still active in the school.

Parties Involved in Payment of SPP the parties involved in the monthly SPP payment system:

1. Student guardian
   Guardian students are those who are responsible for paying tuition fees a student every month.
2. Students
   Students are people who deposit money given by peopleold to TU Staff for SPP payments.
3. TU staff
   The TU staff is the person in charge of receiving all paymentsMonthly SPP and give reports to certain parties.

SPP is intended to help foster education,organization of schools, welfare of personnel, repair of facilities and supervision activities. What is meant by the organization of schools is:

a. Procurement of tools or study materials
b. Procurement of management tools or material
c. Examination, learning evaluation, personal cards, report cards andSTTB
d. Procurement of school libraries
e. Craft and practical lessons

B. Short Message Service

According to Khang in Ibrahim (2011, 85), "Short message service (SMS) is one of the text communications via cellular telephone. SMS is one of the most widely used media today. Besides cheap, the process also runs fast and gets right to the destination, but all this time new SMS has been used to send and receive messages between fellow cell phone owners".

Along with technological development and operator creativity and service provider, SMS service that was originally only for sending each other the message between subscribers, is now developing and more varied, such as services polls, ringtones, premium SMS, mobile banking, ticketing and education services. SMS becomes an inseparable part of development of information and communication. One concrete example is a FaceBook user, can change and read status through SMS (According to Dewanto in Ibrahim (2011, 85)). SMS is a facility for sending and receiving text message via cell phone. One of the advantages of SMS is a low cost. Besides that, SMS is a store and method forward so that the benefits obtained are when mobile phones recipient cannot be reached, is not active or outside the service area, the recipient can still receive SMS when the cellphone is active back. (Ibrahim, 2011: 85) According to Khang (in Ibrahim 2011: 85), "SMS is a feature GSM service, and is a technology that allows sending and receiving messages in the form of text. Data that can be carried by SMS is very limited. One SMS message can contain:

a. maximum of 160 7-bit characters,
b. maximum of 140 8bit characters,
c. a maximum of 70 16-bit Unicode characters.

In SMS technology there is the term SMS Center (SMSC). SMSC responsible for handling SMS. When an SMS is sent from the telephone cellular, the SMS will be received by the SMSC, then SMSC will forward to the destination cell phone. Generally an operator has The SMSC itself

is stored on the operator's SIM Card. Things others contained in SMS technology to provide information regarding shipping and receiving is the Message Status Report, Message Submission Report and Message Delivery Report (Setiawan, et al in Abraham 2011: 85-86).

C. SMS Gateway

According to Thoyib in Fahrudin (2012), "SMS Gateway is interpreted as a platform that provides a mechanism to deliver and receive SMS from mobile devices (cellphones, PDAs, phones and others other)".

According to Fahrudin (2012), "SMS Gateway allows for a message can be sent from an application over the network telecommunication operator to send to the destination number. By using the SMS Gateway application, data sources can obtained directly from the database for further processing information and sent systemically or without manual to many number at one time ".

According to Zahra in Ibrahim (2011: 86), "SMS Gateway is a connecting device between the sender of the SMS with the base data. This device consists of a set of PC, telephone and application programs. This application program will forward every request from each the incoming SMS by querying the database, then given a response from the query results to the sender.According to Triyono in Ibrahim (2011: 86), "SMS Gateway is a software that uses computer assistance and make use of technology cellular ones integrated for distribute the messages generated through the information system via SMS media handled by cellular networks ".

How the SMS Gateway works, According to Yunianto in Ibrahim (2011: 86) Working mechanism SMS delivery is divided into 3 parts, namely:

1. Intra-operator SMS: sending SMS in one operator. SMS sent by the sender will first enter the SMSC the sender's number operator, then the SMSC will send to the number directly addressed. The recipient will then send a delivery report stating that the SMS has been accepted to the SMSC. The SMSC then passes the report to the sending number of the SMS, accompanied by the status of the sending process of the SMS.
2. Inter-operator SMS: sending SMS between different operators. The difference is that this mechanism has two SMSCs, namely sending SMSC and recipient SMSC. The SMS sent will enter to the sender's SMSC and forwarded to the recipient's SMSC, after that the SMS is sent to the destination cellular telephone. Likewise with the delivery report will be received in advance by the SMSC recipient, then forwarded to the SMS sender SMSC. Inter-communication SMSC can run if there is a cooperation agreement between the operators, if there is no agreement will causes the SMS to be sent with the destination number with Different operators will not arrive at the destination number.
3. International SMS: sender of SMS from the operator of a country to other countries. International SMS is essentially the same as inter-operator mechanism, which distinguishes only the SMSC Recipient's number is an overseas SMSC operator and is necessary country code addition to the destination number of the SMS recipient.

SMS Gateway capabilities.According to Ibrahim (2011: 87), SMS Gateway is an important alternativein disseminating information on the grounds:

a. Increase the scale of the application technologyinformation withusing interactive SMS communication.
b. Provides a web-based SMS communication collaboration applicationfor the use ofeducational institutions.
c. Reach consumers and institutional service users easily use interactive SMS communication.

D. Gammu SMS Gateway

Software that will be used to connect the cellphone to the computer in this study Gammu (GNU All Mobile Management Utilities). According to Adiyanto, Suraya, and Edhy Sutanta (2013: 51), Gammu is an application / daemon devoted to build an SMS Gateway that connects between cellular operators to the internet and vice

versa. This application is open source under the GPL license.

Gammu's advantages from other SMS Gateway tools are:

1. Gammu can be run on Linux or Windows operating systems.
2. Many compatible devices on Gammu.
3. Gammu uses a MySQL database to store SMS which is in the inbox (inbox) or to send messages, so that web and desktop based interfaces can be created.
4. Both USB and serial data cables are all compatible on Gammu.

Gammu configuration file, generally there are not too many files that need to be configured for use Gammu SMS Gateway. Files that need to be configured is:

1. Gammurc
   Gammurc file is used for port configuration that is used by connection media to connect to a computer. In addition, the gammurc file is also used to define the type of connection used by media connection.
2. SMSDRC
   The SMSDRC file is used for the database configuration that will be used by the Gammu application.

E. Yii Framework

Framework is a framework. Framework can also be interpreted as a collection of scripts (especially classes and functions) that can help developers or programmers in handling various problems in programming such as connecting to databases, calling variables, files, etc. so that developers focus more and more fast build application. The framework can also be said to be the processing component is ready to reuse at any time, so programmers don't have to make the same script for that task same.

Yii is a component-based PHP framework. High performance for large-scale Web application development. Yii provides maximum reusability in Web programming and able to increase development speed significantly. Yii itself stands for "Yes It Is". Yes it is itself has meaning if Yii is able and right for you to choose working on the project. Yii is a free open source PHP framework latest component-based performance high for developing large scale web applications. He provides maximum resuability in web programming and can significantly accelerates the development process. Name Yii (spelled as / i: /) stands for easy, efficient and extensible (easy, efficient) and can be expanded).

The following figure shows the static structure of an Yii application:

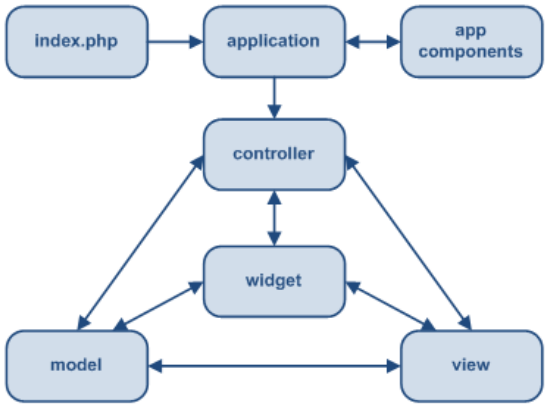

Figure 1. Static Structure of the Yii Application (http://www.yiiframework.com/doc/guide/1.1/en/basics.mc)

Yii Framework Features having mani featurs, according to the Yii Framework developer and community from the site official website, the following are the features found in Yii: (Yii, 2013)

a. Using the MVC pattern, the standard pattern of application development is separate display, logic program, and model;
b. Use a database abstraction layer like Data Access Objects (DAO) and Active Records to facilitate interaction between database
c. Integrated with JQuery Javascript Framework. Although use Jquery as an internal javascript library, but Yii can use other libraries without conflicts. Support Internationalization (I18N) and localization (L10N) for facilitate the development of applications in multiple languages and locations like the use of time and date.
d. Has a cache layer for caching data, pages, parts, and the whole application so that it can improve performance with a variety of media cache options. Use of cache media such as databases, APC, memcache, etc. are easily

managed without making major changes to the code

e. Features error handling and logging, making it easier development in debugging applications in the future application development.
f. Use of themes, facilitate the development of applications in designing the application display.
g. Console, use commands on the console to do various automatic commands such as generating basic structures application, model, crud, and so on.
h. Internal Authentication and authorization support so facilitate application development with authentication features.
i. Widgets, a kind of control that has functions like auto complete, datapicker, table and others. Use Jquery as javascript clientsider.
j. Form input and validation. Facilitate development for work with the form on the application and do input validation from the form.
k. Modular and easy to add with extension and support added components so that various additional features are easily entered.

III. METHODOLOGY

A. Current System Procedure

1. Procedure for Payment of SPP The payment process is that the student deposits the payment to TU officers, TU officers noted it into ledgers, and cards student tuition fees are given the payment date and initial officer.

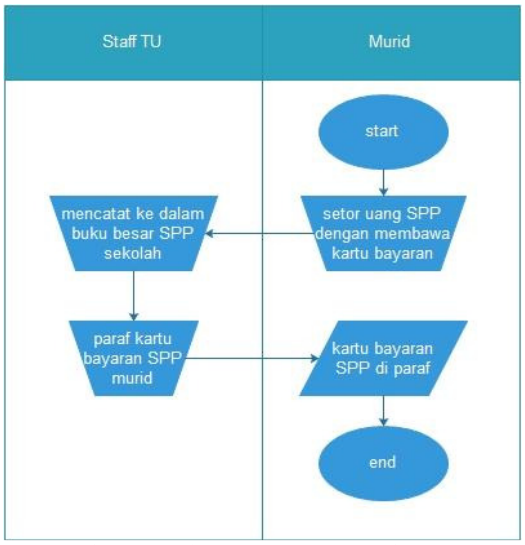

Figure 2. Flowchart Payment of SPP

2. Arrears Notification Procedure the payment arrears notification process only occurs at the time will be UTS and UAS by holding the exam card for a while and provide details of payments that have not been paid.

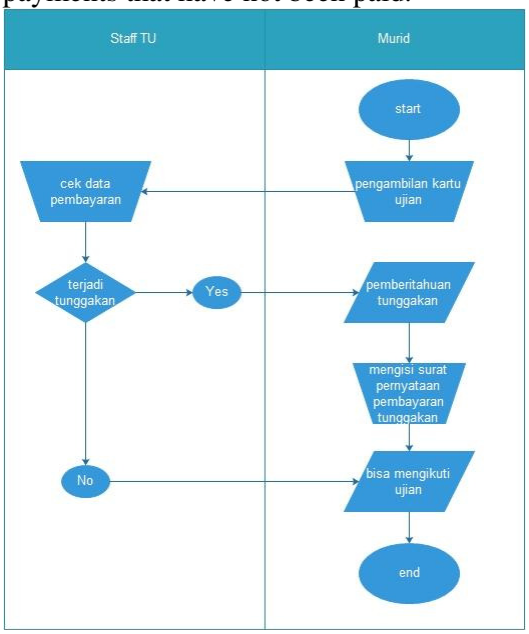

Figure 3. Flowchart SPP Payment Arrears Notification

B. SWOT Analyze

To clarify the position of educational institutions and roles and the information technology function will map the position of the institution education in the form of a SWOT matrix which will be seen as a combination utilization of power to capture opportunities, overcome weaknesses

by taking the opportunity, using power to avoid threats, minimize weaknesses and avoid them threat:

Table I.
SWOT Analisys

Faktor Internal / Faktor Eksternal	*Strength* (Kekuatan)	*Weakness* (Kelemahan)
	1. Pembayaran SPP wajib dibayarkan per bulan 2. Pembayaran SPP digunakan untuk infrastruktur sekolah 3. Pembayaran SPP wajib dibayarkan untuk mengikuti UTS dan UAS	1. Kurangnya tanggung jawab untuk bayar tepat waktu 2. Pendataan pembayaran SPP masih manual 3. Notifikasi tunggakan pembayaran masih kurang
Opportunity (Peluang)	Strategi SO	Strategi WO
1. Pemanfaatan teknologi informasi untuk pembayaran SPP 2. Notifikasi tunggakan pembayaran dapat dikirim menggunakan SMS 3. Meminimalkan tunggakan pembayaran SPP	Pembayaran SPP wajib dibayarkan per bulan, digunakan untuk infrastruktur sekolah, wajib dibayarkan untuk mengikuti UTS dan UAS dapat menangkap peluang untuk memanfaatkan teknologi informasi untuk pembayaran SPP, mengirim notifikasi tunggakan pembayaran SPP melalui SMS, dan dapat meminimalkan tunggakan pembayaran SPP. Keadaan ini institusi pendidikan disarankan menggunakan kekuatan untuk memanfaatkan peluang.	Kurangnya tanggung jawab untuk bayar tepat waktu, pendataan pembayaran SPP yang manual, notifikasi tunggakan pembayaran masih kurang merupakan kelemahan yang berakibat tidak dapat menangkap peluang berupa pemanfaaatan teknologi informasi untuk pembayaran SPP, notifikasi tunggakan pembayaran SPP melalui SMS, dan dapat meminimalkan tunggakan pembayaran SPP. Keadaan institusi pendidikan disarankan untuk memanfaatkan peluang ada dengan meminimalkan kelemahan yang ada.
Thread (Ancaman)	Strategi ST	Strategi WT
1. Komputer untuk pembayaran dapat terkena virus apabila tidak dirawat dengan benar 2. Terdapat kritikan dari orang tua perihal SMS tunggakan 3. Dituntut untuk meningkatkan pelayanan pendidikan sekolah	Pembayaran SPP wajib dibayarkan per bulan, digunakan untuk infrastruktur sekolah, wajib dibayarkan untuk mengikuti UTS dan UAS merupakan kekuatan tetapi mendapat ancaman dari lingkungan berupa komputer dapat terkena virus, terdapat kritikan dari orang tua perihal sms notifikasi, dituntut untuk meningkatkan pelayanan pendidikan sekolah. Keadaan institusi pendidikan disarankan menggunakan kekuatan yang dimiliki untuk menghindarkan ancaman.	Kurangnya tanggung jawab untuk bayar tepat waktu, pendataan pembayaran SPP yang manual, notifikasi tunggakan pembayaran masih kurang merupakan kelemahan yang diperparah oleh ancaman dari lingkungan berupa komputer dapat terkena virus, terdapat kritikan dari orang tua perihal sms notifikasi, dituntut untuk meningkatkan pelayanan pendidikan sekolah. Keadaan institusi pendidikan disarankan menggunakan kekuatan yang dimiliki untuk menghindarkan ancaman. Keadaan institusi pendidikan disarankan bersifat defensive dan berusaha meminimalkan kelemahan yang ada serta menghindari ancaman.

C. *Analisys Method*

1. Input Analysis

   Input analysis is an analysis or problem solving carried out on all data or information that functions asinput data so that it produces a process and then there will be resultsfrom a process itself. Payment process data is obtained whenstudents deposit payment money to the TU Staff.

   a. Name of Input: Deposit of SPP money
   b. Function: As a process for students to pay school tuition fees
   c. Source: Student
   d. Media: Pay cards
   e. Distribution: Student to TU Staff
   f. Frequency: Every month
   g. Description: Contains the date of deposit every time you make a payment

2. Process Analysis

   Process analysis is an analysis or problem solvingcarried out in the process as a result of respect back because of existencedata input in this process all data or information that is entry will be processed using existing system processing.

   a. Module name: Receipt of payment
   b. Input: Receive payments made by students
   c. Output: Take notes in the ledger, initial it on the paid card
   d. Summary of Process: This process will produce a manual record of each student's payment.

3. Output Analysis

Output analysis is analysis or problem solving done on the results of the entire process that occurs from the startinputting data until data processing occurs throughexisting data processing system. And also through the checking processreturn existing data if an error occurs or data is lackingcomplete, namely:

a. Output name: Arrear notification
b. Function: As a warning to students who are overpaid SPP payments
c. Media: Paper
d. Distribution: Student to TU Staff

D. *Proposed System procedures and Design*

After conducting an analysis and research system that is currentlyruns on Al-Amanah Vocational School, then it will be discussed laterregarding the design of the proposed system to be built. There is a proposalprocedures that aim to support late paymentsnow, that is sending short messages to parents for studentswho are late paying. So that parents can be aware ofpaying child payments on time. Based on supportthe new notification system has been determined, then the next flow is design or design of a proposed system that aims to supportold system by giving a clear picture or view according to the system design process from the beginning to the end of the study. Inanalyze the proposed new process in this study used flowcharts to describe the processes that are in a new system that willmade.

The design system flowchart is a draftdescribe the flow of the system process. System designflowchartproposed can be seen in the picture below:

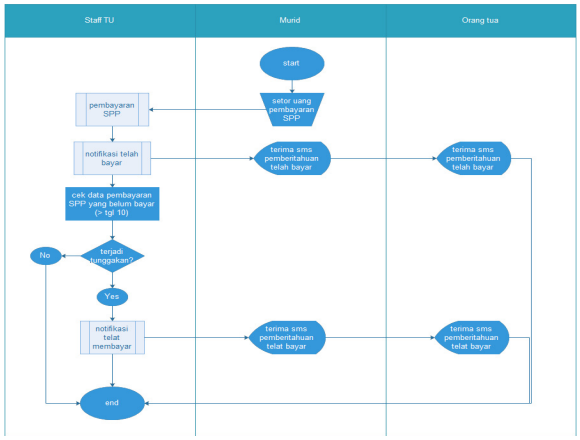

Figure 4. Flowchart Propose System Design

IV. RESULT AND DISCUSSION

A. *Database design*

Database specifications explain the storage media used, stored content, primary key, and record length. Database specifications used in the system to be built is as follows:

Table II.
Structure master_pembayaran

No	Nama Field	Tipe Data	Panjang	Keterangan
1	kode_pembayaran	Tinyint	3	*Primary key, auto increment*
2	Angkatan	Smallint	4	-
3	nama_pembayaran	Varchar	10	-
4	jumlah_pembayaran	Mediumint	8	-

Table III.
Structure transaksi_pembayaran

No	Nama Field	Tipe Data	Panjang	Keterangan
1	kode_transaksi	Int	6	*Primary key, auto increment*
2	tgl_transaksi	Date	-	-
3	Nis	Varchar	10	*Foreign key*
4	Bayarbulan	Varchar	9	-
5	Bayartahun	Int	11	-
6	jumlah_pembayaran	mediumint	9	-

B. *Proposed Flowchart Program*

The program flowchart is more detailed information abouthow each step of the program or procedure actually isheld. This flowchart shows each step of the program orprocedures in the right order when they occur. Following is the Flowchart of the program for System Notification Due to Payment Arrears,that is:

1. Flowchart Program for the Master Menu

   Flowchart program for the master menu illustratesflow that can be done in the master menu. As for the description flowchart can be seen in figure below:

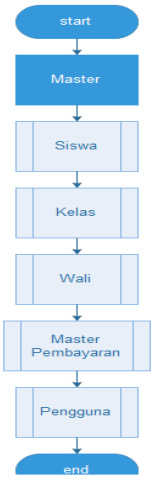

Figure 5. Flowchart Program for the Master Menu

2. Flowchart Master Payment Submenu

Flowchart program for the payment master submenudescribe the flow that can be done in the master submenupayment. The description of the flowchart can be seen in figure below:

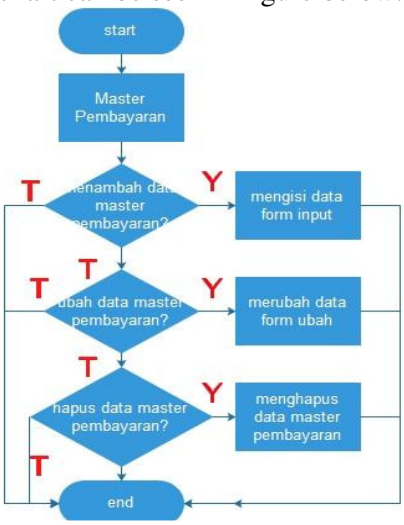

Figure 6. Flowchart Master Payment Submenu

3. Program Payment Flowchart

Flow chartprogram for payment menu describe the flow that can be done in the menu payment. The description of the flowchart can be seen in figure below:

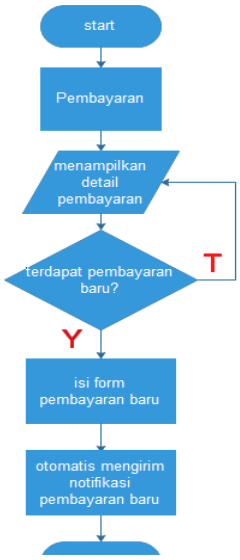

Figure 7. Flowchart payment system

4. Flowchart Program for SMS Info

Flow chartprogram for the SMS Info menu describe the flow that can be done in the SMS info menu.The description of the flowchart can be seen in figure below:

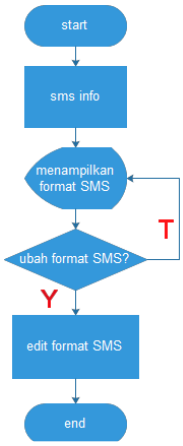

Figure 8. flowchart SMS info

5. Program Flowchart For Report Menu

The program flowchart for the report menu describesflow that can be done in the report menu. As for the descriptionflowchart can be seen in Figure below:

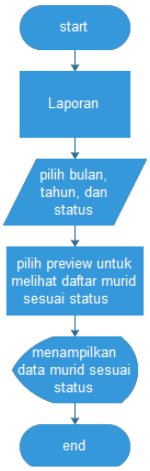

Figure 9. flowchart report

C. *Metode Implementasi*

The implementation of the system notification program due arrearsSchool payments are made using the Blackbox methodTesting. The Blackbox Testing method is a testing programprioritizing testing of the needs of the functions of a program. The purpose of the Blackbox Testing method is to finderror in the program.

Testing with the Blackbox Testing method is done in a wayprovide a number of inputs to the program. The input is then process according to its functional requirements to see ifthe application program can produce output that matches the one desired and in accordance with the basic functions of the program.

If from the input given, the process can produce outputaccording to their functional needs, the program is madeis correct, but if the output produced does not matchfunctional requirements, there are still errors in the programand then the repairs are carried out forcorrect errors that occur.

D. *Blackbox Testing for system application*

1. Blackbox Testing on the Application Login Page

   The following is a table based on application Blackbox testingsystem notification due to overdue payments for the login function, namely as follows:

Table IV.
Blackbox Testing On the application Login

No	Skenario Pengujian	*Test Case*	Hasil Yang Diharapkan	Hasil Pengujian	Kesimpulan
1	Mengisikan dengan salah satu data benar dan satu lagi salah, lalu langsung klik "Login"		Sistem akan menolak akses login dan menampilkan pesan "Username Atau Password Salah!"		*Valid*
2	Mengisikan username dan password dengan benar, lalu langsung klik "Login"		Sistem akan melakukan cek kesasuaian *user name* dan *password*, apa bila benar makan sistem akan masuk dan menampilkan halaman utama.		*Valid*

2. Blackbox Testing at the Main Menu

   The following is a table based on application Blackbox testingsystem notification due to overdue payments for Menu functionsMain, namely as follows:

Table V.
Blackbox Testing at the Main Menu

No	Skenario Pengujian	*Test Case*	Hasil Yang Diharapkan	Hasil Pengujian	Kesimpulan
1	klik tombol *dropdown* pada "Master" dan pilih "Siswa" untuk menuju ke halaman Siswa		Sistem akan menampilkan halaman siswa		*Valid*
4	klik tombol *dropdown* pada "Master" dan pilih "Master Pembayaran" untuk menuju ke halaman Master Pembayaran		Sistem akan menampilkan halaman Master Pembayaran		*Valid*
5	klik tombol *dropdown* pada "Master" dan pilih "Pengguna" untuk menuju ke halaman Pengguna		Sistem akan menampilkan halaman Pengguna		*Valid*
6	klik tombol "Pembayaran" untuk menuju ke halaman Transaksi Pembayaran		Sistem akan menampilkan halaman Transaksi Pembayaran		*Valid*
11	klik tombol "SMS Info" untuk menuju ke halaman Info SMS		Sistem akan menampilkan halaman Info SMS		*Valid*
12	klik tombol "Laporan" untuk menuju ke halaman Laporan		Sistem akan menampilkan halaman Laporan		*Valid*

3. Blackbox Testing for SMS Notifications
   The following is a table based on application Blackbox testingsystem notification due to overdue payments for functionsSMS Notification, as follows:

No	Skenario Pengujian	*Test Case*	Hasil Yang Diharapkan	Hasil Pengujian	Kesimpulan
1	klik menu "SMS *Late*" lalu pilih bulan dan tahun untuk melihat dan mengirim data murid yang belum bayar		Sistem akan mengirimkan notifikasi telat membayar		*Valid*
2	Buat transaksi pembayaran baru pada menu "Pembayaran" untuk mengirimkan notifikasi telah membayar		Sistem akan mengirimkan notifikasi SMS telah membayar		*Valid*

E. Evaluation

After testing with the Blackbox method done by giving a number of inputs to the program such asexample of SPP payment. If the input is complete, the system willsending SMS notifications have paid and delivered to students and parents. It's the same as having paid, forstudents who are late paying will also be sent a late SMS notificationpay.

V. CONCLUSIONS

Based on the analysis of the problem formulation, then the author can conclude that:

1. The SPP payment process that runs currently is still manual, use ledgers to record payment data and for Notifications regarding delinquent payments only occur at the time will take the exam card.
2. In the process of payment of SPP generally requires a sense of responsibility against the predetermined due date, but for minimize the level of late payment of school tuition can by sending short messages (SMS) to students and people old student.
3. In the design process or construction of a system notification falls the tempo of the writer pours into the flowchart. In the process implementation using the PHP and Gammu programming languages SMS Gateway, this system is used by admin, namely TU and staff SMS notifications sent to students and parents.

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