

Engineering of Junior High School New Student Admissions System Using System Performance Based Prototype Method

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Abstract

The process of accepting new students in Junior High Schools (SMP) is currently still constrained by a conventional system that requires physical collection of registration forms, complete files, and time-consuming interviews and tests. Information related to admission procedures, requirements, fees, and registration schedules is also spread across various communication channels, making it difficult for prospective students and parents to access accurate and up-to-date information. In this context, researchers have succeeded in designing a new student admission information system by implementing the prototype method. This system has gone through Black Box Testing and evaluation with the System Usability Scale (SUS) scale, and its performance has been analyzed using the Performance, Information, Economy, Control, Efficiency, Services (PIECES) method. The results of the SUS scale calculation show an average value of 72.9, which is included in the acceptable classification indicating that the New Student Admissions (PPDB) system in the form of a prototype after evaluation can be accepted by prospective users of the prototype system. In addition, the results of the PIECES calculation show that each indicator in the evaluation and measurement of the new student admissions system is in the "very good" and "good" categories, with an average value of 6.22 to 6.56 included in the very good category, an average value of 6.09 is included in the good category.

Keywords : Black Box Testing , New Student Admission, SUS, PIECES , Prototype Method

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1. INTRODUCTION

Education plays a crucial role in shaping a quality future generation. One of the important stages in the education process is the acceptance of new students at school. The process of accepting new students has major implications for the efficiency of school administration and the experience of prospective students and parents. Therefore, the development and implementation of an appropriate information system to manage the process of accepting new students becomes a very urgent need.

In the era of rapidly developing information technology, the use of information systems in the education sector is becoming increasingly important. However, there are still many schools that have not utilized the potential of information systems optimally in managing the new student admission process. Some obstacles

include a complicated and time-consuming registration process, the risk of losing applicant data, and the lack of transparency and accessibility of information for prospective students and parents.

Currently, the process of accepting new students in Junior High Schools (SMP) is still carried out conventionally, such as collecting physical registration forms, collecting complete registration files, and time-consuming interviews and tests. In addition, information regarding admission procedures, requirements, fees, and registration schedules is still scattered in various communication channels, so prospective students and parents often have difficulty accessing accurate and up-to-date information. Accepting new students is one of the activities that occurs every year all schools face new student admission activities.

Research conducted by Badrul et al [1], [2] entitled "Implementation of the Waterfall Method in the Design of a New Student Registration Information System" this research discusses designing a new student registration information system. Furthermore, in research conducted by Jenri Wandu Situngkir et al [3], [4], [5], [6] entitled "web-based new student admissions information system at Ichthus Elementary School, Jakarta" this research discusses designing a new student admissions information system. The drawback of this research is that the system's functionality testing process was not carried out.

This study focuses on the design and implementation of a new student admissions information system based on information technology. The system's business processes include collecting student registration data, the selection process, collecting results, and managing student data in an integrated manner. While the sample of the research object was carried out at SMPN 3 Jatibarang, Indramayu Regency. Meanwhile, the added value of developing this new student admissions information system can provide a more efficient, transparent solution and support the needs of prospective students and parents.

2. RESEARCH METHODS

The research conducted consists of several stages starting from topic determination, data collection, use of prototype methods consisting of needs analysis, creating prototype designs, prototype evaluation, coding the system, system testing using black box [7], SUS-based system evaluation [8], Implementation, system performance analysis using the PIECES method. The following is the research flow carried out:

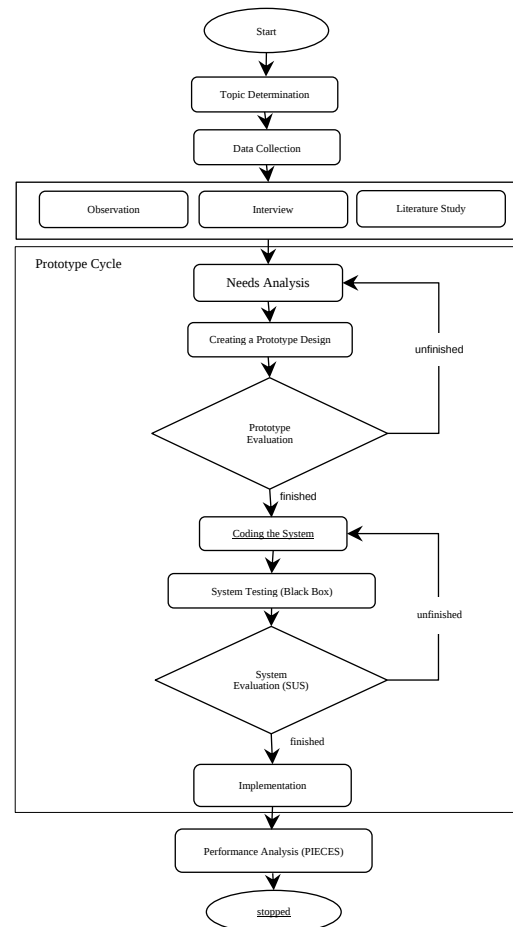


Figure 1. Research Stages

2.1. Data Collection

At this stage, the author collects data that is in accordance with the author's needs in creating a web-based new student admissions system, and in accordance with the Prototype method [9], [10], [11]. The author uses a data collection method in several parts simultaneously, consisting of observation, interviews, and literature studies.

2.2. Needs Analysis

In this analysis stage, the author will create an information system. In creating this system, the author uses the PHP programming language accompanied by modeling in the form of Prototype and PIECES analysis [12], [13]. The analysis of the needs of the new student admission system is as follows:

Needs	Actor	Activities
Users	Prospective Students	1. Fill out the registration form online. 2. Log in to the

Needs	Actor	Activities
		registration page. 3. Upload registration documents. 4. View uploaded documents. 5. Print the registration form. 6. View registration results.
	PSB administrator	1. Log in to the PSB admin page. 2. View all data of prospective students who have registered, and can edit and delete prospective student data. 3. Carry out the process of accepting new students. 4. Receive a PSB data report containing a summary of prospective student data in Microsoft Excel format so that it can be directly saved or printed by the PSB admin
System	Prospective Students and PSB Administrators	1. Displays the information page about PSB. 2. Displays the PSB form. 3. Displays the

Needs	Actor	Activities
		registration login page. 4. Displays the registrant page. 5. Displays the PSB admin login page. 6. Displays the admin page

Table I Needs System

2.3. Prototype Design

This stage the author designs a new student admissions information system according to the general description of the new student admissions system. In the form of a Web-based new student admissions information system, the researcher creates a home design, then creates an Information System that is designed in general.

Use Case Diagram *Prototype* [14]

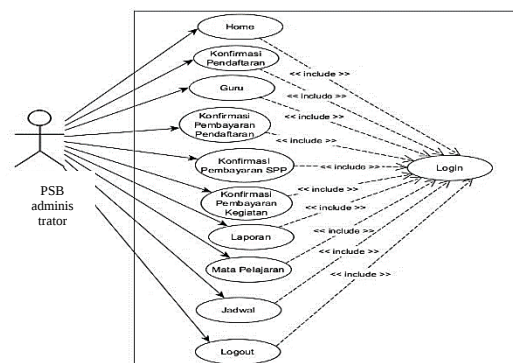


Figure 2. Use Case for Admin

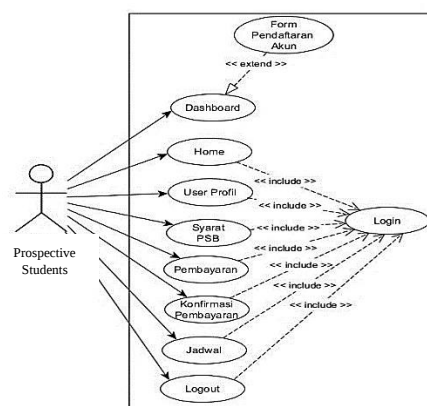


Figure 3. Use Case for Prospective Participants

2.4. Prototype Evaluation

At this stage, the client will use the Prototype system that has been built with the intention of ensuring that the designed system is in accordance with the client's goals and needs. If the Prototype that is built is not in accordance with the client's wishes, corrections and improvements will be made again. This stage will adjust the procedures of the system that will be implemented based on user needs, for example, the input and output displays that are not yet appropriate or require additional features.

1. Use Case for Admin evaluation results

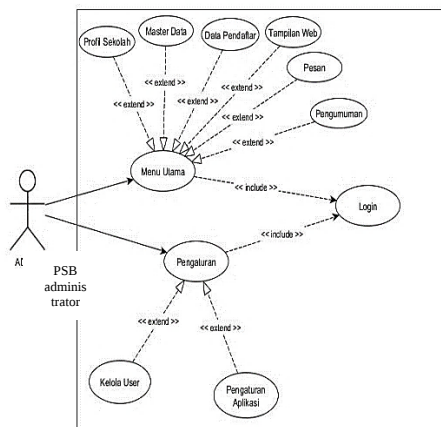


Figure 4. Use Case for Admin evaluation results

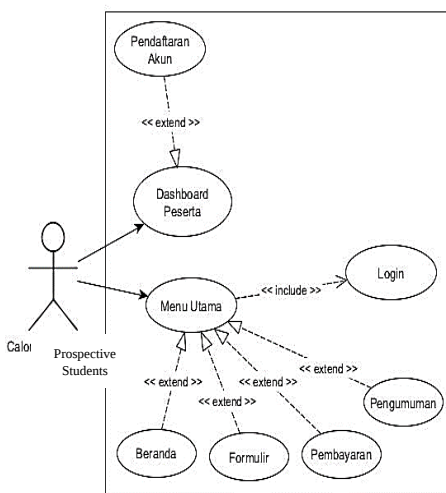


Figure 5. Use Case for prospective participants from the evaluation results

2. Class Diagram

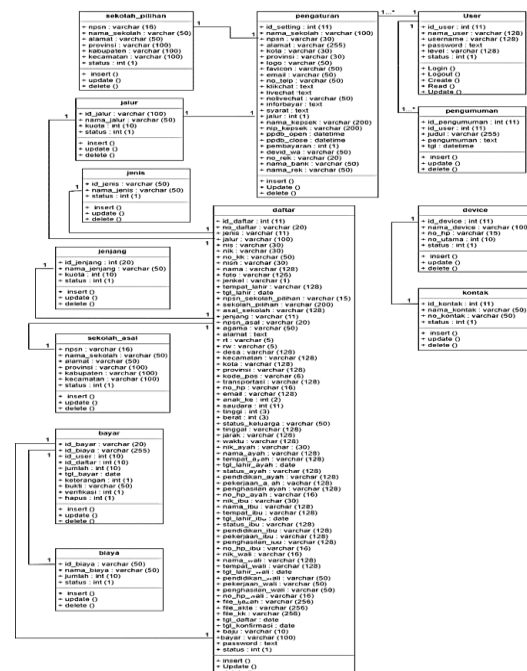


Figure 6. Class Diagram

2.5. Coding the System

The prototype that has been approved in the previous stage by the client will begin the process of being made in the form of code or coding at this stage, by translating it into the programming language used. PHP web-based programming language. The database uses MySQL.

2.6. System Testing

The system that has been programmed using a programming language into a software will be tested first to determine whether the software is suitable for use. The testing carried out aims to ensure that errors are minimized. At this testing stage, Black Box is used.

2.7. System Evaluation

This system evaluation stage ensures that the program or system built is in accordance with the user's wishes. If it is in accordance, the system can be used. But if it is stated that it is not in accordance, the developer must return to the previous stage to fix the inconsistency according to the client's wishes.

Analysis of trial results. Analysis of results serves to determine the level of feasibility of the system that has been

created. Feasibility analysis using the SUS scale determines the usability of the system created so that it is hoped that it can be used sustainably [8], [12], [15].

2.8. Implementation

This implementation stage is the final result of all design activities. After implementing it into the PHP programming language [16] which is used as a framework that is stored in the MySQL database and then run on the localhost network. Then it will display the New Student Admissions Information System.

2.9. System Performance Analysis

This system performance analysis stage is a test of the system that has been built by assessing the extent to which the system meets the expectations and satisfaction of end users regarding how users feel when using the system. The method used at this stage is PIECES. In this analysis stage, a questionnaire was conducted to determine the value of the New Student Admissions Information System. Respondents' answers will be processed as research data [12].

3. RESEARCH RESULTS

3.1. Prototype Evaluation

The results of the prototype evaluation were carried out through a question and answer session with the school administration regarding the addition or reduction of features to the new student admissions system, which will be explained in Table 2 below:

No	Needs	Features	Information
1	Warning notification if entering username or password incorrectly	Login interface	Notification if you enter the wrong username and password
2	PPDB additions are opened and PPDB is closed	Settings menu	PPDB settings are opened and closed in the settings menu
3	Added registration quota info	Master data menu	Registration quota information on the main page of prospective students

No	Needs	Features	Information
4	Additional information on registration requirements and contacts	Web menu	Information on registration requirements and contact details
5	Addition of student information accepted or rejected	Registrant data menu	Information that prospective students are accepted or rejected
6	Added announcement menu	Announcement menu	Announcement menu to make it easier for prospective students to receive information
7	Addition of interaction platform with prospective students	Contact us feature	The WhatsApp feature has been added to make it easier for prospective students to ask questions about things they don't understand.

Table II Prototype Evaluation Results

Table 2 is the result of the prototype evaluation that has been adjusted to the needs of potential system users which are represented in the next prototype system in the form of additional features and user interface design.

3.2. System Interface Results

The new student admission system that has been designed is then programmed using the PHP programming language with the following results:

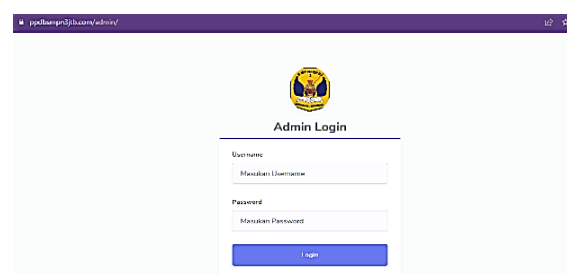


Figure 7. Admin Login

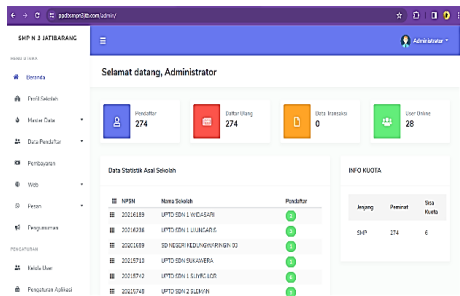


Figure 8. Admin Dashboard

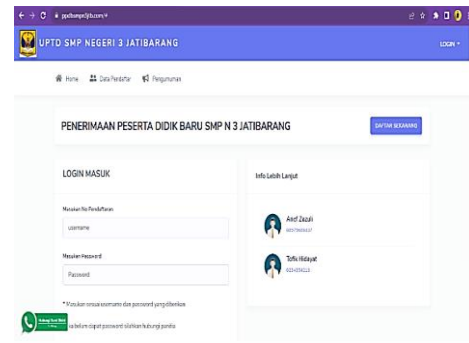


Figure 12. Prospective student login

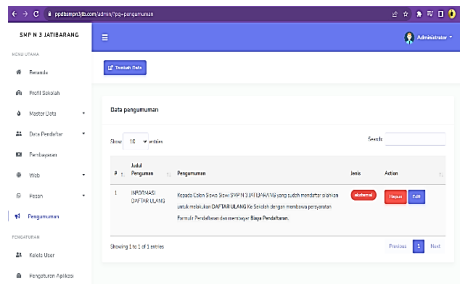


Figure 9. Admin Announcement

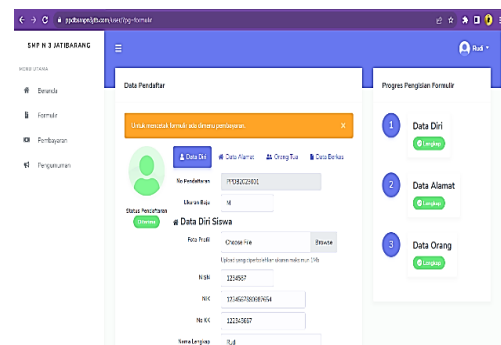


Figure 13. Prospective student form

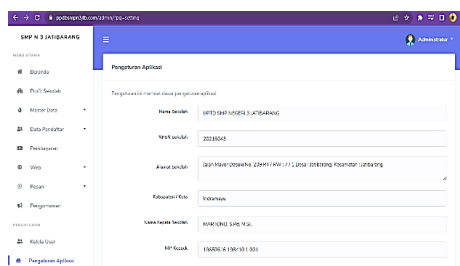


Figure 10. Admin application settings

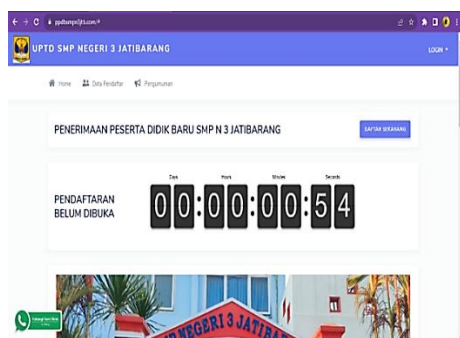


Figure 11. Prospective student homepage

3.3. Black Box Testing

The system testing was conducted using the Black Box method which is an alpha test. To determine the functionality of each feature of the PPDB system prototype to ensure the system can run as expected. The test results can be seen in Table 3 below:

Menu	How to Test	Test Results	Conclusion
Login	Username : (empty) password : (empty)	The system displays a notification message that the username or password is incorrect	Valid
School profile	Enter school profile data	The system stores school profile data	Valid
School of origin data menu	Input the same data or add data	The system will reject if there is a match and the system will save the data if the data is not the same	Valid

Menu	How to Test	Test Results	Conclusion
Registrant data	Perform excel download and data search features	The system will download the excel data, the system will display the data to be searched for	Valid
Application settings	Determination of open and closed registration	The system will open or close registration according to the specified time.	Valid
From registration	Fill in the same data and fill in the correct data	The system will reject registration if the registered NIK is already registered, and the system will display the prospective participant page if the registration has been carried out correctly	Valid

Table III Black Box Test Results

3.4. System Evaluation Results

The SUS test was conducted by giving a SUS questionnaire consisting of 10 questions with each question having 5 answer choices. The questionnaire was distributed to SMPN 3 Jatibarang school officials such as teachers, administration and new student admissions officers. The results of the questionnaire data and the results of the SUS calculations can be seen in Table 4.

Respondents	Amount	The final result
R1	28	70
R2	27	67.5
R3	32	80
R4	32	80
R5	28	70
R6	32	80
R7	28	70
R8	28	70

Respondents	Amount	The final result
R9	24	60
R10	30	75
R11	28	70
R12	28	70
R13	28	70
R14	30	75
R15	28	70
R16	28	70
R17	28	70
R18	28	70
R19	28	70
R20	33	82.5
R21	30	75
R22	28	70
R23	28	70
R24	28	70
R25	29	72.5
R26	30	75
R27	30	75
R28	30	75
R29	30	75
R30	31	77.5
R31	34	85
Average		72.5

Table IV SUS Calculation Results

Based on the test results using the SUS method, the average value obtained was 72.9, the calculation results are as follows:

$$\frac{2.260}{31} = 72,9$$

4. DISCUSSION

The research results presented in the previous chapter will be analyzed using the PIECES method to measure the level of user satisfaction with the applications that have been released.

4.1. System Performance Testing

1. Performance

Choice Answer	Statement		Amount P1+P2	SK	RK
	P1	P2			
Strongly agree	82	94	176	1232	6.31
Agree	192	179	371	2226	
Quite Agree	0	1	1	5	
Enough	0	0	0	0	
Quite Disagree	0	0	0	0	
Don't agree	0	0	0	0	

Choice Answer	Statement		Amount P1+P2	SK	RK
	P1	P2			
Strongly Disagree	0	0	0	0	
Amount			548	3463	

Table V Performance score results

$$\frac{3464}{548} = 6,31$$

Based on the results of the analysis conducted on the new student admission system of SMPN 3 Jatibarang with performance analysis, an average result of 6.31 was obtained with a very good category, so it can be concluded that the performance of the new student admission system of SMPN 3 Jatibarang provides positive values and satisfaction to system users.

2. Information

Choice Answer	Statement		Amount P1+P2	SK	RK
	P1	P2			
Strongly agree	17	113	130	910	
Agree	256	161	417	2496	6.22
Quite Agree	1	0	1	5	
Enough	0	0	0	0	
Quite Disagree	0	0	0	0	
Don't agree	0	0	0	0	
Strongly Disagree	0	0	0	0	
Amount			548	3411	

Table VI Information score results

$$\frac{3411}{548} = 6,22$$

Table 6 shows the results of the analysis carried out In the new student admission system of SMPN 3 Jatibarang, the average result was 6.22 with a very good category, so it can be concluded that the information system for new student admissions of SMPN 3 Jatibarang provides a positive value to system users.

3. Economy

Choice Answer	Statement		Amount P1+P2	SK	RK
	P1	P2			
Strongly agree	166	148	314	2177	
Agree	108	126	234	1422	6.56

Choice Answer	Statement		Amount P1+P2	SK	RK
	P1	P2			
Quite Agree	0	0	0	0	
Enough	0	0	0	0	
Quite Disagree	0	0	0	0	
Don't agree	0	0	0	0	
Strongly Disagree	0	0	0	0	
Amount			548	3599	

Table VII Economy score results

$$\frac{3599}{548} = 6,56$$

Results of the analysis conducted on the new student admission system of SMPN 3 Jatibarang with the economy analysis obtained an average result of 6.56 with a very good category, so it can be concluded that the economy of the new student admission system of SMPN 3 Jatibarang provides positive values and satisfaction to system users.

4. Control

Choice Answer	Statement		Amount P1+P2	SK	RK
	P1	P2			
Strongly agree	21	40	61	427	
Agree	245	232	477	2862	6.09
Quite Agree	7	2	9	45	
Enough	1	0	1	4	
Quite Disagree	0	0	0	0	
Don't agree	0	0	0	0	
Strongly Disagree	0	0	0	0	
Amount			548	3338	

Table VIII Control score results

$$\frac{3338}{548} = 6,09$$

results of the analysis are shown in table 8 on the new student admissions system at SMPN 3 Jatibarang with the indicators *The control* obtained an average result of 6.09 with a good category, so it can be concluded that *the control of* the new student admission system at SMPN 3 Jatibarang provides

positive values and satisfaction to system users.

5. Efficiency

Choice Answer	Statement		Amount P1+P2	SK	RK
	P1	P2			
Strongly agree	90	51	141	987	6.25
Agree	184	222	406	2436	
Quite Agree	0	1	1	5	
Enough	0	0	0	0	
Quite Disagree	0	0	0	0	
Don't agree	0	0	0	0	
Strongly Disagree	0	0	0	0	
Amount			548	3428	

Table VIII Efficiency score results

$$\frac{3428}{548} = 6,25$$

results of the analysis carried out in table 8 on the new student admission system of SMPN 3 Jatibarang with the *efficiency* indicator obtained an average result of 6.25 with a very good category, so it can be concluded that *the efficiency of* the new student admission system of SMPN 3 Jatibarang provides positive values and satisfaction to system users.

6. Service

Choice Answer	Statement		Amount P1+P2	SK	RK
	P1	P2			
Strongly agree	54	171	225	1575	6.40
Agree	219	103	322	1932	
Quite Agree	1	0	1	5	
Enough	0	0	0	0	
Quite Disagree	0	0	0	0	
Don't agree	0	0	0	0	
Strongly Disagree	0	0	0	0	
Amount			548	3512	

Table IX Service score results

$$\frac{3512}{548} = 6,40$$

Table 9 shows the results of the analysis carried out on the new student admission

system of SMPN 3 Jatibarang with the *service analysis* obtained an average result of 6.40 with a very good category, so it can be concluded that *the service of* the new student admission system of SMPN 3 Jatibarang provides positive values and satisfaction to system users.

5. CONCLUSION

1. This research successfully designed and implemented a new student admissions information system according to school needs using the prototype method.
2. The system has received positive evaluation from users with a high System Usability Scale (SUS) score with an average value of 72.9 included in the acceptable classification which indicates good satisfaction.
3. Black Box testing on the new student admission information system with test scenarios obtained valid test results in all cases. So the system is considered usable to meet functional needs .
4. The new student admission system has been evaluated using the PIECES method with an average score of 6.22 to 6.56 where the score is included in the very good category, one indicator in the PIECES method is included in the good category with an average score of at least 6.09, this provides an efficient and satisfactory solution in managing the new student admission process. This system can be considered successful in achieving its objectives and providing significant benefits for schools or educational institutions that use it as well as prospective students and parents who register through this system.

6. SUGGESTION

1. Although the system has received positive evaluations, it is important to continue to monitor and evaluate its performance periodically by considering technological developments and school needs that may change over time, continuous evaluation can help ensure that the system remains relevant. And provide training to system users, especially school staff who use the system regularly so that they fully understand how to use the system and maximize its benefits.
2. This study only conducted Black Box testing, therefore it is recommended to conduct a comprehensive White Box

testing on the new student admission system. In this way, we can ensure that the system code and logic are running correctly, as well as identify potential security vulnerabilities and hidden bugs that may have been missed during Black Box testing. White Box testing will help ensure that the system operates efficiently, optimally, and remains secure.

3. In the context of system performance analysis, it is recommended to use other method approaches, such as statistical methods. By using statistical methods, data that has not shown indicators of system performance satisfaction can be explored and get more relevant results.

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