*Journal of Applied Engineering and Technological Science*
Vol 4(1) 2022 : 415-428

# *DEVELOPMENT OF SERVICE MAIL MANAGEMENT INFORMATION SYSTEM AS A SUPPORTING SYSTEM FOR CALCULATING RECAPITULATION OF REMUNERATION PERFORMANCE POINTS AT UNIVERSITAS NEGERI MAKASSAR*

**Al Imran[1], Haripuddin[2] Sanatang[3], Muhammad Hasan Z[4]**
Electrical Engineering Department, Universitas Negeri Makassar, Indonesia[1234]
al.imran@unm.ac.id

Received : 17 November 2022, Revised: 07 December 2022, Accepted : 07 December 2022
**Corresponding Author*

**Abstract**
This research is research and development (R&D) which aims to produce an official letter management information system, a supporting system for calculating remuneration performance point recapitulation at Makassar State University. Application testing uses ISO/IEC 25010. This study uses the Waterfall development model consisting of five work steps, namely analyzing needs, conducting design, coding, testing and maintenance. The developed system is validated by two system experts, and two content or material experts. The data were collected using questionnaires, interviews and documentation as supporting data for the development of information systems. Data processing uses qualitative and quantitative descriptive analysis techniques. The test results prove that the official letter management information system that has been built meets ISO/IEC 25010 testing standards with the results of testing the functionality suitability aspect in the very decent category. Aspects of performance efficiency with good criteria, aspects of usability with very good category, security aspects obtained level 1 security is at low level criteria with sufficient information. Achievements in the reliability aspect have met Telcordia's testing standards. The maintainability aspect has met three Land testing standards. The compatibility aspect is very feasible and the portability aspect is in the very good category.

**Keywords:** Management System, Office Letter, ISO/IEC 25010,

## 1. Introduction

The development of technology today has increased very rapidly. This is marked by all forms of digitization, starting from the way humans communicate with one another to the way humans earn a living, all of which are supported by technology (Prasetiadi, 2011). The development of information technology in the world is developing very rapidly, this happens because many people in the world use it to facilitate their work and one of them is digitizing management information systems. Management information system technology is currently utilized in all aspects of human life, including agencies. The increasing amount of data that must be managed requires an agency to have a system that is capable enough to be able to optimally manage all the data it has in order to minimize risks such as loss of documents. Management system technology is needed in order to create transparency and digitization within an agency and all existing information can be conveyed properly to all parties (Liu et al., 2019; Navarro et al., 2021; Dong et al., 2021).

Management Information System (MIS) is an information system that in addition to carrying out all transaction management required by the organization, also provides information and processing support within the framework of operational management functions and decision-making processes (Huy & Hang, 2021; Yuesti et al., 2022). The benefits of all these developments can only be felt if they are supported by competent human resources. Because the use of computers and information technology in our lives is very widespread in society, the application of computer-based management information systems is an absolute necessity, and can provide a competitive advantage (Sutabri, 2016; Takain & Katmini, 2021; Triantafyllou, 2022). The management information system provides convenience and streamlines complicated matters for agency needs so that the application of management information systems in work processes such as data management and so on has been digitized. Government Regulation of the Republic of Indonesia Number 23 Year(2005) regarding Public Service Agency (BLU) Financial Management, it is necessary to regulate remuneration. To improve the quality of service to the community, the quality of employee performance and the efficiency of budget use, UNM

requires professional, qualified and committed human resources and needs to be provided with proper and fair welfare. Public Service Agency, hereinafter referred to as BLU, is an agency within the government that is formed to provide services to the community in the form of supplying goods and/or services that are sold without prioritizing profit and in carrying out its activities based on the principles of efficiency and productivity.

Remuneration according to Ruky (Ruky, 2006), explains that compensation has a broader scope than wages or salaries. Usually this is given directly by the company/agency to its employees or employees for the work performance that has been done. Official letter is a written communication tool that is used to convey information about officialdom, made by officials of organizations or government agencies (Alpiyasin, 2016).

Based on the results of the researcher's interview with Mr. Syahid Nur Wahid, S.Pd., M.Pd. who is the admin of the Remuneration System at UPT Information and Communication Technology, Makassar State University on Wednesday 25 August 2021, revealed that the availability of the Remuneration System feature is used by employees to upload their respective business letters to the system. As for official letters that are inputted are assignment letters or decrees made directly by UNM, not for official letters issued from other institutions or agencies, which are then converted into allowance performance points. Problems with inputting official letter documents which are still carried out individually by each employee in each unit make many official letter documents that need to be managed simultaneously. This causes the document inspection process to be ineffective and inefficient in terms of time. There is also the potential for data validation from the same official letter document to be carried out repeatedly, which can then result in the processing of performance points recapitulation data being irregular and at risk of causing human error.

## 2. Research Methods

The type of research used is Research and Development (R&D) or research and development that produces a particular product, and tests the effectiveness of the product. The stages of Research and Development (R & D) by adopting the Waterfall model are: (1) Analyzing needs, (2) Design, (3) Doing coding, (4) Testing, (5) Maintenance. The model used in making official letter management systems is the waterfall development model. Because the waterfall development model is one of several development models that are currently being popularly used. This model can also be easily applied to various information systems. And also this development model procedure can systematically meet the needs in the development of this system. The waterfall development model can be seen in the image below:

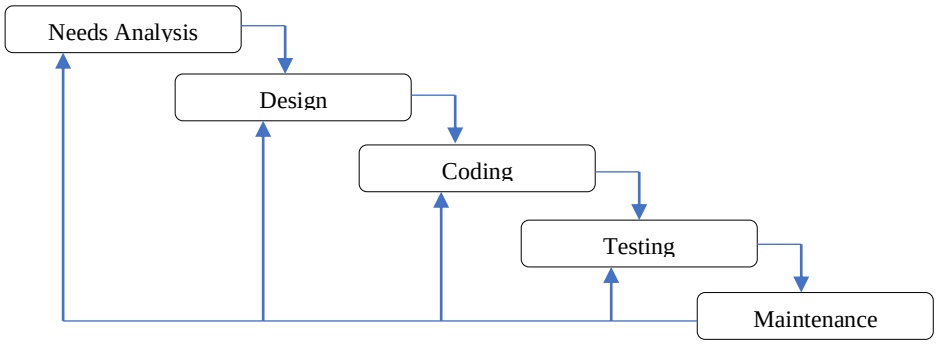


Fig. 1. Waterfall Model Development Procedure
Source. (Pressman, 2010)

This research was carried out at UPT Information and Communication Technology, Universitas Negeri Makasar, especially in the remuneration section. The research will be conducted in July 2022 – October 2022. The research subjects that are the focus of this research process are 2 lecturers as system expert validators, 2 lecturers as content/material expert validators and 40 education staff and educators (lecturers) as a respondent or system user. Research data collection techniques were carried out using 4 techniques consisting of interviews, questionnaires or questionnaires and documentation, questionnaires

or questionnaires, and documentation. Then the process of distributing questionnaires or questionnaires was carried out both offline and online with the data analysis techniques used were descriptive qualitative and quantitative. Questionnaire sheets or questionnaires are validated by instrument experts, there are 3 instruments that will be used, namely instruments for content/material experts, system experts (functionality), and respondents (usability). Assessment for instrument validation uses a Likert scale. The assessment given will be processed using the average formula according to the following:

$$\bar{X} = \frac{\sum X_i}{n}$$

Information:

$\bar{X}$ = Average count
$X_i$ = The value of the i-th sample
$n$ = Number of samples

From the results of the instrument validation carried out, the values are entered into the following intervals:

Table 1 - Instrument Validation Interval

| Interval | Information |
|---|---|
| $4,5 \leq M \leq 5$ | Very Valid |
| $3,5 \leq M \leq 4,4$ | Valid |
| $2,5 \leq M \leq 3,4$ | Quite Valid |
| $1,5 \leq M \leq 2,4$ | Less Valid |
| $M \leq 1,5$ | Invalid |

(Source: Karmila, 2019)

Then the assessment for content / material validation uses a Likert scale. The assessment given will be processed using the percentage formula as follows:

$$Persentase\ (\%) = \frac{(Score\ Obtained)}{(Max\ Score)} \times 100\ \%$$

Then the assessment for validation From the results of the content/material validation carried out, the percentages are categorized based on the following achievement levels:/material using a Likert scale. The assessment given will be processed using the percentage formula as follows:

Table 2 - Content Validation Achievement Rate

| Achievement Level (%) | Category |
|---|---|
| 81% – 100% | Very worth it |
| 61% – 80% | worthy |
| 41% – 60% | decent enough |
| 21% – 40% | Not Wort it |
| 0% – 20% | very unworthy |

Source: (Riduwan, 2013)

Quality testing of the management system uses the ISO/IEC 25010 standard which consists of 8 (eight) test characteristics including:

1. *Functional Suitability*

   Testing was carried out by 2 expert validators in the field of web applications. Testing is carried out to see the validity of the system which includes admin interfaces, inputs, assessors and validators. The scale of measurement uses a Likert scale. The assessment given will be processed using a percentage formula. From the results of the functional suitability testing, the percentages are categorized based on the following scores:

Table 3 - *Functionality* Percentage

| Score | Category |
|---|---|
| 0% - 20% | very unworthy |
| 21% - 40% | Not Wort it |
| 41% - 60% | decent enough |
| 61% - 80% | worthy |
| 81% - 100% | Very worthy it |

Source (Ristanto et al., 2020)

2. *Performance efficiency*

Testing using the GTMetrix software is used to determine the performance score, the higher the score, the better the performance quality. Performance assessment categories can be seen in the table below:

Table 4 - *Performance* Percentage

| Grade/Score | Category |
|---|---|
| A 90%-100% | Very Good |
| B 80% -89 % | Good |
| C 70% - 79% | Enough |
| D 69% | Not Enough |

Source (Sari, 2016)

The obtained response time results were compared with the Jakob Nielsen standard. If the system has a response time of under 10 seconds then the system can be declared to meet the characteristics of efficiency. The standard of success is seen based on:

Table 5 - Jakob Nielsen standard

| Response Time | User View |
|---|---|
| < 0,1 second | Users feel a very fast response from the web |
| < 1,0 second | The user feels a pause but he is still focused on the web |
| < 10 second | User attention to the web will decrease sharply |
| > 10 second | Most likely the user will switch from the web |

Source (Tribowo et al., 2015)

3. *Usability*

The user will provide a feasibility assessment based on a questionnaire given using a Likert scale. From the processed questionnaire data, it can be determined how feasible the software is to use. The usability percentage calculation is as follows:

Table 6 - *Usability* Percentage

| Percentage Value | Category |
|---|---|
| 81% - 100% | Very Good |
| 61% - 80% | Good |
| 41% - 60% | Enough |
| 21% - 40% | Not Enough |
| 0% - 20% | Very Good |

Source (Jayanto, 2017)

4. *Security*

The security used in the official letter management system is assessed based on the Acunetix Web Vulnerability Scanner test. System security indicators.

Table 7. Security Test Indicator

| Value | Category | Information |
|---|---|---|
| 1 | There is 1 security hole at High level | Very Bad |
| 2 | There is 1 security hole at Medium Level, but no security holes at High level | Bad |
| 3 | There is 1 security hole at Low Level, but there is no security hole at Medium Level and High level | Enough |
| 4 | There is 1 security hole at the Information Level, but there are no security holes at the Medium Level, High Level and Low Level | Good |
| 5 | There are no security holes | Very Good |

Source (Alamsyah, 2019)

5. *Reliability*

Reliability testing is carried out to test the reliability or trustworthiness of the system. Reliability testing will be tested later *using* the WebServer Stress Tools software by testing system performance while it is working. The percentage results are compared with the standard reliability test from the Telcordia Standard. According to Asthana and Oliviera (2009) said that the test results are said to meet the reliability aspect if the percentage of successful software reliability is 0.95 or 95%.

6. *Maintainability*

Maintainability testing was carried out by researchers to determine the quality of maintenance

on the system as measured using standard Land metrics. If the tested web passes for all aspects of the instrument, the web can be declared to meet the maintainability characteristic test. The standard of success is seen based on:

Table 8 - Land Testing Standards

| Value | Test Result |
|---|---|
| *Instrumentation* | When an error is made by the user, the system will issue a warning to identify the error |
| *Consistency* | The design form of the data processing system has the same form. This can be seen in the system implementation section |
| *Simplicity* | Easy to manage, repair and expand. This can be seen in the stages of the process of writing program code |

Source (Land, 2002)

7. *Compatibility*

The compatibility testing aspect aims to test the system's ability to interact with other components simultaneously, to find out the efficiency of the functions required when sharing resources. The data analysis technique used in the aspect of compatibility with the formula below:

$$PK = \frac{\text{Score Obtained}}{\text{Max Score}} \times 100\%$$

Information: *PK* = Eligibility Percentage

After obtaining the percentage results, then they are categorized in the compatibility feasibility table.

Table 9 - *Compatibility* Eligibility Percentage

| Percentage | Category |
|---|---|
| 0 % - 20 % | very unworthy |
| 21 % - 40 % | Not Wort it |
| 41 % - 60 % | decent enough |
| 61 % - 80 % | worthy |
| 81 % - 100 % | Very worthy it |

Source (Jayanto, 2017)

8. *Portability*

The system developed uses portability testing to determine the ability of the software to carry out system functions using different web browsers that are frequently used. Indicator portability using gutman scale.

Table 10 - Portability Testing Success Indicators

| Category | Information |
|---|---|
| Websites cannot adapt to all different environments. | Very Bad |
| Websites cannot adapt to 1 of all different environments. | Bad |
| Websites cannot adapt to 2 of all different environments. | Enough |
| The website can't adapt to 3 of all the different environments. | Good |
| Websites can adapt in all different environments | Very Good |

(Source: Alamsyah, 2019)

## 3. Result and Discussion

### Result

The results of this study are in the form of an official letter management system as a support system for calculating remuneration performance point recapitulation at Universitas Negeri Makasar. The system is created using the programming languages PHP, HTML, CSS, and Java Script with the help of Visual Studio Code software and the Laravel 8 framework. The development of this system aims to manage official letters within the scope of UNM equipped with various features that can make it easier for remuneration admins to manage data point needs the performance of employee benefits for education staff and educators no longer needs to upload official letter files individually, because each unit will carry out these activities. Then the system development uses the waterfall model with the following results:

1. Analyze Needs

The preliminary study was carried out by researchers to analyze the needs needed before

carrying out system development through interviews and direct observation at UPT Information and Communication Technology, Makassar State University. Interviews were conducted with the Universitas Negeri Makasar Remuneration Admin using interview guidelines. The official letter management system format that will be developed, according to the results of identifying university needs, is broadly described as follows:

a. The remuneration admin and the UNM Information and Communication Technology UPT claim that the official letter feature in the remuneration system is less effective and efficient in managing official letters.
b. The remuneration admin and the UNM Information and Communication Technology UPT consider that the official letter feature should be developed into a separate system so that it can facilitate input in official letter management and validators validating official letter.
c. UNM Information and Communication Technology UPT prepares the required data such as: employee data, unit data, rubric data, position data and period data. The data is in the form of an Application Programming Interface (API) in JSON format, then later stored in the official mail management system database so as not to burden the database server.
d. Access levels consist of admin, input, validator and employee.
e. The data entered by users who want to access are in the form of usernames and passwords, where education staff use NIP and educators (lecturers) use NIDN as username.
f. Admin can access all features on the system such as dashboard, unit management, data management, official letter management.
g. Inputters can access the dashboard, official letter menu and official letter membership menu.
h. The validator can access the dashboard, official letter approval menu, official letter member assessment menu and official letter membership menu.
i. Employees can access the official letter membership dashboard and menu.

2. Do The Design

Design is done by making several designs, namely: database design and process design. At the design stage the database consists of several UML, namely: 1) Context Diagram (DFD level 0) a diagram that describes the overall system design and establishes the context and flow of admin, input, validator and employee role boundaries, 2) DFD level 1 is a continuation of context diagram or DFD level 0 which explains the system process in more detail and complete because the main process has been decomposed into several sub-processes, 3) DFD level 2 is a continuation of DFD level 1 which explains the system process in more detail and complete because the sub processes have been broken down into many sub-processes, 4) ERD, data model in the form of graphical notation in a conceptual data model that describes the relationship between tables in the official letter management system such as the user table with the decision letter table, the assignment letter table with the assignment letter member table, 5) Structure The table represents the field name, data type and field description in the form of a primary key or foreign to y each table in the official letter management system database.

The next stage is the process design consisting of several UML, namely: 1) System Architecture consists of a set of connected models that describe the basic nature of the system starting from a server that already has a public IP so that it can be accessed online by admins, inputters, validators and employees, 2 ) Use Case interaction relationship and describes the type of interaction between system users and the system such as admin can access all available menus, input can access official letter menu to add official letter data, validator can access approval menu to validate official letter and can access member assessment menu to assess the performance of members against the goals underlying the decision letter or assignment letter made, employees can access the official letter membership menu to monitor the progress of their performance points, 3) Activity Diagram a visual workflow form that contains activities and actions, which can also contain selection, repetition, and concurrency of each lev existing el user, 4) Sequence Diagram used to explain and show in detail the interactions between objects in a system such as user login and enter the wrong username or password the system will check data from the database because the data is missing or wrong then the system will return error messages on the user interface, 5) Flowchart Diagram showing the steps and decisions to execute a process of a program. Each step is represented as a diagram and connected by a line or arrow as the admin starts by logging in to enter the username

and password, when the wrong one is entered it will return to the previous stage, namely re-entering the username and password, after that it is multiplied to the dashboard page, the admin can also switch pages by selecting another available page on the menu tab, the admin can also log out then the program is complete.

3. Coding

The system coding stage is the realization of the agreed process design and translated into a programming language. The programming languages used are html, php css and javascript. The system coding results can be accessed on the UNM Suratdinas sub-domain with the link http://suratdinas.unm.ac.id/ and preview as follows:

a. *Login* Page

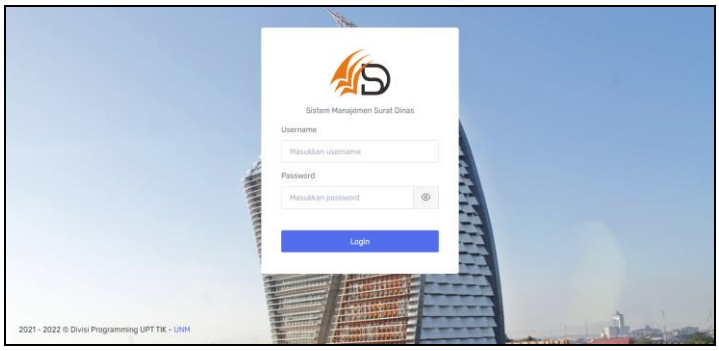


Fig. 2. *Login* Page

b. Admin Dashboard Page

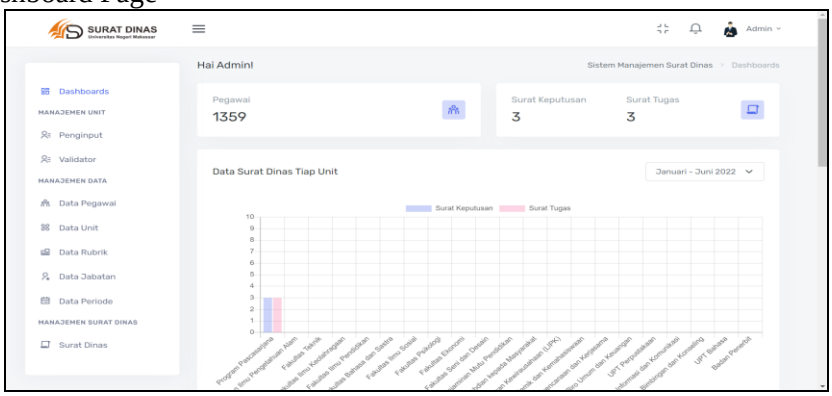


Fig. 3. Admin Dashboard Page

c. Employee Dashboard Page

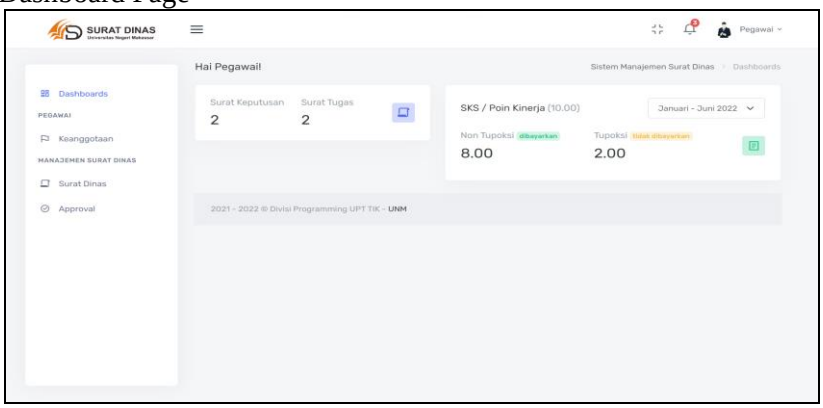


Fig. 4. Employee Dashboard Page

4. Testing

Testing was carried out through the stages of instrument testing, content validation and system validation using ISO/IEC 25010 so that in this study 10 aspects of testing were used, along with the test results:

a. Instrument Testing

Instrument testing is divided into 3, namely: media/system instrument testing (Functional Suitability ISO 25010), material/content instruments and respondent instruments (Usability ISO 25010). Instrument testing was carried out by instrument expert validators consisting of lecturers from the Department of Informatics and Computer Engineering UNM, there were 3 aspects tested on the instrument, namely: aspects of instructions, aspects of content and aspects of language, totaling 8 questions from each instrument tested. The following instrument items have 5 rating scales or ratings using rating scales. Here are the results.

Table 11. Result Instrument Testing

| Instrument | Score | Means | Category |
|---|---|---|---|
| *Functionality* | 36 | 4,5 | Very Valid |
| Content | 36 | 4,5 | Very Valid |
| *Usability* | 36 | 4,5 | Very Valid |
| Validation Interval | | | |

The three instruments above have been validated by an expert instrument validator. So based on the results of processing the instrument validation data, it can be concluded from the results of the instrument testing in table 11 included in the instrument validation interval, it was found that the instruments used were in the 4.5 rating category with the description "Very Valid".

b. Material/Content Testing

Content testing on the official letter management system is carried out using a Likert scale assessment. There were 15 questions on the material/content instrument which were filled out by content expert validators from lecturers from the Department of Informatics and Computer Engineering as well as Programming Division Staff of UPT Information Technology and Communication UNM. The statements were assessed with the choices of strongly agree, agree, undecided, disagree, and strongly disagree. The choice is a criterion for each item in the instrument statement. Here are the results.

Table 12 - Result Content Testing

| Score | Score Max. | Percentage | Category |
|---|---|---|---|
| 73 | 75 | 97% | Very Worth it |
| Achievement Level (%) | | | |

Content validation that has been validated or rated by content expert validators. The percentage of the two validators obtained an average score of 74 with a feasibility percentage of 97%. So based on the results of processing the content validation data, it can be concluded from the results of the content testing in table 12 included in the content validation interval, it was found that the instrument used was at an achievement level of 97% with the achievement category "Very feasible".

c. System Testing Using ISO/IEC 2501

1) *Functional Suitability*

Functional suitability testing is carried out by involving two experts or validators who are experienced in the field of information systems. Experts test the system directly by trying all the functions and features of the system in it. Next, fill in the test results based on the instruments that have been made by the researcher, the assessment instrument uses a Likert scale. The results of the functional suitability testing data are as follows:

Table 13 - Result *Functional Suitability* Testing

| Score | Score Max. | Level Percentage | Category |
|---|---|---|---|
| 344 | 355 | 96% | Very Worth it |
| Achievement Level (%) | | | |

Based on the results in table 13, it can be seen that the average for each assessment is:

$$Persentese\ Functionality = \frac{344}{355} \times 100\%$$
$$Persentase\ Functionality = 96\%$$

System validation of functional suitability aspects that have been validated or assessed by system expert validators. The percentage of the two validators in the functional suitability test obtained an average score of 96 through the functionality percentage formula, namely the score obtained per maximum score multiplied by 100 percent. So based on the results of the functional suitability testing data, it can be concluded from the results of the functional suitability testing in table 13 then entered into the Functionality Percentage, it is obtained that the functional suitability of the official letter management system used is at an achievement level of 96% with the "Very feasible" category.

2) *Performance efficiency*

Performance efficiency testing uses the GTMetrix software to determine the performance efficiency score or the efficiency level of the performance of the application being developed. The results of performance efficiency test data using GTMetrix are as follows:

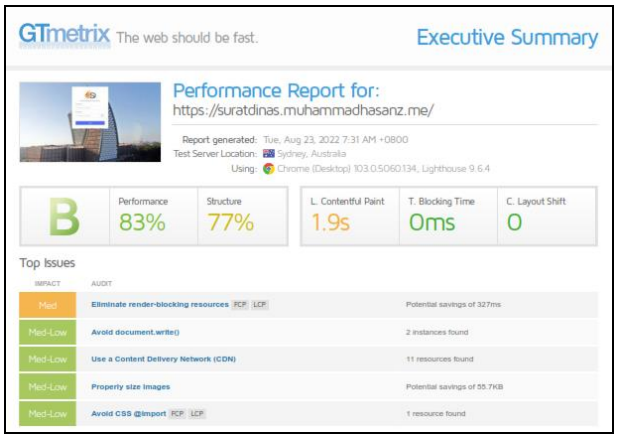

Fig. 5. Result *Performance Efficiency Testing*

The data from the performance efficiency test is 83%, the structure is 77%, the load time is 1.9 seconds with the performance rating B. The web can be said to be good if the load time is less than 10 seconds. So based on the results of performance efficiency testing, it can be concluded in Figure 5 that then put into the percentage of performance, the performance efficiency of the official letter management system used is Grade B 83% with the criteria "Good".

3) *Usability*

Usability testing was carried out using online and offline questionnaires which were filled out by 40 education staff and educators (lecturers) at Universitas Negeri Makasar. This is done because usability testing aims to see the extent to which system users can interact effectively and see the level of user satisfaction in using the system, so that respondents are taken from people who will use the system created. Here are the test results:

Table 14 - Usability Testing Data Analysis

| Score | Score Max | Percentage | Category |
|---|---|---|---|
| 2687 | 3000 | 90% | Very Good |

Source (Data Processed, 2022)

$$Persentese\ Usability = \frac{2687}{3000} \times 100\%$$
$$Persentase\ Usability = 90\%$$

Validation of the usability aspect system that has been validated or assessed by UNM employees totaling 40 people, namely educational staff and educators. The results of the

questionnaire from 40 respondents in the usability test obtained an average score of 67 or if it is calculated using the usability percentage formula, namely the score obtained per maximum score multiplied by 100 percent, the result is 90%. So based on the results of the usability testing data, it can be concluded in table 14 that it is then entered into the usability percentage, the results of the usability testing of the official letter management system used are at a percentage of 90% in the "Very Good" category.

4) *Security*

Security testing on the official letter management system uses the Acunetix Web Vulnerability Scanner application. The level of security vulnerability of the official letter management system based on the results of security testing is in the low category, namely level 1, then it is included in the security testing indicator criteria. Below are the results of the security test.

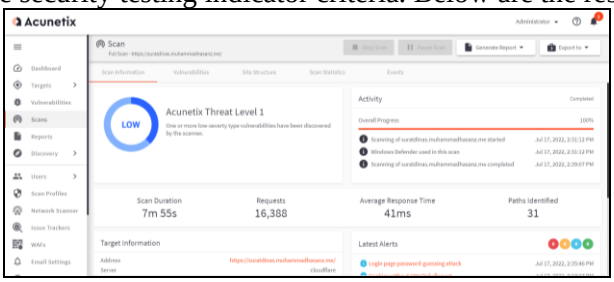


Fig. 6. Result *Security* Testing

5) *Reliability*

One of the reliability tests carried out on information systems is by using the stress testing method, where stress testing is a test that determines the robustness of a software by testing it outside the limits of normal use. The main goal in conducting this test is to force a program to crash and find out how the program can work again as soon as possible, crashes can be caused by many access requests from many users at the same time. Stress testing in this test uses the Webserver Stress Tool software, which has three aspects of the test, namely the click test, time test and ramp test.

Table 15 - *Reliability* Test

| Test Type | Percentage of *Error per Url* | Percentage of *Success per Url* |
|---|---|---|
| *Click Test* | 0% | 100% |
| *Time Test* | 0% | 100% |
| *Ramp Test* | 0% | 100% |
| Means | 0% | 100% |

Based on the results of the reliability test in Table 15, it can be concluded that the percentage of success from the reliability test using the click test, time test and ramp test is 100% acceptable, because it meets Telcordia standards, namely a minimum success of 95%.

6) *Maintainability*

Testing on the maintainability aspect uses measurements tested by researchers directly in the field operationally, in accordance with the test instruments mentioned by Land (Land, 2002), This test includes 3 aspects, namely instrumentation, consistency and simplicity. The results of the maintainability test can be seen in the image below. If an input error occurs or is used by the user, the system will automatically provide a warning message.

Table 16 - Analysis of Maintainability Test Results

| Testing | Result of Testing |
|---|---|
| *Instrumentation* | When an error is made by the user, the system will issue a warning to be able to identify the error. |
| *Consistency* | The design form of the data processing system has a similar form. This can be seen in the implementation section of the system page. |

| | |
|---|---|
| *Simplicity* | Easy to manage, repair, and expandable too. This can be seen in the stages of the process of writing program code. Because the system is created by utilizing PHP and CSS frameworks in the form of Laravel and Bootstrap on the Model View Controller (MVC) framework to build dynamic websites using the PHP, Html, CSS and Javascript programming languages. If you want to add system functions, the developer only needs to create a new controller without having to make any changes to the appearance of other system components. |

From the results of the operational test for the maintainability aspect as shown in Table 16 above, the results of the test for the maintainability aspect can be said to meet maintainability standards.

7) *Compatibility*

Compatibility testing aims to check the ability of the developed system to run on different hardware, operating systems, applications, and network environments. Compatibility testing uses software, namely SortSite Tools.

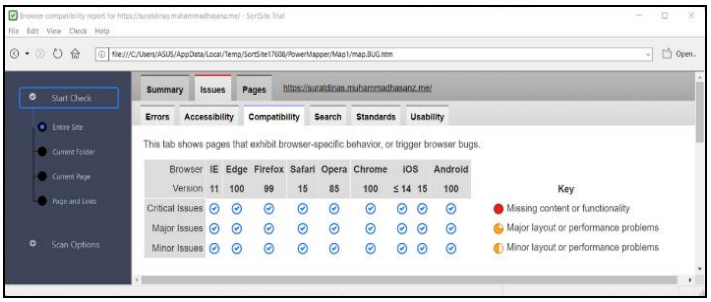


Fig. 7. Result of *Compatibility*

The results of testing the system with compatibility aspects using the Sortsite Tools software show that the system on IE, Edge, Firefox, Safari, Opera, Chrome, IOS, and Android browsers has critical issues, major issues, and minor issues (minor problems) are not found or the 100% test results can be used in browsers or other devices so that if you look at the feasibility percentage of compatibility with the test results in Figure 7, it can be stated that the system meets the compatibility test with a percentage of 100% with the interpretation "Very Eligible".

8) *Portability*

Testing the portability of this system uses the help of a web testing tool, namely browserstack.com, namely testing is carried out by cross browser testing or checking the system using various browsers on desktop and IOS mobile. Portability test results can be seen in Table 17.

Table 17 - Result of *Portability* Testing

| Browser | Operating system | Results | Score | Score Max. |
|---|---|---|---|---|
| Google Chrome | Windows 11 | Succeed | 100 | 100 |
| Mozilla Firefox | Windows 11 | Succeed | 100 | 100 |
| Google Chrome | Windows 7 | Succeed | 100 | 100 |
| Mozilla Firefox | Windows 7 | Succeed | 100 | 100 |
| Google Chrome | MacOS | Succeed | 100 | 100 |
| Safari | MacOS | Succeed | 100 | 100 |
| Samsung Internet | Android 12 | Succeed | 100 | 100 |
| Safari | IOS 16.0 | Succeed | 100 | 100 |
| Google Chrome | Android 12 | Succeed | 100 | 100 |
| Safari | iPadOS 15.5 | Succeed | 100 | 100 |
| Google Chrome | Android 13 | Succeed | 100 | 100 |
| Menas | | Succeed | 100 | 100 |
| Achievment Value (%) | | | 100% | |

Based on Table 17 above, it is obtained that the portability test achievement level is 100% and

then it is included in the portability test success indicator. The portability test results obtained for the official letter management system used are in the criteria "Website can adapt in all different environments" with the description "Very Good ".

9) *Maintenance*

The process of maintaining the system occurs after socialization is held with the aim of presenting the system that has been developed to those responsible for remuneration covering the Head of the Finance and General Affairs Bureau, Sub-coordinator of Education Personnel and Staff of the UPT ICT Programming Division. So that the system is directed to make improvements or changes with the following requests:

a. Access assessing is done by the validator by looking at evidence of activity.
b. Employees must confirm that they are actually participating in an activity by sending evidence of activities in the form of files or photos as one of the validators' assessments.
c. The new feature is that notifications for each employee are added to official letters
d. The inputter cannot add more members if it has been approved by one of the validators.
e. An official letter can be declared accepted if the letter has been approved by 2 or 3 validators.

**Discussion**

The official letter management system in this study is a system designed to provide convenience in recapitulating employee benefits performance points. This Office Mail Management System is designed using the Html, Css, Javascript programming languages as the frontend, the Php backend and the MySQL database using the Css framework, namely Bootstrap and the Php framework, namely Laravel 8. This system was developed using the waterfall development model. The stages of developing the waterfall model are needs analysis, designing, coding, system testing and maintenance. The development process begins with analyzing needs by conducting interviews directly with the Remuneration Admin with some directions from the Head of the UPT ICT and the Sub-coordinator of Education Personnel at Pinisi UNM. Interviews were conducted using an interview guide which contained information on the current condition of the system, opinions on whether to build from a feature into a separate system in order to facilitate the process of recapitulating employee benefit performance points in UNM remuneration. After the interviews were carried out, DFD, ERD, table structures, system architecture, use cases, activity diagrams, sequence diagrams, flowcharts and interfaces were made. a diagram that describes the system that will be developed based on the system architecture, then developed into a management system display in accordance with the system workflow (He et al., 2021).

The official letter management system testing is carried out using the ISO/IEC 25010 standard as a reference for testing. ISO 25010 defines eight characteristics, namely functional suitability, performance efficiency, usability, security, reliability, maintainability, compatibility and portability. The results of software quality testing in terms of functionality as seen in the table of functional testing results and it can be concluded that the Service Letter Management System is acceptable in terms of its function. Capabilities related to the use of software, ease of using the functions provided, ease of learning the system and satisfaction in using the official letter management system. And the results of the functional suitability test are at an achievement level of 96% in the "Very feasible" category.

Testing the performance efficiency of the Service Letter Management System is carried out online. This test is intended to see the level of efficiency of the application being tested. There are several tools used for this test, namely Page Speed, Fully Loaded Time and Serve Scaled Images which contain tools whose function is to analyze web pages and investigate things that cause page loads to slow down based on Fully Loaded Time tools to increase website performance. The efficiency test shows that the results obtained are 83% for Performance at level B with "Good" criteria, 77% for Structure and 1.9 seconds for fully loaded time. The web is said to be good if the load time is at least less than 10 seconds. Usability testing using a questionnaire given to users, based on the calculation results obtained an average of 67 with a percentage of 90% which is included in the "Very Good" category can be seen in the table of usability test results, the Likert scale score range and its interpretation shows that the Service Letter Management System can accepted by users (Al-Maroof et

al., 2022).

Security testing on the Official Mail Management System using the Acunetix Web Vulnerability Scanner version 14, it can be concluded that the system already has a level 1 security level or a low category gets a value of 3 with the description "Enough". This states that the error rate in setting the Html code can allow brute force attacks to occur, namely the technique of entering random usernames and passwords. Testing the reliability of the Service Letter Management System is carried out using the stress testing method. Stress testing is a software testing method that determines the robustness of a software by testing it outside the limits of normal use. Stress testing can be tested using a webserver testing tool called the Webserver stress tool, which has a 100% success ratio in the Official Mail Management System. So that from these results the test on the reliability aspect has fulfilled.

The maintainability test on the Service Mail Management System is tested directly, if there is an input error made by the user, the system will automatically give an error warning message, the test results show that the system is easy to repair and develop, because it is made using a Model-View based PHP framework -Controller (MCV). If you want to add functionality, the developer only needs to create a new controller without changing other system components. When errors are found in system functions, errors can be traced to the problematic part of the module/controller component. For example, if the data storage function does not work properly, the developer only needs to look for errors in the data storage module component alone. In testing the compatibility aspect is the aspect that tests the application or system how far it can adapt to other platforms. This test was carried out to show that the Official Mail Management System continues to function properly on various types of browsers, both desktop and mobile versions.

In portability testing using help from browserstack. Based on the results of the Official Mail Management System research after validation and testing using ISO/IEC 25010 in terms of Functional Suitability, Performance Efficiency, Usability, Security, Reliability, Maintainability, Compatibility and Portability, it can be concluded that the Official Mail Management System can use and applied to Makassar State University Remuneration. As for the results of system maintenance carried out on request, namely access to conducting an assessment by the validator by looking at evidence of activity, employees must confirm that they are actually participating in an activity by sending evidence of activity in the form of files or photos as one of the validators' assessments, a new feature, namely notifications for each employee added to the official letter. The inputter cannot add more members if it has been approved by one of the validators. An official letter can be declared accepted if the letter has been approved by 2 or 3 validators. Based on the remuneration admin's response, it was revealed that the system was in accordance with the needs and the features of the system could run and be used properly and had fulfilled the required system repair requests.

## 4. Conclusion

Based on the results of the research and discussion, the researcher can draw the following conclusions. The results of the development of an official letter management system in this study are in the form of an information system designed to provide convenience in recapitulating employee benefits performance points. This system assists the validator in facilitating the validation of each official letter in a unit, and can assist the remuneration admin in processing performance points recapitulation. The Service Letter Management System is considered feasible because the test results show that it meets ISO/IEC 25010 standards in 8 aspects of testing: The functional suitability aspect is at the achievement level of 96% with a very feasible category, performance efficiency is at the Grade B level of 83% with good criteria, the usability aspect is at 90% with a very good category, the security aspect has a level 1 security level at the low level criterion, gets a score of 3 with sufficient information, the reliability aspect with a success percentage of 100%, the maintainability aspect meets the standard, the compatibility aspect with a percentage 100% and the interpretation is very feasible, the portability aspect is in the very good category. The response by the Remuneration Admin revealed that the system was in accordance with the requirements and the features of the system could run and be used properly and had fulfilled the required system repair requests.

**References**


Alamsyah, S. (2019). Analisis kualitas dan penerapan software quality assurance pada website lembaga kursus menggunakan model iso 9126. *Prosiding SeNTIK*, *3*(1).

Alpiyasin, F. (2016). *Sistem informasi administrasi surat dinas pada dinas komunikasi dan informatika (diskominfo) pemerintahan kota bandung*. Universitas Komputer Indonesia.

Al-Maroof, R., Al-Qaysi, N., Salloum, S. A., & Al-Emran, M. (2022). Blended learning acceptance: A systematic review of information systems models. *Technology, Knowledge and Learning*, *27*(3), 891-926.

Dong, J., Meng, W., Liu, Y., & Ti, J. (2021). A framework of pavement management system based on IoT and big data. *Advanced Engineering Informatics*, *47*, 101226.

He, W., Zhang, Z. J., & Li, W. (2021). Information technology solutions, challenges, and suggestions for tackling the COVID-19 pandemic. *International journal of information management*, *57*, 102287.

Huy, D. T. N., & Hang, N. T. (2021). Factors that affect Stock Price and Beta CAPM of Vietnam Banks and Enhancing Management Information System–Case of Asia Commercial Bank. *Revista Geintec-Gestao Inovacao E Tecnologias*, *11*(2), 302-308.

Jayanto, R. D. (2017). Evaluasi kualitas aplikasi mobile kamus istilah jaringan pada platform android dengan standar iso/iec 25010. *Elinvo (Electronics, Informatics, and Vocational Education)*, *2*(2), 178–182.

Karmila, K. (2019). *Pengembangan sistem informasi pelayanan dinas sosial pada provinsi sulawesi barat berbasis web*. Universitas Negeri Makassar.

Land, R. (2002). Measurements of software maintainability. *Proceedings of the 4th ARTES Graduate Student Conference*, 1–7.

Liu, K., Li, K., Peng, Q., & Zhang, C. (2019). A brief review on key technologies in the battery management system of electric vehicles. *Frontiers of mechanical engineering*, *14*(1), 47-64.

Navarro, M. M., Prasetyo, Y. T., Young, M. N., Nadlifatin, R., & Redi, A. A. N. P. (2021). The perceived satisfaction in utilizing learning management system among engineering students during the COVID-19 pandemic: Integrating task technology fit and extended technology acceptance model. *Sustainability*, *13*(19), 10669.

Prasetiadi, A. E. (2011). *WEB 3.0 : Teknologi Web Masa Depan*. *1*(3), 1–6.

Pressman, R. S. (2010). Rekayasa perangkat lunak pendekatan praktisi (buku satu). *Yogyakarta: Andi*.

RI, P. P. (2005). *Peraturan pemerintah (pp) tentang pengelolaan keuangan badan layanan umum* (p. Pasal 10, Bagian Pertama). LN. 2005 No. 48, TLN No. 4502 LL SETNEG : 26 hlm.

Riduwan, M. B. A. (2013). Skala pengukuran variabel-variabel penelitian. *Alf. Bandung*.

Ristanto, R. D., Kurniawati, K., Dwinanto, A., & Nawassyarif, N. (2020). Analisis software product quality iso/iec 25010 pada pengembangan tes bakat menggunakan sistem computer-based test (cbt). *Edu Komputika Journal*, *7*(2), 49–60.

Ruky, A. S. (2006). Manajemen penggajian dan pengupahan. *Jakarta: Gramedia Pustaka Utama*.

Sari, T. N. (2016). Analisis kualitas dan pengembangan sistem informasi akademik berbasis web menggunakan standard iso 9126. *JIKO (Jurnal Informatika Dan Komputer)*, *1*(1).

Sutabri, T. (2016). *Sistem informasi manajemen (Ed. II). Yogyakarta: ANDI*.

Takain, I., & Katmini, K. (2021). The Implementation of Computer-Based administrative Information Systems to Improve the Performance of Services Quality in Hospitals. *Journal for Quality in Public Health*, *5*(1), 203-216.

Tribowo, A., Rusdianto, D. S., & Nurwarsito, H. (2015). *Pembangunan Sistem Pengelolaan Restoran Terintegrasi Dengan Pengujian Kualitas Berbasis ISO 9126*. Nov.

Triantafyllou, S. A. (2022, May). Use of Business Information Systems to Achieve Competitiveness. In *2022 13th National Conference with International Participation (ELECTRONICA)* (pp. 1-4). IEEE.

Yuesti, A., Adnyana, I. M. D., & Pramesti, I. G. A. A. (2022). Management information systems and the quality of financial statements in local government. *Journal of Public Affairs*, *22*(3), e2462.