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WEB-BASED MAIL MANAGEMENT INFORMATION SYSTEM AT SMA NEGERI 1 SIDAREJA

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ABSTRACT

Every institution including schools has the responsibility to manage archives, especially letters. But the conventional methods of mail management take up a lot of time and space with the risk of losing documents. With a mail management information system, it can simplify and speed up mail management and minimize the risk of losing documents. This application use Yii2 framework and MySQL for the database. Rapid Application Development used in this research and 5 of 8 aspect ISO 25010 for the evaluation. The results are 100% (excellent) for suitability, 98% (excellent) for performance efficiency, 81,64% (excellent) for usability, successful for reliability and 100% (excellent) for portability. Based all aspect of the evaluation the system meet the ISO 25010 standard and well received at SMA N 1 Sidareja.

Keywords: Mail Management, ISO 25010, Rapid Application Development

1. INTRODUCTION

Paper is the only conventional medium used for mail management and considered to have many weaknesses. Conventional methods of mail management takes up a lot of time and space (Junus, 2018). In addition, loss of documents is the main threat to conventional document management. It led to long periods of stalling and no history of mail distribution (Dita, 2015).

The Government of Indonesia guarantees the safety of national accountability materials regarding the planning, implementation and administration of national life which must be maintained for their integrity, security and safety in UU no.43 Tahun 2009 about archive (R. Indonesia, 2009). Therefore, every institution, including schools, are responsible to manage archives, especially letters. In the end, the archive is authentic evidence in the accountability of government activities (Machmoed, 2001).

According to the interview with the administrative head of SMAN 1 Sidareja, it was revealed that mail management is currently being handled through conventional methods using physical books and paper. The recording has been carried out properly by grouping both incoming and outgoing mail by type and sorted by number in the archive storage. However, there is still a risk of data loss and the low time effectiveness is considered to still need to be improved considering the high frequency of letters and administration in a high school. Web-based mail management system have beem widely developed but can't cover the entire mail management process in school as research conducted by Junus (Junus, 2018), Luqman (Luqman, 2013), and Cahyaningrum (Cahyaningrum, 2013) where the information system only contains incoming and outgoing mail processes. there is also research conducted by J. Sasongko & Diartono (J. Sasongko & A. Diartono, 2009) and Khoirul & Riasti (Khoirul et al., 2013) but it is desktop-based which is less flexible because it can only be used on a computer.

This study aims to create a mail management information system that can accommodate the entire mail management process in schools. The author used ISO 25010 software engineering theory for the evaluation because it is the latest version of ISO 9126 which was introduced in 1991.

2. RESEARCH METHOD

Research and development methods was used in this research since it aimed at producing a mail management information system and test its effectiveness. The application development model used in this research is Rapid Application Development (RAD) (Kendall & Kendall, 2002) which have several steps :

1. Requirement planning: At this step the system requirements are determined both functionally and non-functionally.
2. Design system: At this step database design is made based on the needs of the previous step.
3. Implements: At this step the author will develop the system design that has been made into the program code and evaluate it.

According to David in Ghaffur (Ghaffur, 2017) testing for mobile applications includes 4 characteristics, namely functional testing, compatibility testing, usability testing, and performance testing. If the aspects of David's mobile web testing standard are compared with the ISO/IEC 25010 standard, then web application testing needs to be carried out on the characteristics of functional suitability, usability, performance efficiency, performance testing and portability. Since the application is made on a web-based, the portability aspect is needed to see the characteristics of the application on various browsers therefore the author use 5 of 8 characteristics :

1. Functional suitability
   This characteristic uses a test case instrument to find out if the system functions are running as expected by the author.
2. Performance Efficiency
   This characteristic uses the GT Metrix application for measuring performance by knowing page load time, total page size and HTTP requests.
3. Usability
   This characteristic uses the USE Questionnaire made by Lund (Lund, 2001). The USE Questionnaire is available in English and has been translated into Indonesian and has been tested for validity by A. Sasongko, Jayanti, & Risdiansyah (A. Sasongko et al., 2020). The questionnaire is divided into 4 criteria : usefullness, ease of use, easy of learning and satisfaction.
4. Reliability
   This characteristic uses the WAPT application to determine whether the information system is running well when under pressure. There are 4 aspects that are measured, namely session, page, response time and hits
5. Portability
   This test uses various browsers to find out how the information system runs in different environments.

The average percentage of each characteristic is calculated in the following way:

$$\text{Percentage}(\%) = \frac{\text{Score}}{\text{Maximum Score}} \text{x} 100\%$$

The results are compared with the table from Sudaryono (Sudaryono et al., 2011) to get the interpretation that described in Table 1.

Table 1. Score Interpretation

Percentage	Interpretation
0% - 20%	Very Low
21% - 40%	Low
41% - 60%	Average
61% - 80%	Good
81% - 100%	Excellent

3. RESULT AND ANALYSIS

This research uses the RAD development model which consists of 3 steps : requirement planning, design system and implementation The evaluation uses 5 of 8 characteristics of ISO 25010.

3.1. RESULT

3.1.1. Requirement Planning

a. Functional requirement
   The system has 4 types of users with different roles like admin, school principals, administrative staff and teachers. The detailed functional requirement of system :
   - System can perform authentication.

- System can manage user account.
- System can manage occupation type.
- System can manage work units.
- System can manage employee.
- System can manage incoming mail.
- System can manage disposition
- System can manage outgoing mail.

b. Non-functional requirement

Non-functional requirements are related to the resources and limitations of the services provided by the system. Non-functional requirements of the mail management information system can be seen in Table 2.

Table 2. Non-functional Requirements

Characteristic	Explanation
Reliability	The system has good performance when encountering failures or errors and has good security
Portability	The system can run properly when accessed by various browsers
Usability	The system can be easily understood and used by users
Efficiency	System performance according to the specifications of the resources used

3.1.2. Design System

Using the outcomes of the previous stage, use case diagrams, activity diagram, ERD, and table relationships are obtained. There are some output of design systems :

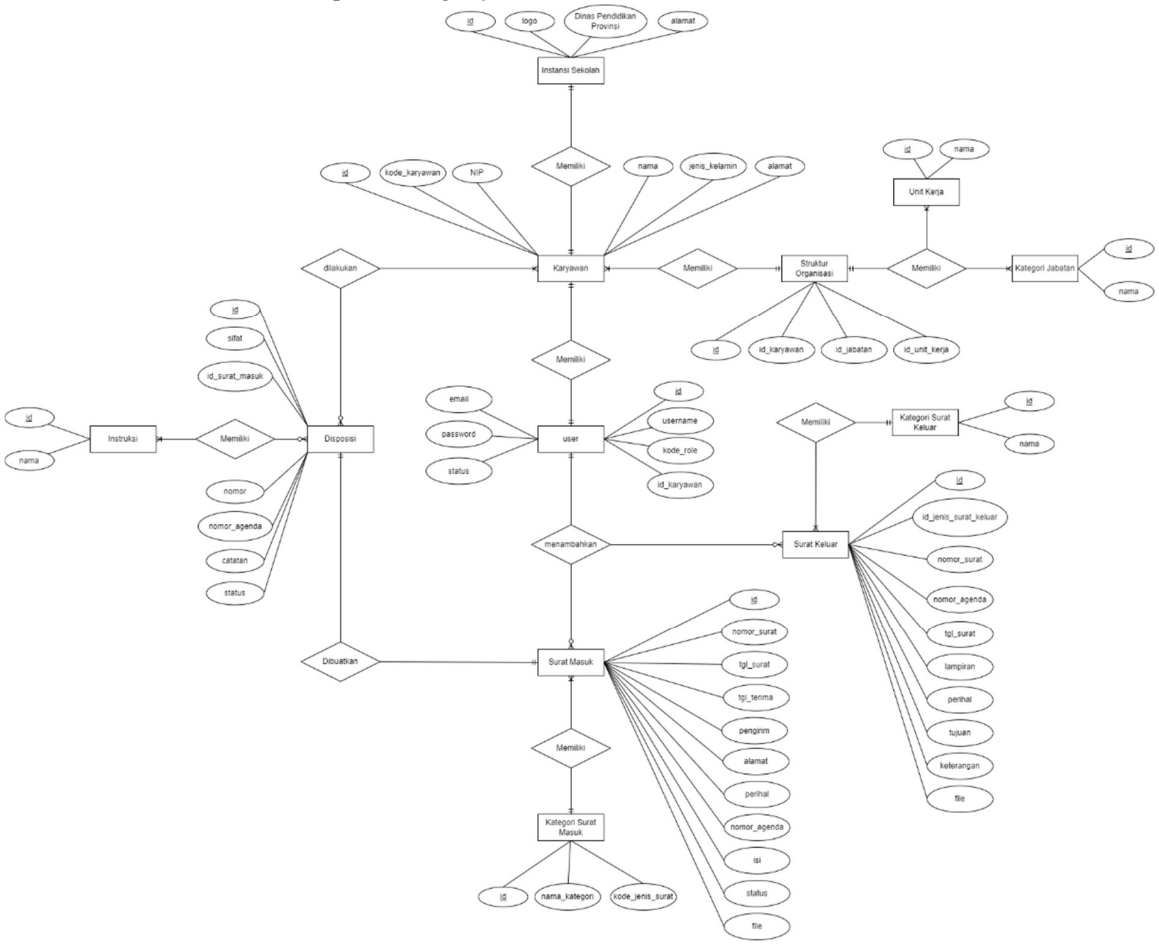

Figure 1. ERD

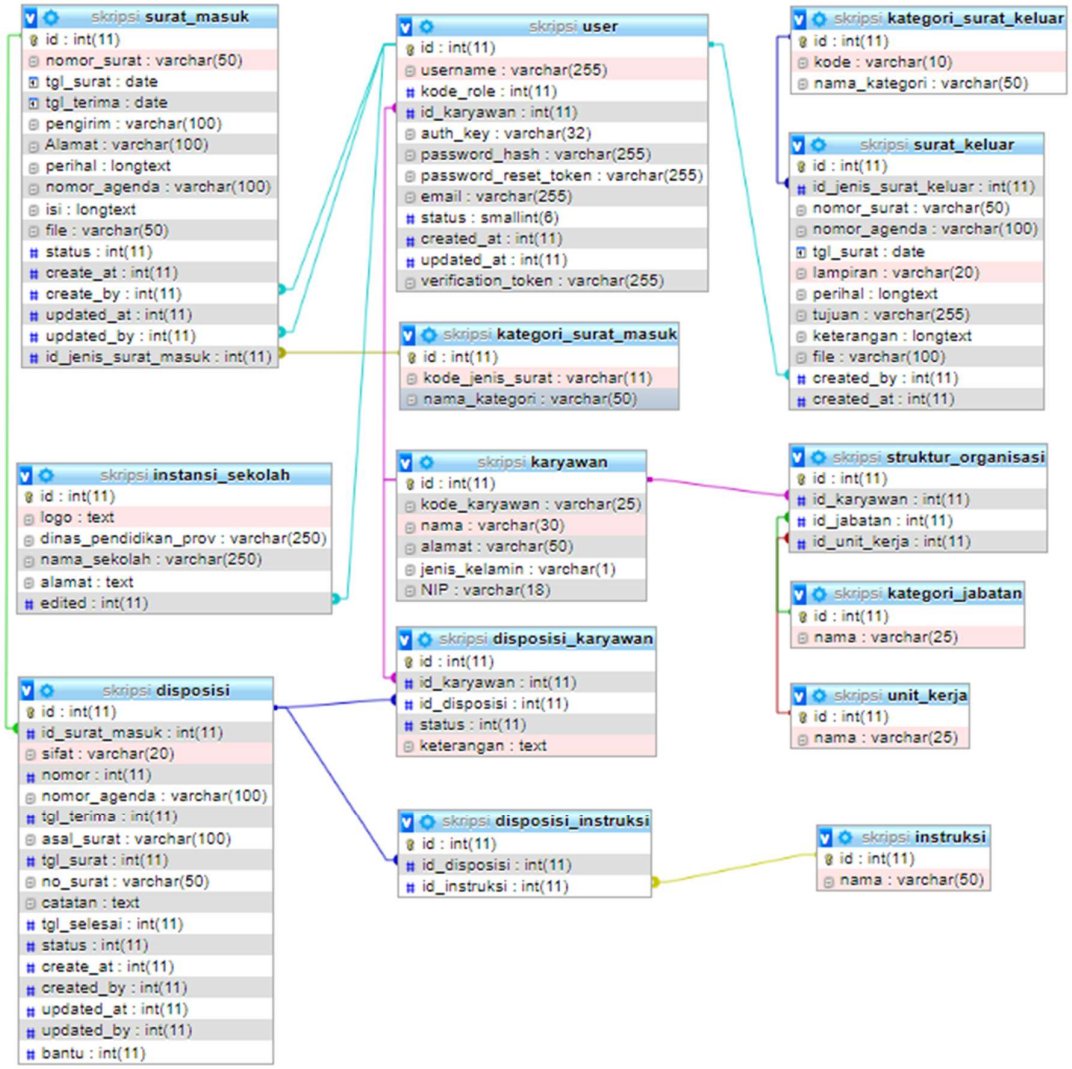

Figure 2. Table Relationship

3.1.3. Implementation

In this step, the design that was made in previous step starts to be implemented to the code of program. The mail management information system will be created using PHP script language, with Yii2 framework and MySQL for the database. The result of this step is information system that ready for evaluation. There are some interfance of the mail management information system that has been created.

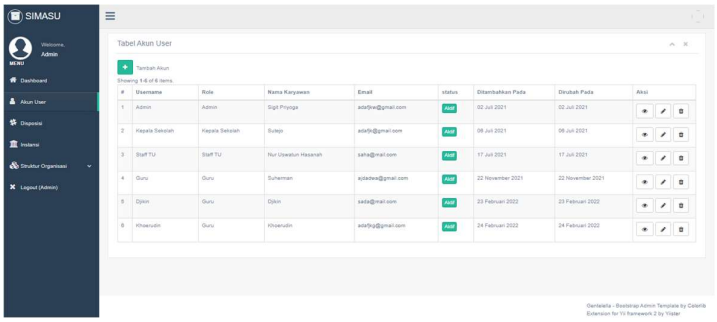

Figure 3. User Management

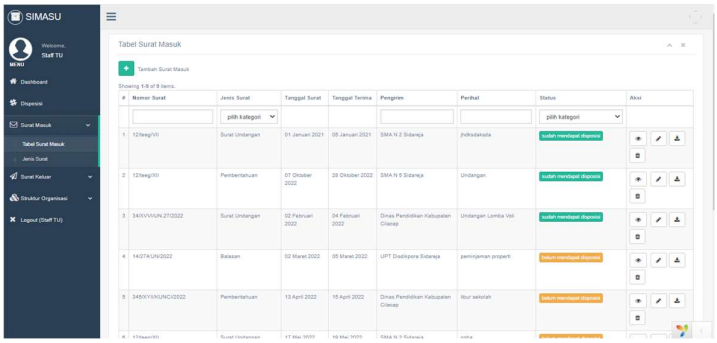

Figure 4. Incoming Mail Management

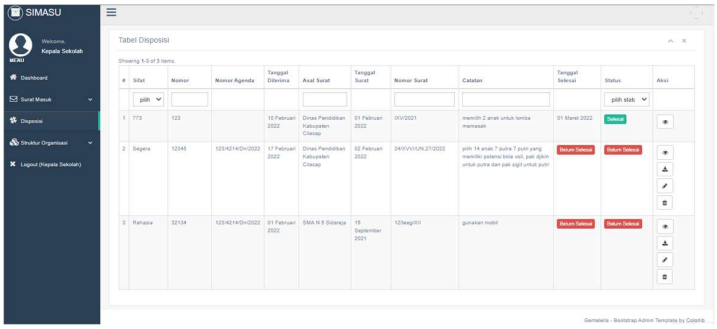

Figure 5. Disposition Management

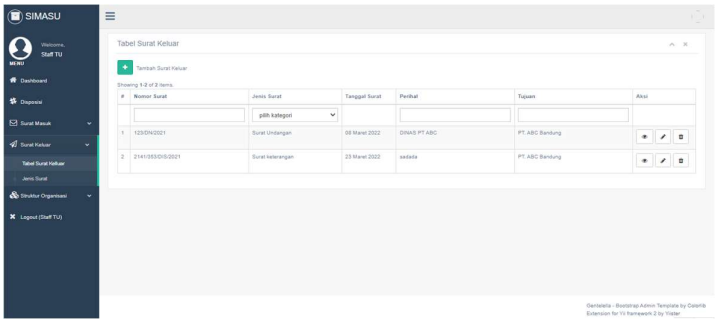

Figure 6. Outgoing Mail Management

3.1.4. Evaluation

a. Functional Suitability

The objective of testing functional suitability is to ascertain whether the functions and features within the system are operating as expected. This test uses a test case table instrument and done by the developer with the results shown in Table 3.

Table 3. Test Case Result

No.	Feature	Scenario	Expected Result	Result
1.	Home	Select home navigation	Displays the home page with various information	Success
2.	Login	a. Input username and password (wrong)	Displays a username or password error pop-up and redirected to the login page to try again	Success
		b. Input username and password (correct)	Displays dashboard page with user's role session	Success
3.	Logout	Select logout menu	Logout from the account and be redirected to the home page	Success
4.	Incoming mail category	Select incoming mail category menu	Successfully displays incoming mail category data and performs CRUD	Success
5.	Outgoing mail category	Select outgoing mail category menu	Successfully displays outgoing mail category data and performs CRUD	Success
6.	Incoming mail data	Select incoming mail menu	Successfully displays incoming mail data and performs CRUD	Success
7.	Outgoing mail data	Select outgoing mail menu	Successfully displays outgoing mail data and performs CRUD	Success
8.	Disposition	a. Disposition of incoming mail	Successfully made the disposition of incoming mail to employees	Success
		b. Receive the disposition	Receive and change the status of disposition	Success
		c. Refuse the disposition	Refuse, change the status and state the reasons	Success
9.	Download file	Select download button	Successfully download the file	Success
10.	User account	Select user management menu	Successfully displays user account data and performs CRUD	Success

b. Performance Efficiency

Performance efficiency testing uses the GTMetrix web service. GTMetrix conducts an assessment based on Lighthouse, a tool used to measure web quality and performance. GTMetrix uses 2 aspects to perform the assessment, performance (70%) and structure (30%). The server test was selected based on the location closest to Indonesia, namely Hong Kong China with following result:

Table 4. GTMetrix Result

Grade	Performance	Structure	Score
A	99%	98%	98%

Source : https://gtmetrix.com/reports/priyoga.web.id/yXDTtbqk/

c. Usability

The usability test involved distributing questionnaires to participants, followed by observing their direct interactions with the created system to assess their understanding. The results from respondents are shown in Table 5.

Table 5. Questionnaires Result

Aspect	Statement	Score					Percentage
		1	2	3	4	5	
Usefulness	1	0	0	0	23	7	84,7%
	2	0	0	0	24	6	84%
	3	0	0	0	20	10	86,7%
	4	0	0	5	20	5	80%
	5	0	0	1	22	7	84%
	6	0	0	0	23	7	84,7%
	7	0	0	1	23	6	83,3%
	8	0	0	1	23	6	83,3%

	9	0	0	0	24	6	84%
	10	0	0	4	23	3	79,3%
	11	0	0	3	25	2	79,3%
	12	0	0	5	22	3	78,7%
	13	0	0	5	20	5	80%
Ease of Use	14	0	0	3	21	6	82%
	15	0	0	11	18	1	73,3%
	16	0	0	3	25	2	79,3%
	17	0	0	3	19	8	83,3%
	18	0	0	3	22	5	81,3%
	19	0	0	5	21	4	79,3%
	20	0	0	3	23	3	80,7%
Ease of	21	0	0	2	22	6	82,7%
Learning	22	0	0	3	18	9	84%
	23	0	0	5	21	4	79,3%
	24	0	0	5	22	3	78,7%
	25	0	0	2	20	8	84%
	26	0	0	3	21	6	82%
Satisfaction	27	0	0	3	21	6	82%
	28	0	0	0	27	3	82%
	29	0	0	4	22	4	80%
	30	0	0	3	20	7	82,7%
Average							81,64%

d. Reliability

Reliability test uses WAPT 10 that aimed to find out system reliability when given a certain load. This test was done with 20 different users for 10 minutes. There are 4 aspects that were considered in this test, namely sessions, pages and hits with the interpretation of the results of successful and failed. The results of this test are shown in Table 6.

Table 6. Reliability Result

Parameter	Success	Failed	Total
Session	147	13	160
Pages	2415	13	2428
Total KBytes sent			3920
Total KBytes received			88049
Avg response time, sec (with page resources)			0.55 (0.64)
Test Result			Success

e. Portability

Conducting a portability test across various browsers aimed to assess how the system responds in different environments. The test done with 6 mostly used browsers in 2022 (Statcounter, 2022), Chrome (65.86%), Safari (18.87%), Edge (4.45%), Firefox (3.04%), Samsung Internet (2.68%) and Opera 2.27%). The test results are shown in Table 7.

Table 7. Portability Result

No.	Browser	Result
1.	Chrome	Normal
2.	Safari	Normal
3.	Edge	Normal
4.	Firefox	Normal
5.	Samsung Internet	Normal
6.	Opera	Normal

3.2. ANALYSIS

From the conducted tests, it is evident that the functional suitability aspect has achieved a 100% success rate. Interpreting these results in accordance with Table 1. places it within the "Excellent" criteria.

The performance efficiency aspect has received an A grade with a score of 98%. When referencing Table 1. for interpretation, it meets the criteria for an "Excellent" rating. In the structure parameter, there is a slight decrease caused by several assets such as CSS and javascript files not using a CDN (Content Delivery Network) however it can still be optimized..

The usability aspect gets the lowest score that 73% in statement 15 which states whether the respondent can use this system without written instructions. This shows that direct explanations are lacking and somewhat difficult to understand by respondents. The highest score is 86.7% in statement 3 which states that this system is very useful. This shows that respondents feel this system can be very helpful when applied to the mail management at school. The average score is 81,64% that interpreted with Table 1. It achieve the "Excellent" criteria.

There was only 8% error in reliability aspect and 0,5% error on the page aspect. It means the result from WAPT was successful.

The system operates smoothly across all browsers, resulting in a perfect 100% score for the portability aspect. When considered in the context of Table 1., it fulfills the criteria for an "Excellent" rating.

4. CONCLUSION

This system can help, simplify and speed up mail management in schools. Start from incoming mail that are positioned on employees and getting outgoing mail. This system also provides easy access because it is web-based so it can be accessed nywhere and anytime. The risk of losing documents can also be minimized with digital storage that can be downloaded.

Based all aspects of the evaluation of this system achieve good results and fulfil the ISO 25010 standard indicating that this system can be well received at SMAN 1 Sidareja.

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