# UML Modeling and Black Box Testing Methods in the School Payment Information System

Bhakti Helvi Rambe[1], Rahmadani Pane[2], Deci Irmayani[3], Marnis Nasution[4], Ibnu Rasyid Munthe[5]

[1]Fakultas Ekonomi dan Bisnis
[1]Universitas Labuhanbatu, Rantauprapat, 21418, Indonesia
[2,3,4,5] Fakultas Sains dan Teknologi
[1,3,4,5]Universitas Labuhanbatu, Rantauprapat, 21418, Indonesia

E-mail: bhaktihelvirambe@gmail.com[1], rahmadanipane@gmail.com[2], deacyirmayani@gmail.com[3], marnisnst@gmail.com[4], Ibnurasyidmunthe@gmail.com[5]

| A R T I C L E   I N F O | A B S T R A C T |
|---|---|
| | The payment information system enables the entry of cash transaction data to SMA Teluk Panji through administrative staff (TU). The TU maintains the money payment reports that the students pay. This approach is useful and allows students to know more about the money they have to spend. This approach gives students complete knowledge in paper form. Useful reports to discover how much they charged and students who did not pay. Model UML is a visual language for modeling and designing information systems or applications. As support for the development of this information system, UML uses diagrams and text. Any significant modeling influences the design of useful applications. The system must meet its specifications and be capable of converting data into usable and efficient users. The black box evaluation method serves as a software assessment. The method operates from inside the unknown. When the system testers test this system as designed and focused on the school payment information system, the information system software is appropriately controlled by the external control mechanism. The prototyping method aims to summarise the application developed during these phases. |
| | |

## 1.　Introduction

The Senior High School (SMA) has 639 students in Teluk Panji. Senior high schools must also have a program to prevent data collection failures, such as data on tuition payments at high schools. Payment of school fees still handwritten is the problem with senior high schools, namely by storing bookkeeping data containing a number, nis, name, and meaning. In this bookkeeping, one academic is produced, and there is no fixed deadline for school fees, so many students pay school fees late. No card is made of proof of payment of school fees to students since there is no budget to create the card. Senior High School needs an information system to manage specifics of school fees. With this information system, it was hoped that the school money payment officer could simplify and shorten their job so that the data entry process for school fees could be completed in a short time. It improves performance in organizations and institutions, and a breakthrough in good performance management is significant. Using information systems to assist organizational and operational progress, the organization's components or parts, and technology are interlinked to enhance human resources' quality and effectiveness at work [1].

Unified Modeling Language ( UML) is a standard language widely used to define requirements, analyze and design, and to explain the architecture of object-oriented programming in the industrial world. UML is a computer modeling and visual communication language that uses diagrams and text support. The use of UML is thus not restricted to a single method, but UML is mostly used in object-oriented methodologies.[2]. Implementation of the UML Model in Teluk Panji's High School Payment Information System describes the need for an information system to help system analysis fulfill software engineering's implementation needs.

## 2. Method

The information system is an operational system that meets the needs of day-to-day transaction management, promotes processes, handles the organization's strategic activities, and provides the necessary reports to external parties. The general device model is input, process, and output. A fundamental system definition; a system can have several inputs and outputs. Often, the system has specific features that characterize it as a system. Tata Sutabri says the characteristics are as follows.: [3]

a) System Components (Components)
b) System limitation (Boundary)
c) Outside the System environment (Environment).
d) System Interface (Interface)
e) System input (Input)
f) System Output (output)
g) System Processing (Process)
h) System Goals (Objective)

Using diagrams and supporting text, a UML (United Modeling Language) diagram represents the life-flow design approach in software design. Several UML diagrams include case diagrams, class diagrams, activity diagrams, and sequence diagrams. Successful modeling also impacts software design. A sound system must rapidly meet the needs of its users and valuable process information. UML diagramming must be done since it is one of the software development stages.[4]

A prototype is an early software system version used to demonstrate concepts, concept experiments and explore more possible problems and solutions. The prototyping approach is intended to provide an overview of the application is designed first, which will be reviewed by the user. The user evaluated the prototype application and then used it to build applications that use it as a production end product. [5]
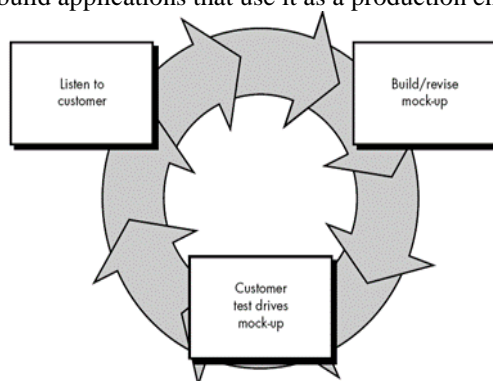


**Fig 1.** Prototype Model

Black box testing software engineering is a method of testing that deals with unknown internal outcomes. The testers see the software as a "black box" not required to show the contents, but subject to external testing. In this type of black-box testing, the software will run and then try to test whether it meets the user has defined needs at the start without unloading the program listing. [6]

## 3. Results and Discussion

### 3.1 Use Case Diagram

See Figure 2. Use Case Diagram Information System has three actors who conduct the payment process by showing proof of payment. In the TU (Administrative) actor, who plays a vital role in paying school fees by logging in to the School Payment Information System, the primary menu mechanism will appear. By entering a student's NIS, the administrative staff (TU) inspects. Do the process of finding out how much the student is supposed to pay if they are found. Students then carry out the payment process by providing school fees according to report how much the administrative staff (TU) has to charge. Students who made payments in the payment records with printed proof of payment verified with a stamp from the approved administrative staff to verify that they paid school fees. Major actors as a process of knowing all payment transactions reported to the Principal by TU actors as a final step in using this method.
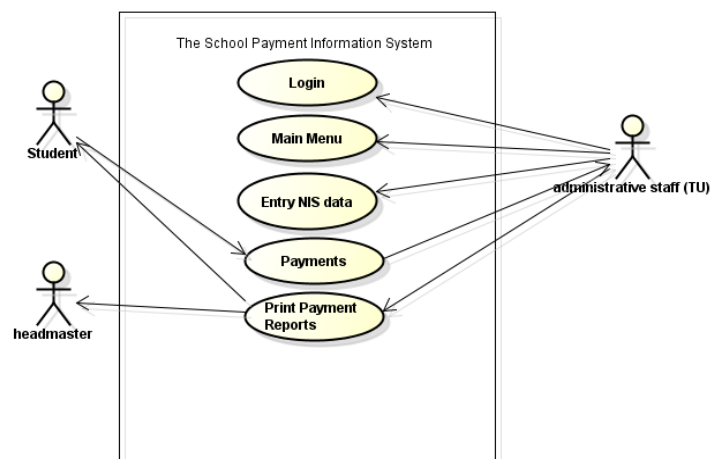
**Fig 2.** Use Case Diagram of Information Systems
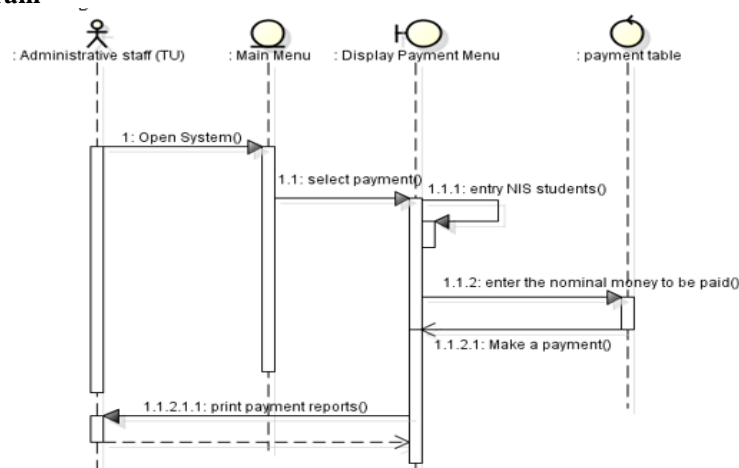
### 3.2  Sequence Diagram



**Fig 3.** The Sequence Diagram of payment of money at school

Figure 3. The Sequence Diagram for the payment of school fees shows that the TU (Administrative) individual conducts the method of paying school fees as an administrator to enforce the information system. Administrative staff (TU) opens the School Payment Information System, which enters the login's validity. The system offers sufficient security. If the login process is right, the School Payment Information System's main menu will appear. A payment menu is shown on the main menu to check school fees charged or not, and a table of money to be paid by students will appear by entering the NIS in the payment form Interface. Students know how much money is needed. Students will be paid depending on how many students' expenditures have been received. School Administration Staff (TU) enter the nominal information system with payment confirmation. Administrative staff (TU) has been approved to make the charge, so data on the required cost report appears. Then, print a simple proof of payment by the method of students' money in their school. The final move of the TU actors is to provide printed proof of the validity of the scheme stamps as useful tools for both the students and the TU actor.

### 3.3  Activity Diagram

Figure 4. Login operation diagram as the first information system operation. The login activity diagram links the administrator to the School Payment Information System as the actor who controls the information system by opening the money payment application. The device reacts by displaying the login menu, accessing the e-mail and password as a prerequisite for accessing school payment details. In this process, if e-mail and password are correct, the system will view the main menu on the administrator, and if e-mail and password are rejected, the system will reappear in the login menu.
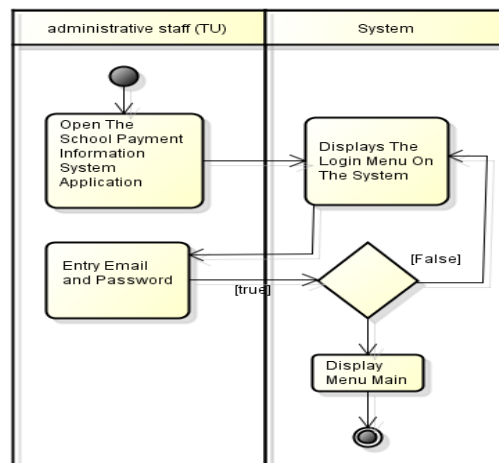
**Fig 4.** Login Activity Diagram

Figure 5. The payment input activity diagram as a processing task received by the administrator is running the information system. If the login process is right, the device responds by displaying the school payment information system's main menu. The administrator will select the payment menu by entering the student's NIS in the information system to respond and display student data about how much to pay the student. The administrator shall inform the nominal amount to be charged, the month and amount to be paid, the administrator shall process the data, the administrator shall receive the money, and the student's payment data shall be confirmed. Whether complete or not, if not complete, the process will return to the show. Suppose payment is complete. The next step is to print the fees charged as a helpful tool to prevent possible problems and accidents.
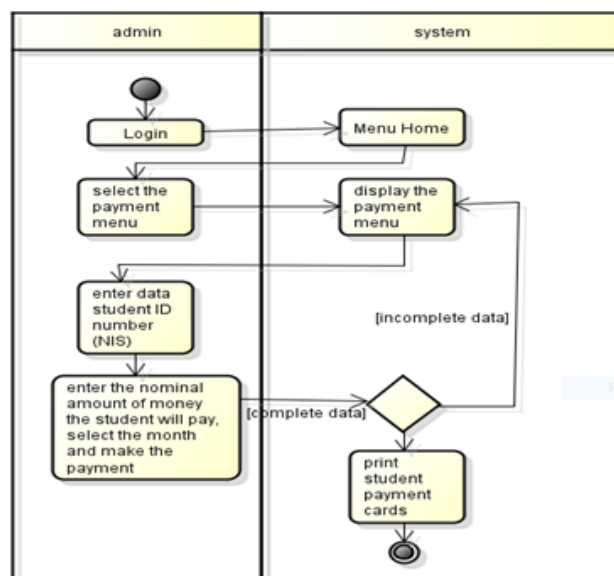


**Fig 5.** Payment input activity diagram

### 3.4  System Testing with Black Box Testing

Testing is performed to detect errors or defects in application system research. Testing aims to evaluate the application framework that met the design goals of the application system.

**a)  Functional Testing**

Functional testing, as admin, can see in table 1. The admin scenario tests the login menu function, processes payment data, processes department data, processes student data: processing class, student, and school info. Testing takes place from password authentication to school data collection, whether the information system plans to make an error or not using black-box evaluation.

**Table 1.**
Admin and User Testing Scenarios

| Feature Test | Testing Details | Types of Testing | Results Testing |
|---|---|---|---|
| Login | Verify login data | Black Blox | ✓ |
| Processing payment data | Input student identification number, Pay, Print Data, Delete data | Black Blox | ✓ |
| Processing department data | Add data, Save data, Edit data, Delete data | Black Blox | ✓ |
| Manage student data | Add data, Save data, Edit data, Delete data | Black Blox | ✓ |
| Manage class data | Add data, Save data, Edit data, Delete data | Black Blox | ✓ |
| Processing user data | Add data, Save data, Edit data, Delete data | Black Blox | ✓ |
| Manage lesson data | Add data, Save data, Edit data, Delete data | Black Blox | ✓ |

**b) Cases and Test Results**

Based on the functional testing performed, a test is performed on the device, with a test table for each test performed on the component filled with correct data and incorrect data.

**Table 2.**
Testing Table Payment Admin

| Cases and Test Results (Correct Data) | |
|---|---|
| Input data | Student Identification Number (NIS): 421 Nominal Money: IDR 20,000 Select month: January |
| Expected | If the student ID number (NIS) entry, the application will process the data to open the school Payment Information System |
| Observation | Enter the student ID number (NIS). The admin will input the nominal money and select the next month, click pay for the payment entry process. |
| Conclusion | Student payment successfully entered |
| **Cases and Test Results (Incorrect Data)** | |
| Input data | Student Identification Number (NIS): 421 Nominal Money: IDR 20,000 Select month: January |
| Expected | Can display an empty text field |
| Observation | Student Identification Number (NIS) cannot be wrong |
| Conclusion | The input process cannot be done. |

**Table 3.**
Testing Table Admin Department

| Cases and Test Results (Correct Data) | |
|---|---|
| Input data | Department Code: IPA Department Name: Natural Sciences |
| Expected | If the Department code and Department name have been entered, the application will process the stored data. |
| Observation | Department code and Department name have been entered. The admin will then input the nominal money and select the next month, click pay for the payment entry process. |
| Conclusion | Department entered successfully |
| **Cases and Test Results (Incorrect Data)** | |
| Input data | Department Code: IPA Department Name: |
| Expected | Can display a message in an empty text field |
| Observation | Department name cannot be empty |
| Conclusion | The input process cannot be done. |

**Table 4**
Testing Table Student Admin

| Cases and Test Results (Correct Data) | |
|---|---|
| Input data | NIS: 412 |
| | Name of Student: Abdul Salim |
| | Department: Natural Sciences |
| Expected | If the NIS, student name, and department have been entered, the application will process the stored data. |
| Observation | NIS, student name, and department can be entered, the Save button to process inputting student data. |
| Conclusion | Student data entered successfully |
| **Cases and Test Results (Incorrect Data)** | |
| Input data | NIS: |
| | Name of Student: Abdul Salim |
| | Department: Natural Sciences |
| Expected | Can display a message in an empty text field |
| Observation | NIS cannot be empty |
| Conclusion | The data entry process cannot be performed. |

**Table 5**
Class Admin Testing Table

| Cases and Test Results (Correct Data) | |
|---|---|
| Input data | Class: X-IPA1 |
| | School year: 2018/2019 |
| | Department: Natural Sciences |
| Expected | If the class, school year, and the department entry, the application will process the data for storage |
| Observation | Class, school year, and department can be entered then the Save button for the class input process. |
| Conclusion | Class data entered successfully |
| **Cases and Test Results (Incorrect Data)** | |
| Input data | Class: |
| | School year: 2018/2019 |
| | Department: Natural Sciences |
| Expected | Can display a message in an empty text field |
| Observation | Classes cannot be empty |
| Conclusion | The process of entering the Data Class cannot be done. |

**Table 6**
Admin Data User Testing Table

| Cases and Test Results (Correct Data) | |
|---|---|
| Input data | Username: Ria |
| | Password: ria |
| | Full name: user |
| | Admin: admin / not |
| Expected | If the username, password, full name, and admin have been entered, the application will process the stored data. |
| Observation | Username, password, full name, and admin can be entered. Then the Save button is for the class input process. |
| Conclusion | Enter user data successfully |
| **Cases and Test Results (Incorrect Data)** | |
| Input data | Username: Ria |
| | Password: ria |
| | Full name: - |
| | Admin: admin / not |
| Expected | Can display a message in an empty text field |
| Observation | Full name cannot be empty |
| Conclusion | The entry process cannot be performed. |

**Table 7.**
Admin Lesson Testing

| Cases and Test Results (Correct Data) | |
|---|---|
| Input data | School year: 2018/2019 |
| Expected | Suppose the school year has been entered into the application. The application will process the data for storage. |
| Observation | The school year can enter data. Then the Save button is for the process of entering class data. |

| Cases and Test Results (Correct Data) | |
|---|---|
| Conclusion | School year data was successfully entered |
| **Cases and Test Results (Incorrect Data)** | |
| Input data | School year: |
| Expected | Can display a message in an empty text field |
| Observation | The school year cannot be empty |
| Conclusion | The input process cannot be done. |

## 4. Conclusion

SMA Teluk Panji 's school payment information system makes it easy for administrative staff (TU) to enter money payment transaction details. Administrative staff (TU) handles the money payment reports students to have to pay. This method is beneficial and allows students to know the money to be paid. This method provides students with full data as papers. Useful reports to find out how much was charged and students who did not pay. UML is a visual language for modeling information systems or applications. UML uses diagrams and text to support this framework. Modeling influences software design. A device must satisfy needs, be able to transform data into usable and productive users. As a software test, the black box test approach works. The method works from the unknown. The system testers view the information system program running as adequately subject to the external testing process in testing this system as planned and according to the school payment information system. The prototyping approach aims to obtain a definition of the application through other phases.

## 5. References

[1] A. Kadir, *Pengenalan sistem informasi edisi revisi*. Andi, 2014.
[2] M. Syarif and W. Nugraha, "PEMODELAN DIAGRAM UML SISTEM PEMBAYARAN TUNAI PADA TRANSAKSI E-COMMERCE," *J. Tek. Inform. Kaputama*, vol. 4, no. 1, 2020, [Online]. Available: http://jurnal.kaputama.ac.id/index.php/JTIK/article/view/240.
[3] J. Marojahan, D. Trisnawarman, and Z. Rusdi, "SISTEM INFORMASI GEOGRAFIS PEMETAAN POTENSI PARIWISATA TOBA SAMOSIR BERBASIS WEB Key Words: Geographic Information System of Tourism Potential Mapping of Toba Samosir Regency," *J. Ilmu Komput. dan Sist. Inf.*, 2018, [Online]. Available: http://journal.untar.ac.id/index.php/jiksi/article/view/2640.
[4] D. D. Pertiwi and R. Taufiq, "Analisis dan Desain Sistem Informasi Pengolahan Nilai Siswa di SMK Avicena Rajeg," *J. Tek. Inform. Univ. Muhammadiyah Tangerang*, 2020, [Online]. Available: http://jurnal.umt.ac.id/index.php/jika/article/view/2435/1486.
[5] H. R. Andrian and R. Hendriyanto, "Usulan Pembangunan Model Prototype Layanan Cloud Computing – Saas Portal Konten Untuk Membangun Konten Pedesaan," in *Seminar Nasional Teknologi Informasi dan Multimedia 2014*, 2014, vol. 2, no. 1, pp. 1–6.
[6] U. Salamah and F. N. Khasanah, "Pengujian Sistem Informasi Penjualan Undangan Pernikahan Online Berbasis Web Menggunakan Black Box Testing," *Inf. Manag. Educ. Prof.*, vol. 2, no. 1, pp. 35–44, 2017.