Design and Build a New Student Registration Information System Supported by SMS Gateway at Alhira Middle School

Yosdarso Afero[1],*

[1]*AMIK Kosgoro Solok, West Sumatra, Indonesia*

Article Information

A B S T R A C T

This study aims to design a Web-Based Online Registration Information System Supported by SMS (Short Message Service) Gateway at Alhira Middle School that is valid, practical, and effective. The process of registering new students, which has been taking place at Alhira Junior High School, has not yet run online; this can be seen from the data process, report generation that still uses Ms. Office Word, and use paper archives. It makes data security not guaranteed, allowing much data to be lost. On the other hand, for prospective registrants who want to know information related to schools, it is still difficult to do, because it requires prospective registrants to come or visit the hut directly. Another problem is that more prospective new students come from outside the Tanah Datar area, of course, it requires a lot of costs, especially transportation. This problem is the background of this research. The type of research used is Research and Development, with the 4-D model stands for Define, Design, Develop and Disseminate. While the system development model used adopts the SDLC cycle (System Development Life Cycle, namely the waterfall model. The results of this study are a new student registration information system that has been tested for products including validity, practicality and effectiveness tests. The results of the validity test were carried out on three people; the validator obtained a total score of 0.88 with very valid criteria, the practicality test was carried out on three validators obtaining a total value of 93.33 with very practical criteria, and the effective value for ten respondents obtained a total result of 0.79 with very effective criteria. After testing the product, this information system can be declared feasible and can be used in the process of accepting new students at Alhira Middle School.

1. Introduction

At present, along with the increasing public need for knowledge, the development of information and communication technology runs very quickly. The progress of the development of information technology has changed the way people live their daily activities. The role of information technology in all sectors of life has unwittingly brought the world into a new era of globalization faster than all imagined. This development has influenced the economic, political and educational aspects. Global demands cause the world of education to adapt technological developments to improve the quality of education, especially the use of Information and Communication Technology in the learning process.

The utilization of cellular technology with various applications and services such as SMS Gateway can support the acceptance of new students. This application can be a supporting media to provide information regarding the acceptance of new students. In addition, a web-based information system and SMS Gateway can also be a source of information that can be accessed by users [1]. Including in this case the Alhira Scouting Boarding School is expected to make this school gain more value from community satisfaction to guide their children to high-quality schools. So that this becomes an attraction for new students and a new beginning for IT-based things, with the hope that the Pamuka Alhira Islamic Boarding School especially Alhira Middle School can enter the world of IT in academic non-academic processing.

The problem faced by SMP Alhira is that the management of new student admission data has not been carried out computerized and in the process of making reports still using Microsoft Word and using paper archives to store new student data. It makes data security not guaranteed, allowing many data to be lost. Accessing school-related information as a consideration for new students is difficult, requiring them to come or visit the lodge, because most of the new students come from outside the Tanah Datar area. Students from outside the Tanah Datar area who will register require much money, especially transportation.

The procedures applied at Alhira Middle School regarding the New Student Registration (PPDB) are as follows: (1) Prospective students visit the Alhira Scout Islamic Boarding School; (2) Prospective students fill out the registration form provided by the PPDB committee; (3) After filling out the form, prospective new students will pass several tests, which consist of an interview test and a written test; (4) Prospective students will be given a more detailed biodata form to take home and fill out, along with documents that must be brought back for re-registration for prospective students who pass; (5) Furthermore, the prospective new students are also given a list of items that must be brought and completed before entering the dormitory and details of the funds that must be issued by the parents of the students for the students who have graduated; and (6) Last administrative payment for initial registration.

Researchers tried to see the number of registrants at Alhira Middle School for the last 4 years with the aim of knowing the number of registrants each year. The number of new registrants or prospective students at SMP Alhira for the last 4 years is presented in table 1 below.

Table 1. Number of Applicants in the Last 4 Years at Alhira Middle School

Year	Amount
2017/2018	102 people
2018/2019	122 people
2019/2020	134 people
2020/2021	119 people

Based on the data in table 1 at SMP Alhira, it can be detailed the number of new applicants or prospective students who come from areas outside the Tanah Datar district. This data aims to determine the percentage of the number of applicants who come from outside the school area and ensure the need to design a web-based information system that can reach prospective new students from areas of origin outside the district. Table 2 shows the number of registrants by region of origin for the last 4 years or the 2017/2018 to 2020/2021 academic year as follows.

Table 2. Number of Registrants by Region of Origin for the Last 4 Years

No	Place of Origin	Total
1	Dhamasraya	30 person
2	Padang	33 person
3	Solok	29 person
4	Pariaman	32 person
5	Riau	27 person
6	Jambi	25 person
7	Duri	31 person
8	Batam	25 person
9	Sarulangun	29 person
10	Solok Selatan	28 person
11	Batu Sangkar	32 person
12	Sujunjung	31 person
13	Sawah Lunto	25 person
14	Mungka Talawi	24 person
15	Pasaman Barat	21 person
16	Pesisir Selatan	19 person
17	Mentawai	32 person

Based on the description above, the researcher is interested in raising the research topic on the use of internet technology, especially web-based online information systems and SMS Gateway technology. This study aims to produce a Web-Based Online Registration Information System Design Supported by SMS (Short Message Service) Gateway at SMP Alhira that is valid, practical and effective. This system is useful for practitioners in schools in managing the admission of new students at Alhira Middle School.

2. Method

This research is classified as Research and Development (R&D), which is used to produce certain products [2]. This type of research is used in needs analysis research and aims to test the product's effectiveness. For the research product to function in the wider community, it is necessary to test the product's effectiveness. This type of research is used to develop or validate products in the learning and education process [3].

The step in this research is to apply the 4-D (Four-D) development model which is taken from the abbreviation Define, Design, Develop and Disseminate [4]. The researcher chose research with the 4D method because of the 4D working steps that the researcher understood and from the 4D explanation, which was not difficult to do in field cases. Following the 4-D stages, namely [5]: Define, The define or definition stage aims to define or analyze the system requirements to be developed and their specifications. The stages of needs analysis are carried out through research and literature studies; Design, The purpose of the design stage is to make a design or blueprint of the system to be developed. Designing drawings to be made or in the form of program sketches; Develop, the waterfall model which is one of the models of the System Development Life Cycle (SDLC) was chosen by the researchers as the stages of the system development model. The waterfall model has phases or stages that can be described as shown in Figure 1 below [6].
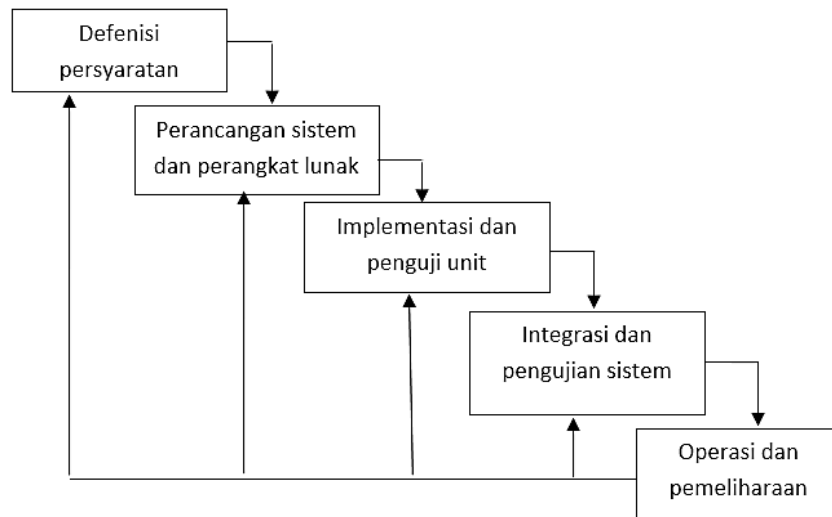
Figure 1. Waterfall Model System Development Life Cycle

Based on Figure 1 above, the stages or life cycle of the waterfall model system development can be explained as follows: (1) Definition of requirements, the requirements at this stage are defined in detail and function as system specifications. At this stage, the system's services, limitations, and objectives are determined through consultation with the system user; (2) System and software design, the system design process in this stage aims to determine the overall system architecture; (3) Implementation and unit testing, after the product has gone through the next design stage, the product is implemented and tested to be verified and declared to have met the specifications; (4) System integration and testing, the black box testing method was chosen for this study. Black box testing focuses on testing the functional requirements of the software; and (5) Operation and maintenance, in this phase the system is implemented or installed and maintained. Maintenance includes correction of previously undiscovered errors [7]. Dissemination, the distribution of products that have gone through the product testing stage aims to make the products can be used by others, especially the SMP Alhira in the process of accepting new students [8].

The stages of research using the 4-D model RnD method and the waterfall development model can be described as in Figure 2 below.
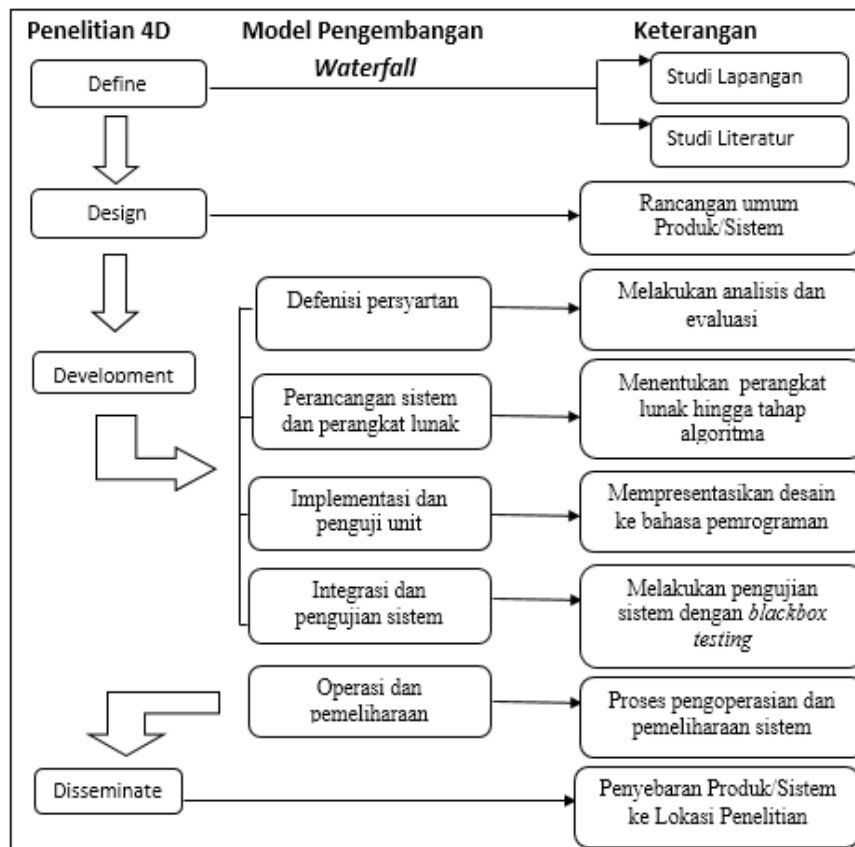
Figure 2. Research Stages

Based on the pictures blend 4-D models and the models of development waterfall above, this research have the following phases: definition (Define), field studies and literature study is an initial stage in this stage. Field studies are carried out to dig up information about the old system or the current system. Field studies are also useful for finding problems in the research location. The primary data sources were the head of the Islamic boarding school and the new student admissions committee. Data collection techniques were carried out through interviews, observation and documentation studies. In comparison, the data analysis technique is done by qualitative analysis. The study of the literature studied is related to information systems. Theoretical understanding of the system before it is developed is expected through literature study. Design, the results of field studies and literature studies are then used to design products. Broadly speaking, product design is obtained in the following stages: (1) Finding relevant products; (2) Compiling product design specifications; (3) Evaluating the various concepts offered; and (4) Describing the form of product design. Development (Develop), development or develop in this study were adopted from waterfall development model (waterfall) with stages as described in the development stage in the development of point 2.3 (Develop); Dissemination, the distribution of products that have gone through the product test phase, namely testing the validity, practicality and effectiveness to the research location of the Alhira Scout Islamic Boarding School. Product Validity Test, The research product is tested for validity to three experts who are competent in their fields. Test the validity of the product using a questionnaire instrument that contains several aspects of the assessment, namely: aspects of content validity, instructional design, display and programming. Furthermore, from the questionnaire that the validator has validated, the results are processed using a validation formula that refers to the Aiken's V formula, where the determination of the product category is declared valid if the value is in the range 0.60 - 1.00 and is declared invalid if the value is less than 0.60 [9]. Product Practicality Test, The Practicality test also uses a questionnaire instrument to

validate three validators. The practicality test will show whether the system built provides convenience for its users and is feasible. The practical analysis uses the formula used by Purwanto as follows.

Practical Value = $\frac{Total\ score\ obtained\ x\ 100\%}{Highest\ score\ total}$

The criteria used to determine the practicality of the product can be seen in table 3 below.

Table 3. Practical Reference

Criteria	Average Practical Value
Very Practical	86% – 100%
Practical	76% – 85%
Practical enough	60% – 75%
Very Impractical	≤ 54%

Product Effectiveness Test, Effectiveness test will measure the suitability between the objectives and the product results. Product results that achieve all the goals that have been set can be said to be effective. Operationally, the design of this information system gives results as expected. Product effectiveness test was carried out using Richard R. Hake's Statistical Formula. With the following conditions: high effectiveness if it is worth >= 0.7, moderate effectiveness if it is 0.7 > (g) > 0.3 and low effectiveness if it is worth (g) <= 0.3 [10].

3. Results and Discussion

3.1. Define

This definition aims to find out how the role of the new student registration system in Alhira Middle School is. In addition, by doing this definition, it is also possible to identify the problems found in the inaccurate diagnostic results.

The definition in this study is a process to find information on the system that is currently running to make it easier for researchers to translate the problems contained in the new student registration process. Some of the obstacles that exist in the field are that the registration process for new students at Alhira Middle School has not been computerized and is not online. So it is difficult for registrants outside Tanah Datar to register and allows data to be lost because data security is not guaranteed. Figure 3 shows the system applied by SMP Alhira in accepting new students.

Figure 3. Old Flow of New Student Registration System

The picture above clearly shows that the student admission system is still conventional, uses paper, and requires prospective students to visit the school to register and access information. From this, there are several weaknesses in the system used, such as prospective students having to spend money to come to school and take time, to access the information they have to come to school because there is no supporting information system, for schools the data security of prospective students is not guaranteed because to store data only use a folder or cupboard.

3.2. Design

From the results of interviews and observations carried out by researchers at Alhira Middle School, researchers have found several main problems that have been explained in the introduction. Therefore the

system that researchers designed is as follows: (1) this information system provides an attractive appearance and is easy to use; (2) This Information System has 4 main menus, namely: Home, which is the program's start page. The Announcement which is the result of the selection of applicants. The registration is a form that registrants will fill out, and an Account is a page where users and admins log in to the program page. On the admin login page, users can enter according to their username and password; (3) On the user page, the user can view the registration and information containing the announcement of the results of the new student registration; and (d) On the admin page, the admin can manage the page display, registration which contains the registration form and information containing the announcement of the results of the new student registration.

Users of this online registration system program need devices such as a monitor, CPU, keyboard, mouse, prime card and network. As shown in Figure 4.
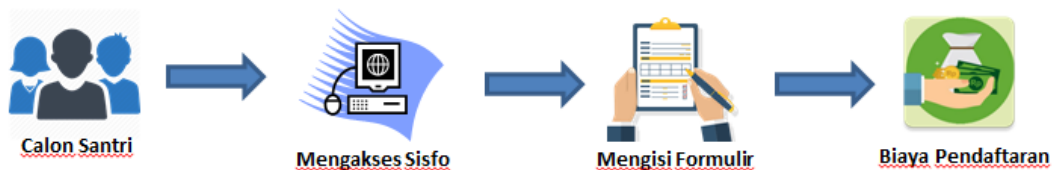

Figure 4. New Flow Design of New Student Registration System

3.3. Develop

3.3.1. Definition of requirements

To run the online registration system, two technology components are needed, namely hardware and software component. The hardware needed to run this expert system is: HP Laptop with AMD A9-9420 RADEON R5 Processor, 5 COMPUTE CORE 2C + 3G 3.00 GHz, Mouse, Keyboard, 4 GB Memory, 500 GB Hard Drive, ZTE Incorporated Modem + GSM Card and Cellular Phones (Handphones). The software used to run this system is as follows: Microsoft Windows 7/8/10, Sublime Text, Mozilla Firefox 50 / Google Chrome Browser, Wamp server and MySQL Database Management System.

3.3.2. System and software design

The design of the system and software includes the following stages: (1) General System Design which includes the design of: (a) Use Case Diagrams , Use Case diagrams of this information system are as shown in Figure 5 below.
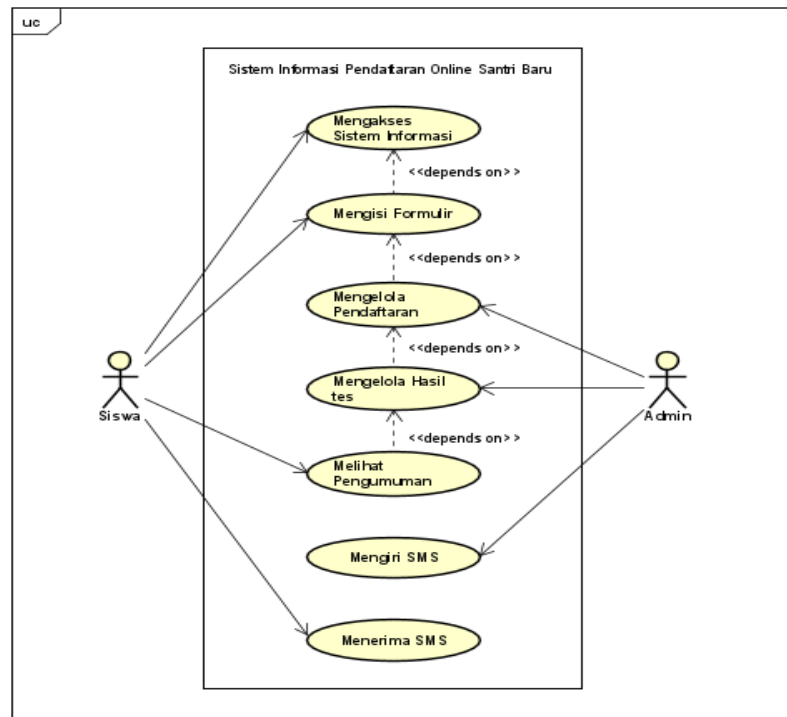
Figure 5. Use Case Diagram

From Figure 5 above, it can be seen that there are two actors involved in the online registration information system design, namely: admin and user, as well as six use cases, namely login, registration of registration results announcements, managing users, managing SMS, and notifications using SMS. (b) Activity Diagram, as for the existing Activity Diagram in the Design of New Santri Online Registration Information System Supported by SMS Gateway, which the author will make is shown in Figure 6.
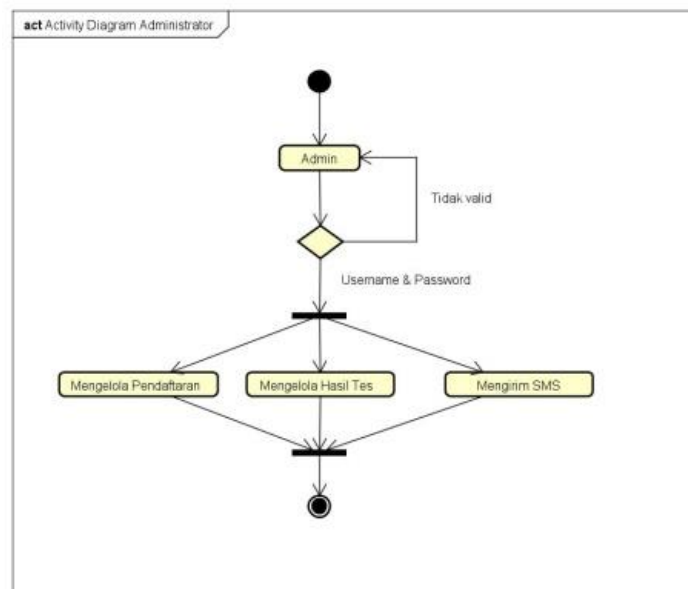

Figure 6. Administrator Activity Diagram

In the Administrator Activity Diagram picture 6 above, there is an administrator's activity described as follows: Enter the username and password, at the beginning of entering the admin system, enter the username and password to enter the admin page. Manage SMS, Selection Results, Edit Data, and Delete Data. This activity is where the admin manages SMS so that notifications are sent regarding the registration

of New Santri, manages the selection results, edits data, and deletes data. Figure 7 is a student activity diagram.
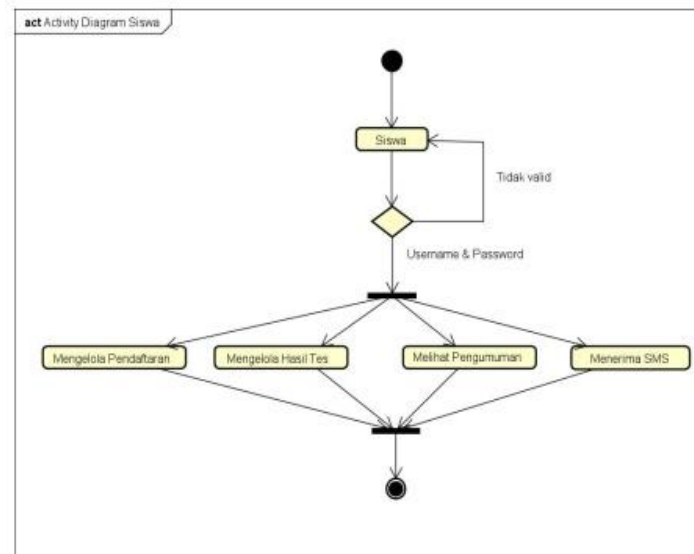

Figure 7. Student Activity Diagram

In the Student Activity Diagram above, there are several activities carried out, so the activities of a user can be explained as follows: Visit Links, View Pages, Registration, and View Selection Results. (c) Sequence Diagram, Sequence diagram describes the interaction between users or users with the system created. Sequence diagrams are used to describe the details of each stage or scenario that is carried out and is the response of an event to produce a certain output. In the sequence diagram, each object or actor has a vertical lifeline. Messages are represented as arrows from object to object. Figure 8 follows the sequence diagram of the new student online registration information system supported by the SMS Gateway.
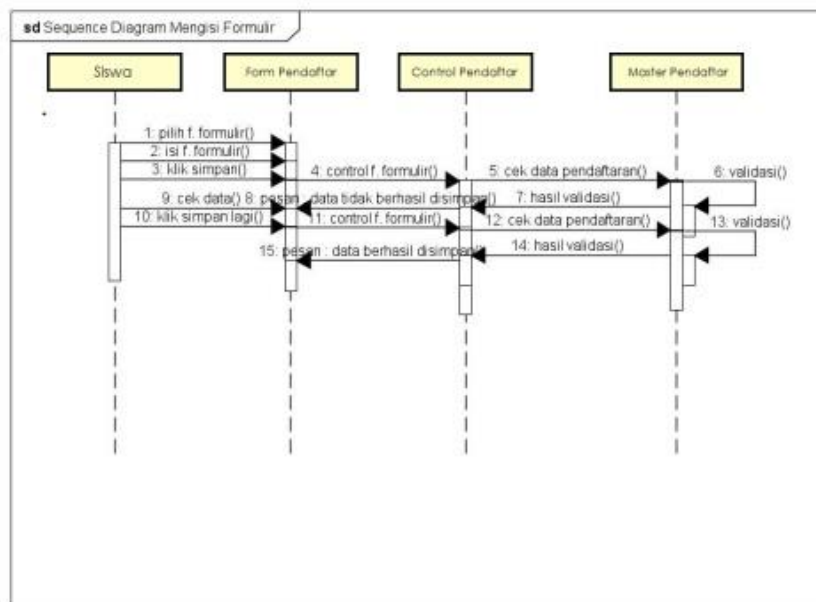

Figure 8. Sequence Diagram Filling in the Registration Form

The sequence diagram for filling out the registration form describes a detailed scenario of the registration steps taken by prospective new students. This process starts with selecting the registration form menu, filling out the form, and attaching or uploading the registration requirements. The next process is

selecting the save button. It is then forwarded by the registration form controller to be validated before being stored in the master table in the database. Figure 9 below is a sequence diagram for managing test results.
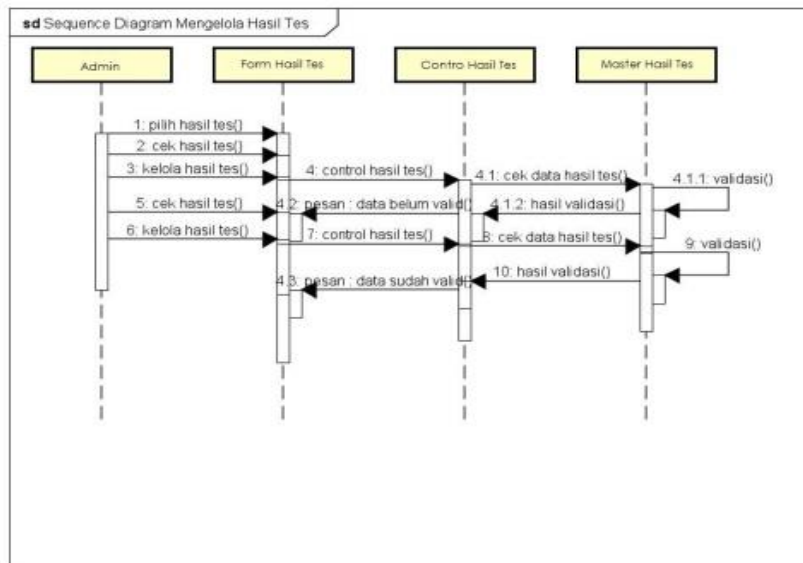

Figure 9. Sequence Diagram Managing Test Results

Sequence diagram managing test results describes the process carried out by the administrator starting from selecting the test results form. Next, check and manage the test results and forward it to the test results form controller to validate the data and display it on the test results form. Based on the test results on the form, the administrator can choose the next action. Figure 10 is a sequence diagram of sending SMS.
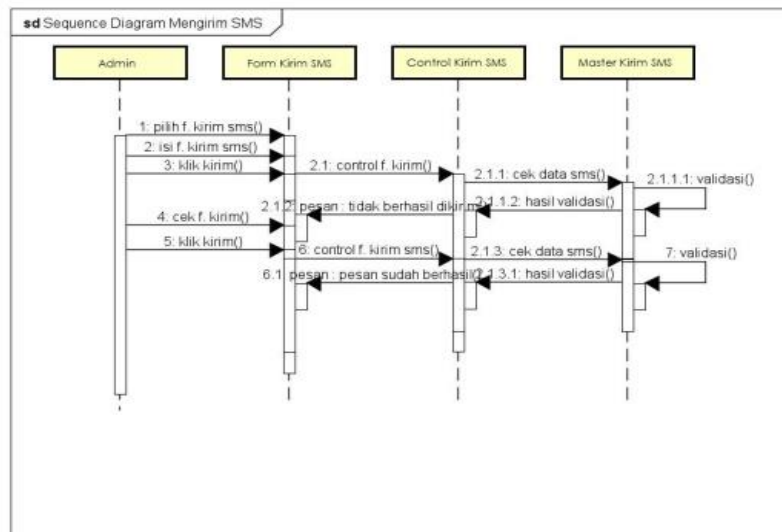

Figure 10. Sequence Diagram of Sending SMS

The sequence diagram for sending messages or SMS describes the process carried out by the administrator on the send message form; this process begins with selecting send messages. The process of sending messages in detail is filling out the message to be sent, confirming the destination number and then selecting to click the send button. The message sent is then checked and validated by the controller of the send message form, if the message is successfully sent, a message will be displayed on the form. (d) Class Diagram, Class diagram is static. This diagram shows the classes, interfaces, collaborations, and relationships. This diagram is commonly found in object-oriented system modelling. Even though they are static, class diagrams often contain active classes. The following is a class diagram of the new online registration system supported by SMS Gateway. Figure 11 is a class diagram.
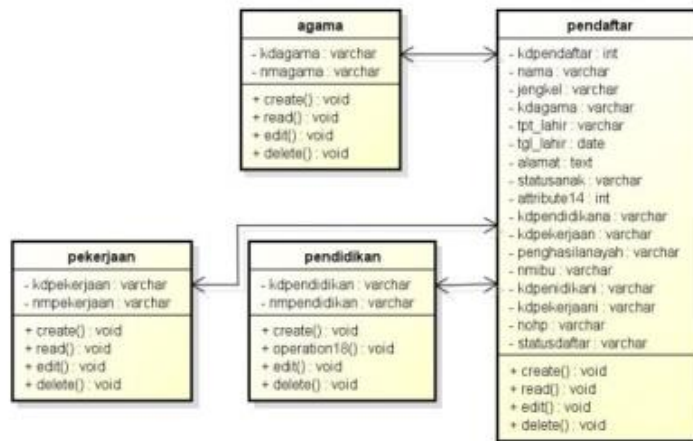
Figure 11. Class Diagram

The next stages of system and software design are: (2) Detailed System Design, which includes: (a) Output Design, such as the announcement of the selection results and data reports of new students. (b) Design Input, such as: Design Form Login, Design Form Login SMS, Design Guide Form Administrator, and Design Guide Form Administrator SMS Gateway. (3) Database Design, the designed table design includes user, registration, and psb result files. (4) Design technology, to run this information system, the required two-component technology, the hardware and software.

3.3.3. Implementation and unit testing

The acceptance of new students is still not computerized and is not online, it does not have a forum for registrants outside Tanah Datar. Likewise, there is no media for information or confirmation of the registration of prospective new students. It is where the researchers designed an online registration information system for new students supported by an SMS Gateway so that Alhira Middle School can easily accept new students and provide confirmation to applicants, so that this program greatly helps Alhira Middle School.

3.3.4. System integration and testing

The blackbox method was chosen to test the system in this study. The black box method aims to show whether the system interface or interface can function properly or not. If the interface has not run according to the target, iteration or improvement is carried out on the system design. Conversely, if the interface is following the goals and targets that have been determined, the system made is ready to be deployed to the field or to the next step, namely the distribution stage.

3.3.5. System operation and maintenance

In the maintenance phase, the researcher made updates to the system and made some corrections for the shortcomings obtained through the system testing phase. Some corrections and updates that need to be made include the need to reorganize the order of the data on the registration form, the uploaded data must be added and the data submitted on the form should refer to existing standards, for example: DAPODIK, SIMPATIKA, and others.

3.4. Disseminate

This implementation test is done by testing whether the functions work well. Implementation of this research was limited to trials with parties related to the information system on online registration of new students supported SMS Gateway are implemented and carried out in SMPS Alhira product deployment.

At the implementation stage, researchers conducted product tests including: (1) Validity Test; product validity testing was carried out using a questionnaire instrument. The questionnaire instrument was given and filled out by three experts in computer programming. The validity test results with three validators obtained an average value of 0.84. Based on the determination of validity with the Aiken formula, the product is declared valid. In general, the results of the product validity test can be seen in table 4 below.

Table 4. Validity Test Results

Validator	Content Validation Aspect Average	Average Aspects of Instructional Design Average	Display Aspect Average	Programming Aspect Average
Validator 1				
Validator 2	0,85	0,88	0,78	0,86
Validator 3				
Whole		0,84		
Criteria		Valid		

The following product test is: (2) Practicality Test; the practicality test of the online registration information system for new students supported by SMS Gateway is obtained based on the practicality sheet filled out by the examiner, namely to computer experts at Alhira Middle School as many as 2 people. The general assessment of the product of this rating system is that it can be used and is very practical with a value of 93% following the attachment to the product practicality questionnaire which has been summarized and presented in table 5.

Table 5. Practicality Test Results

No.	Evaluated Aspect	Examiner		
		Tester 1	Tester 2	Tester 3
1.	Aspects of the appearance of the program that has been designed	100	100	100
2.	Aspects of attributes: text and colors used in the program	100	100	80
3.	Aspects of using the program or application	100	80	80
4.	Systematic aspects of presenting content in the program	100	100	80
5.	User friendly aspect	100	100	80
	Average	100	96	84
	Practical Results		93	
	Category		Very Practical	

Furthermore, the third product test, namely: (3) Effectiveness Test, Testing the effectiveness of the online registration information system for new students supported by SMS Gateway, was distributed and filled out by ten respondents, namely students of SMP Alhira. A general assessment of the effectiveness of this product can be seen in table 6.

Table 6. Effectiveness Test Results

No.	Student Name	Prior Value (Si)	Value After (Sf)
1	Respondent 1	40	80
2	Respondent 2	32	80
3	Respondent 3	28	80
4	Respondent 4	64	92

5	Respondent 5	80	84
6	Respondent 6	72	96
7	Respondent 7	40	92
8	Respondent 8	40	80
9	Respondent 9	40	84
10	Respondent 10	48	92
	Amount	484	860
	Average	48,4	86

So the overall product effectiveness value using the G-Scores formula is.

$$G = \frac{Sf - Si}{100\% - Si}$$

$$G = \frac{86 - 48,4}{100 - 48,4}$$

$$G = \frac{37,6}{51,6}$$

G = $0,72$ with high effectiveness category.

4. Conclusion

This research resulted in a new student registration information system based on Web and supported by SMS (Short Message Service) Gateway at SMP Alhira. The validity test results obtained a total value of 0.88 with very valid criteria; the practicality test obtained a total value of 93.33 with efficient criteria and the effectiveness value with a total result of 0.79 with very effective criteria. Based on the results of the product test, this information system can be declared feasible and can be used to accept new students at Alhira Middle School. In order for the system that has been implemented to run well, it is recommended to SMP Alhira to appoint an administrator who functions to maintain and manage this system.

References

[1] M. Afrina and A. Ibrahim, "Pengembangan Sistem Informasi SMS Gateway Dalam Meningkatkan Layanan Komunikasi Sekitar Akademika Fakultas Ilmu Komputer Unsri," *J. Sist. Inf.*, vol. 7, no. 2, pp. 852–864, 2015, [Online]. Available: http://ejournal.unsri.ac.id/index.php/jsi/index.

[2] Sugiyono, *Metode Penelitian Kuantitatif dan R&D*. Bandung: Alfabeta, 2010.

[3] Sugiyono, *Metode Penelitian Pendidikan (Pendekatan kuantitatif, kualitatif dan R & D)*. Alfabeta, 2008.

[4] A. Nur Khomarudin, S. Zakir, R. Novita, Endrawati, M. Zahiri Bin Awang Mat, and E. Maiyana, "K-Mean Clustering Algorithm in Grouping Prospective Scholarship Recipients," *J. Phys. Conf. Ser.*, vol. 1779, no. 1, 2021, doi: 10.1088/1742-6596/1779/1/012007.

[5] S. Zakir, E. Maiyana, A. Nur Khomarudin, R. Novita, and M. Deurama, "Development of 3D Animation Based Hydrocarbon Learning Media," *J. Phys. Conf. Ser.*, vol. 1779, no. 1, 2021, doi: 10.1088/1742-6596/1779/1/012008.

[6] I. Sommerville, *Metode Penelitian dan Pengembangan (Research and Development/R&D)*. Jakarta, 2003.

[7] R. A. Shalahuddin, Muhammad Sukamto, *Rekayasa Perangkat Lunak (terstruktur dan berorientasi objek)*. Bandung: Informatika Bandung, 2011.

[8] S. Mayati, S. Supriadi, and A. N. Khomaruddin, "Perancangan Aplikasi E-Discussion Pada SMA Negeri 1 Banuhampu," *CSRID (Computer Sci. Res. Its Dev. Journal)*, vol. 11, no. 2, p. 118, 2021, doi: 10.22303/csrid.11.2.2019.118-129.

[9] L. R. Aiken, "Three Coefficients for Analyzing the Reliability, and Validity of Ratings," *Educ. Psychol. Meas.*, vol. 45, pp. 131–142, 1985, doi: https://doi.org/10.1177/0013164485451012.

[10] R. Sagita, F. Azra, and M. Azhar, "Pengembangan Modul Konsep Mol Berbasis Inkuiri Terstruktur Dengan Penekanan Pada Interkoneksi Tiga Level Representasi Kimia Untuk Kelas X Sma," *J. Eksakta Pendidik.*, vol. 1, no. 2, p. 25, 2017, doi: 10.24036/jep.v1i2.48.