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Measuring the Software Quality of Government Website by Applying McCall Methods

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Abstract

This study measures the quality of the eKinerja Application of the Communication and Informatics Service of Bener Meriah Regency after conducting a literature study, this study began by distributing questionnaires compiled based on the McCall method. The McCall method is one of the methods that can be used to measure software quality, then the results of filling out the questionnaire are tested for validity and reliability to obtain valid and reliable variables and indicators. In the test, there were 177 people who became respondents in this study. These variables and indicators are then used to measure the quality value (Fa) of each variable, the measurement begins with the process of weighting variables and indicators through questionnaires filled out by experts. The weighting uses a scale of 0.1 to 0.5 for each variable Correctness, Reliability, Efficiency, Integrity and Usability along with their respective indicators. The results of the McCall method calculation on the quality of the Bener Meriah Regency Communication and Informatics Service Performance Application show that the correctness quality factor gets a good category with a percentage result of 74% from the usability factor getting a result of 60% with a fairly good category, the integrity factor getting a result of 77% with a good category, from the reliability factor getting a result of 83% with a very good category from the efficiency factor getting a result of 46% with a bad category.

Keywords: Department of Communication and Information, ekinerja application, Mccall

INTRODUCTION

The dynamics of information technology and the development of the digital economy have made the Ministry of Communication and Informatics focus on accelerating the equalization of digital infrastructure in the form of telecommunications access and internet networks. In addition to changes in nomenclature, at the end of 2006, the Ministry of Communication and Informatics implemented a financial management pattern for public service agencies based on the Decree of the Minister of Finance Number: 1006/KMK.05/2006 concerning the Establishment of the Rural Telecommunications and Informatics Center (BTIP). The Bener Meriah Regency Communication and Informatics Office has a Personnel Application called ekinerja.

The e-performance application is used to create performance reports, employee performance targets (SKP), ASN work performance assessments, and ASN task placements, in addition, ASN can be absent through the e-performance application so that it is more efficient and accurate and account owners can also view personnel data in the e-performance application. In the e-performance application, the Head/Leader of the Agency can also assess ASN work performance and ASN assignments. However, basically the implementation of this e-performance application has not been able to solve all existing problems, there are still some problems that occur. The first problem, based on observations during practical work, when ASN uses the e-performance application, ASN still feels dissatisfied with the quality of the e-performance application system provided. Such as when taking attendance in the e-performance application, errors often occur, so that the attendance process is not recorded or counted as absent. Furthermore, when filling out the ASN performance report, they often report to the Communication and Information Service 1 of Bener Meriah Regency that they cannot fill out the report because the e-performance application is down and cannot be accessed and ASN also reports that the features provided by the e-performance application system are difficult to understand.

Some of the problems that have been explained previously. Of course, it has an impact on users such as ASN considering the e-performance application system is not reliable in providing information and quality needs for users. For this reason, there needs to be an evaluation action on the quality of the e-performance application system. Software quality

can be interpreted as an effective process that is realized in the form of a product that can provide benefits and can be measured. Measuring the quality of an Information system is very important to find out the current condition of the information system itself, whether it is still relevant or not with the current conditions. If after the measurement is carried out it turns out that the information system is no longer relevant, then it can be used as a reference or reference for improvements to be made to be even better.

Therefore, it is necessary to measure the quality of the ekinerja application to find out the shortcomings in the application so that the test results can be improved to produce a better quality application. To find out the quality of the ekinerja application of the Bener Meriah Communication and Informatics Service, the researcher used the Mccall method. The reason the researcher chose the Mccall method is because this method is one of the methods that can explain the software quality factor or software quality factors consisting of product operations including several factors, namely correctness, reliability, usability, integrity, and efficiency. The Mccall method has good accuracy and detail so that it can be used to test and guarantee quality.

LITERATURE REVIEW *(OPTION)* (11PT, BOOK ANTIQUA)

MCcall Model

Model or quality model, as written by (Rafa E. Al-Qutaish, 2010) is a set of characteristics and relationships between characters that can be used as a basis for determining quality requirements and for evaluating products. There are several software testing models that are widely used, including the Mccall, Boehm, FURPS, Dromey, and ISO 9126 models. Each quality model consists of several characteristics, which have more specific branches called sub-characteristics. Characteristics and sub-characteristics produce a perfect hierarchy. Characteristics in a quality model are interpreted as quality factors that cannot be measured and are used for the purpose of classifying sub-characteristics of the model.

Several models of software quality factors and their categorization have been proposed over the years. The classic model of software quality factors was proposed by Mccall which consists of 11 factors (McCall, 2005). Mccall is a software testing method that has the most complete and in-depth criteria. The Mccall factor model classifies all software requirements into 11 quality factors. The eleven factors are divided into three categories, namely Product Transition, Product Revision and Product Operation.

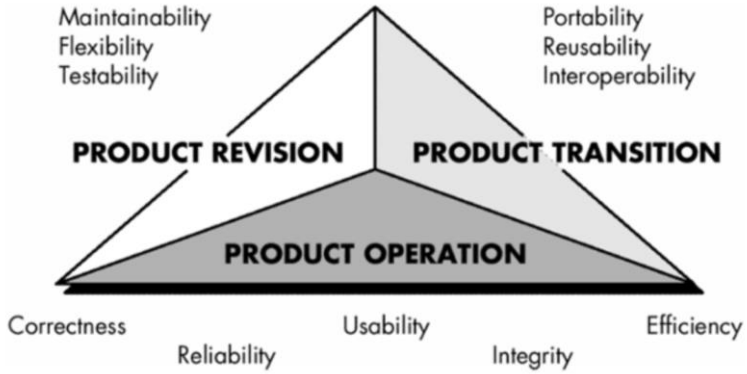


Figure 1. Method Mccall

Product operation has 5 factors, namely: Correctness: The ability of a software to meet the needs of its users and suitability with the purpose of making the software, Reliability: The ability of a software in the context of system resilience from errors and damage so that it is suitable for use and is relied on, Efficiency: Efficiency of processing time, memory usage, Integrity: The ability of a software in security and access rights for each user, Usability: The ability of a software in ease of operation. Each factor has criteria for measurement, these criteria are given in Table [1].

Table 1. McCall Factors and Criteria

Factor	Criteria
Correctness	Completeness, consistency, traceability
reliability	Accuracy, error tolerance, consistency, simplicity
efficiency	Execution

	efficiency, storage efficiency
Usability	Communicativeness, operability, training
Integrity	Access control, access audit

Measurement Model

Data analysis was carried out by quantitative data analysis using measurement techniques based on Equation 1.

$$(1) Fa = w1c1 + w2c2 + w3c3 + \cdots + wncn$$

Where:

Fa = Software Quality Factor
W1 = Weight depending on the product of interest
C1 = Metrics that influence software quality factors

The assessment system uses the following stages:

- Determining the criteria used to measure a factor
- Determine the weight (w) of each criterion (0.1 <= w <= 0.4), based on the interests of the department head towards the system. Can be seen in the weight determination table:

Table 2. McCall Factors and Criteria

Weight(w)	Information
0.1	It's not very important
0.2	Not important
0.3	Important
0.4	Very important

- Determine the criteria scale, where the assessment scale used is between 1-4 where 1 is the minimum assessment and 4 is the maximum assessment.
- Enter values for each criteria.
- Calculate the total value with Equation 2.

$$(2) Fa = w1c1 + w2c2 + w3c3 + \cdots + wncn$$

Fa is the total value of factor a. W1 is the weight for criterion 1, and c1 is the value for criterion 1.

- Then the quality factor value is changed into a percentage (%). The percentage is calculated using Equation 3.

$$Persentase \frac{Nilai\ yang\ di\ dapat}{Nilai\ Maksimum}\ x\ 100\% \quad (3)$$

The percentage results are used to provide answers to the feasibility of the aspects studied. The division of quality categories according to (Arikunto, 2019), there are five. This scale considers the range of percentage numbers. The maximum expected value is 100% and the minimum is 0%. The division of the quality category range can be seen in Table 3.

Table 3. Quality Category Range

Category	percentage
Very good	81%-100%
Good	61%-80%
Pretty good	41%-60%
Not good	21%-40%
Very bad	<21%

SOFTWARE QUALITY

System quality means the quality of the combination of hardware and software in an information system. The focus is on the performance of the system itself, which refers to how well the hardware, software, policies, procedures of the information system can provide information on user needs (Sitorus & Malau, 2017). According to (Luzyanina et al., 2005) quality is the totality of features and characteristics of a product or service that affect the ability to meet certain needs or implied needs. Meanwhile, according to Fitzpatrick (1996), software quality is a standard for stating that software can be declared good or bad quality.

Sample

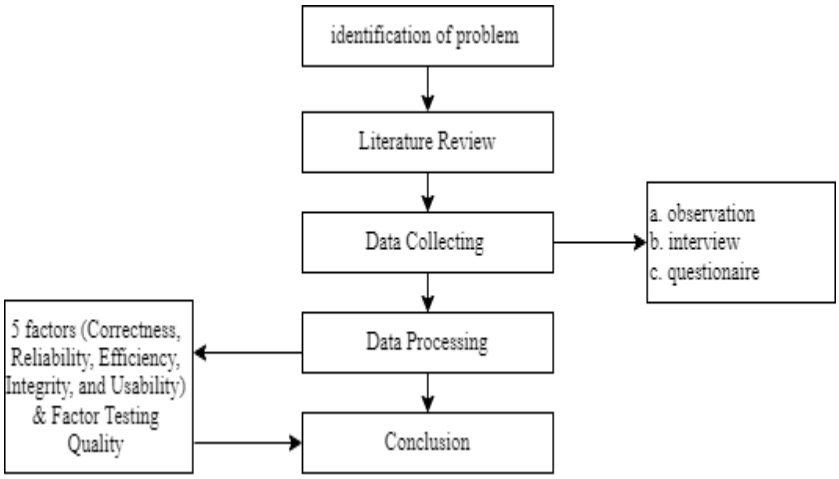
According to Pradana and Reventiary (2016) population is a generalization area consisting of objects or subjects that have certain qualities and characteristics determined by researchers to be studied and then conclusions drawn. This study selected a population of all employees who have the status of State Civil Apparatus of the Bener Meriah Regency Government totaling 3076 employees. While the sample is part of the number and characteristics possessed by the population. The sample of this study was 177 Respondents.

The sampling method in this study uses the Slovin formula which can be seen in equation 4.

$$n\frac{N}{1+Ne^2} \tag{4}$$

The formula description is as follows: n is the sample size, N is the population size, and is the margin of error for the desired population, namely: 10% (0.10), 5% (0.05), or 1% (0.01).e^2

MATERIALS & METHODS



- Problem Identification At this stage, identification is carried out on the problems that occur in the research object, namely the ekinerja software whose users are ASN (State Civil Apparatus) of the Bener Meriah district government.
- Literature Study Literature study is conducted to study theories related to the research to be conducted by the author and used as a reference in conducting this research.
- Data Collection Data collection is carried out using several methods, namely:
- Observation This stage is carried out to conduct direct observation of the use of POSPA Ekinerja software, to see what obstacles and problems may occur during its use.
- Interviews at this stage were conducted with one of the heads of the Bener Meriah Communication and Informatics Office as the head of employees who use Ekinerja software. The interviews were conducted to find out what obstacles are often experienced in using Ekinerja software.
- Questionnaire The questionnaire was conducted to collect data from users of the ekinerja software, namely the civil servants of the Bener Meriah district government, using a Likert scale instrument.
- Data Processing At this stage, data processing is carried out that has been obtained through the data collection stage. Data processing is carried out by calculating the results of the questionnaire using the McCall model with a Likert scale instrument. Calculation of the average results of the quality test value of several quality factors contained in the McCall method, namely product operation consisting of Correctness, Reliability, Efficiency, Integrity, and Usability.
- Drawing conclusions This stage is carried out after calculating and analyzing the data from the questionnaire that has been conducted.

RESULTS AND DISCUSSION

Research object

The research was conducted on ekinerja software which is software used by the state civil apparatus of the bener meriah district government. eKinerja software is software used for employee performance reporting, the main page of ekinerja can be seen in Figure 4.1

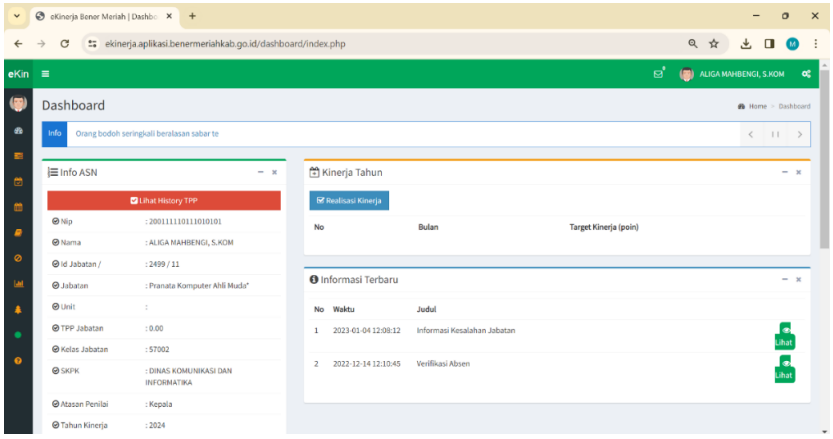


Figure 2. Dashboard eKinerja

Population and sample analysis

Determining the number of samples from the population using the Slovin formula. The 5% sampling error formula and the formula for determining the sample. Here is the Slovin formula:

$$n \frac{N}{1 + Ne^2}$$

The way to determine the sample in this study is to use the Slovin formula with a 95% confidence level, so the error rate is 5%. Based on the research sample formula above,

$$n = \frac{3076}{(1 + (3076\ x\ 0{,}5^2))}$$

$$n = \frac{3076}{\left(1 + \left(3076\ x\ 0{,}0025\ \ \right)\right)}$$

$$n = \frac{3076}{(1 + 7{,}69)}$$

$$n = \frac{3076}{(8{,}69)}$$

$n = 353{,}97008$ atau dibulatkan menjadi 354 responden

Based on the Slovin formula with a sample error limit of 5% with a 95% confidence level, the number of samples in this study was 354 respondents from ASN employees of the Bener Meriah Regency Government.

Validity Test

The correlation number obtained statistically must be compared with the critical number of the r value correlation table with a significance level of 5%. The validity test is carried out by comparing it with the provisions if r count > r table then the item is declared valid. In this study n = 177, so df = 177 - 2 = 175 with a significance level of 0.06 then the r table is 0.148 (2-failed) if the Pearson correlation value > the comparative value in the form of r table, then the item is valid. Or if the Sig. (2 tailed) <0.06 means the item is valid and vice versa, the validity test is carried out using IMB SPSS v 29 software.

Table 4. Quality Category Range

Factor	Statement	R Count	R Table	Information
Corretnes	C1	0.582	0.148	Valid
	C2	0.608	0.148	Valid
	C3	0.557	0.148	Valid
	C4	0.666	0.148	Valid
	C5	0.705	0.148	Valid
	C6	0.736	0.148	Valid
	C7	0.554	0.148	Valid
	C8	0.560	0.148	Valid
Usability	U1	0.669	0.148	Valid

	U2	0.719	0.148	Valid
	U3	0.696	0.148	Valid
	U4	0.586	0.148	Valid
	U5	0.683	0.148	Valid
	U6	0.659	0.148	Valid
	U7	0.541	0.148	Valid
	U8	0.560	0.148	Valid
Integrity	I1	0.706	0.148	Valid
	I2	0.661	0.148	Valid
	I3	0.637	0.148	Valid
Reliability	R1	0.714	0.148	Valid
	R2	0.645	0.148	Valid
	R3	0.613	0.148	Valid
	R4	0.684	0.148	Valid
	R5	0.675	0.148	Valid
	R6	0.657	0.148	Valid
	R7	0.695	0.148	Valid
	R8	0.630	0.148	Valid
	R9	0.786	0.148	Valid
Efficiency	E1	0.757	0.148	Valid
	E2	0.656	0.148	Valid

From Table 4 it can be seen that the correlation between each statement item has a high correlation score, because the calculated r> rtable as follows:

a. *Correctness*(C) yaitu CI 0,582>0148, C2 0,606>0,148, C3 0,557>0,148, C4 0,666>0,1488, C5 0,705>0,148, C6 0,736>0,148, C7 0,554>0,148, C8 0,560>0,148.
b. *Usability*(U) yaitu U1 0,669>0,148, U2 0,719>0,1488, U3 0,696>0,148, U4 0,586>0,148 U5, 0,683>0,148, U6 0,659>0,148, U7 0,541>0,148 U8 0,560>0,148
c. *Integrity*(I) namely I1 0.706>0.148, I2 0.661>0.148, I3 0.637>0.148
d. *Reliability*(R) namely R1 0.714>0.148, R2 0.645>0.148, R3 0.613>0.148 R4 0.684>0.148, R5 0.675>0.148, R6 0.657>0.148, R7 0.695>0.148, R8 0.630>0.148, R9 0.786>0.148.
e. *Efficiency*(E) namely E1 0.757>0.148, E2 0.656>0.148.

Reliability Test

After conducting a validity test on the questions that will be used in this study, a reliability test is then conducted to determine whether the data collection tool used can show the level of accuracy, precision, stability or consistency of the tool in revealing certain symptoms from a group of individuals, even though it is carried out at different times. Reliability testing is carried out on questions that have been declared valid. This test is carried out using the Cronbach's Alpha technique. The answer value consists of a range of values with the alpha coefficient must be greater, A measuring instrument used in research can be said to be reliable if the results are close to 1. The following are the results of the reliability test on questions that have been declared valid, which can be seen in table 5

Table 5. Reliability Statistics

Reliability Statistics	
cronbach's alpha	N of Items
0.954	30

Based on the Cronbach's alpha value in the reliability test results in the table above and based on table 4.2, all variables and indicators have an average Cronbach's alpha value of 0.954, which means that all research variables and indicators are declared reliable.

Mccall Quality Factor Analysis

The instrument used in this study was a questionnaire with a total of 30 questions representing each variable and indicator based on the McCall method. This study used an instrument in the form of a questionnaire. Where the data collection technique using a questionnaire is useful for providing answers based on the opinions of system users while using the eKinerja Application of the Communication and Informatics Office of the Bener Meriah Regency Government. In the questionnaire used, respondents were given several questions representing each variable and indicator of the quality factor criteria in the McCall method, including: Correctness, Reability, Usability, Integrity, and Efficiency. The instrument used in the questionnaire used was a Likert scale, where each question representing each variable will later be given a certain value or weight for each answer to the question.

In this study, the score on the Likert scale used is between 1 and 4 with 4 alternative answers. Before calculating the quality level of the eKinerja Application of the Bener Meriah Regency Government Communication and Informatics Service, it is necessary to do a value weighting first. The value weighting is done using the same questionnaire as the one that will be distributed to respondents, namely Employees. However, to do the weighting, the questionnaire is distributed to several people who are considered experts. In this study, the questionnaire was distributed to 3 experts at the Bener Meriah Regency Government Communication and Informatics Service. The weighting value is obtained based on the average value of the answers that have been distributed to several experts. The variable weight value and the weight value of each question (w) that represents each indicator are different values.

Table 6. Question value weighting

Variables	indicators (criteria)	Question	Criteria weight
correct (Fa1)	(Completeness)	Is every menu in the e-performance application capable of display information	0.4
		Does each menu in the e-performance application display the appropriate information?	0.3
		Is the information required in the e-performance application appropriate and up to date?	0.3
		Are all the menus and features provided by the e-performance application working properly?	0.3
	(Consistency)	Do all e-performance application pages have a consistent display design (sequential or orderly)?	0.4
		Is the language (writing/reading) on each page of the e-performance application consistent?	0.4
	(Traceability)	Is the e-performance application capable of performing data searches from all the information provided by the system?	0.3
		Is the e-performance application capable of providing feedback on user errors?	0.4

Usability (Fa2)	(Operability)	Can Users use the e-performance application easily?	0.3
		Is the information on each e-performance application menu easy to understand?	0.3
		Can users find the information they need quickly and easily?	0.3
		Is the e-performance application comfortable to use and satisfying?	0.4
	(Training)	Can new users easily use the e-performance application?	0.3
		Does the e-performance application have a menu that can be used to provide suggestions, criticism and user complaints?	0.4
	(Communicative)	Can the writing on all pages of the e-performance application be read clearly?	0.3
		Does the e-performance application use easy-to-understand language?	0.4
Integrity (Fa3)	Security	Does the login process on the system meet user expectations?	0.3
		Can e-performance applications control user access by limiting access rights?	0.3
		Is the data security in the system (e-performance application) reliable?	0.4
		Is it easy for users to input the data required by the system (e-performance application).	0.4
Reliability (Fa4)	Accuracy	Can the system display the correct data according to the keywords searched?	0.3
		Does the System (e-performance application) provide data and information that meets user needs accurately and quickly (up to date).	0.3
		Is the system information accurate and free from errors.	0.3

		Is the output (result of data processing) from the system (e-performance application) presented in an appropriate form so that it is easy for users to understand?	0.3
	Error Tolerance	Can the data in the e-performance application only be accessed by system users?	0.4
		Is the information provided by the system (e-performance application) easy to understand?	0.4
	Simplicity	Are the menus in the system functions and data in accordance with user needs?	0.4
		Are the menus in the system (e-performance application) easy to understand without any difficulty?	0.4
Efficiency (Fa5)	Execution Efficiency (Ease of Execution)	Is the interface display (system interface) on the system adequate?	0.3
		Does the function of each content in the e-performance application fulfill the information delivery requirement?	0.3

Test Results

The calculation of each quality factor is carried out based on the criteria value and weight value that has been determined with a maximum value of 4 according to table 4.3. The following is the calculation of the quality level of the ekinerja application of the Communication and Informatics Service of Bener Meriah Regency using the McCall formula for each variable and its indicators.

Correctness Quality Factor Calculation Results

a. Completeness
= (w1+c1) + (w2+c2) + (w3c3)+(w4c4)
=(0.4 x 3.40) + (0.3 x 3.16) + (0.3 x 3.27) + (0.3 x 2.99)
=1.36 + 0.95 + 0.98 + 0.90
= 4.19

b. Consistency
= (w1+c1) + (w2+c2)
=(0.4 x 3.20) + (0.4 x 3.14)
=1.28 + 1.26
= 2.54

c. Traceability
= (w1+c1) + (w2+c2)
=(0.3 x 3.15) + (0.4 x 3.08)
=0.94 + 1.23
= 2.18
Then the results obtained will be entered into the Fa formula as follows:

$$Fa1 = \frac{completeness + concistency + Traceability}{3}$$

$$= \frac{4{,}19 + 2{,}54 + 2{,}188}{3}$$
$$= \frac{8{,}90}{3}$$
$$= 2{,}97$$

From the results obtained, the factor quality value is changed into a percentage using the following equation:

$$Persentase = \frac{2{,}97}{4}\ x\ 100\% = 74\%$$

Usability quality factor calculation results

a. Operability
= (w1+c1) + (w2+c2) + (w3c3)+(w4c4)
=(0.3 x 3.08) + (0.3 x 3.08) + (0.3 x 3.22) + (0.4 x 3.05)
=0.93 + 0.93 + 0.97 + 1.22
= 2.82

b. Training
= (w1+c1) + (w2+c2)
=(0.3 x 3.07) + (0.4 x 3.04)
=0.92 + 1.22
= 2.14

c. Communicativeness
= (w1+c1) + (w2+c2)
=(0.3 x 3.20) + (0.4 x 3.23)
=0.96 + 1.29
= 2.25

Then the results obtained will be entered into the Fa formula as follows:

$$Fa2 = \frac{operability + Training + communicativeness}{3}$$
$$= \frac{2{,}82 + 2{,}14 + 2{,}25}{3}$$
$$= \frac{7{,}21}{3}$$
$$= 2{,}40$$

From the results obtained, the factor quality value is changed into a percentage using the following equation:

$$Persentase = \frac{2{,}40}{4}\ x\ 100\% = 60\%$$

Integrity Quality Factor calculation results

a. Security
= (w1+c1) + (w2+c2) + (w3c3)
=(0.3 x 3.16) + (0.3 x 3.04) + (0.3 x 3.08)
=0.95 + 0.91 + 1.23
= 3.09

Then the results obtained will be entered into the Fa formula as follows:

$$Fa3 = \frac{Security}{1}$$
$$= \frac{3{,}09}{1}$$
$$= 3{,}09$$

From the results obtained, the factor quality value is changed into a percentage using the following equation:

$$Persentase = \frac{3{,}09}{4}\ x\ 100\% = 77\%$$

Reliability quality factor calculation results

a. Accuracy
= (w1+c1) + (w2+c2) + (w3c3) + (w4c4) + (w5+w5)
=(0.4 x 3.11) + (0.3 x 3.07) + (0.3 x 3.14) + (0.3 x 3.03) + (0.3 x 3.11)
=1.24 + 0.92 + 0.94 + 0.91 + 0.93
= 4.95

b. Error tolerance
= (w1+c1)
=(0.4 x 3.24)
=1.30
= 1.30

c. Simplicity
= (w1+c1) + (w2+c2) + (w3c3)
=(0.4 x 3.16) + (0.4 x 3.11) + (0.4 x 3.14)
=1.27 + 1.24 + 1.26
= 3.76

Then the results obtained will be entered into the Fa formula as follows:

$$Fa4 = \frac{accuracy + error\ tolerancy + simplicity}{3}$$
$$= \frac{4{,}95 + 1{,}30 + 3{,}76}{3}$$
$$= \frac{10{,}01}{3}$$
$$= 3{,}34$$

From the results obtained, the factor quality value is changed into a percentage using the following equation:

$$Persentase = \frac{3{,}34}{4}\ x\ 100\% = 83\%$$

Results of calculating the Efficiency Quality Factor

a. Execution efficiency
= (w1+c1) + (w2+c2)
=(0.3 x 3.08) + (0.3 x 3.03)
=0.92 + 0.91
= 1.83
Then the results obtained will be entered into the Fa formula as follows:

$$Fa5 = \frac{execution\ efficiency}{1}$$
$$= \frac{1{,}83}{1}$$
$$= \frac{1{,}83}{1}$$
$$= 1{,}83$$

From the results obtained, the factor quality value is changed into a percentage using the following equation:

$$Persentase = \frac{1{,}83}{4}\ x\ 100\% = 45\%$$

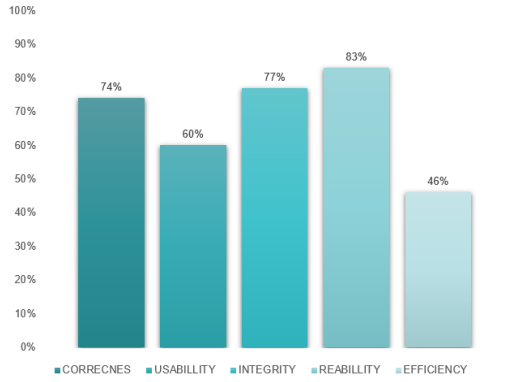


Figure 3. Calculation

Based on the results of the calculations that have been carried out for each quality factor, the following percentages were obtained: correctness 74%, usability 60%, reliability 77%, integrity 83% and efficiency 46%.

Analysis of Results

The results obtained will be categorized referring to the percentage range of quality categories in table 3.1. quality division and will get the following system quality results:

Table 6. McCall method calculation

Mccall Method Factors	Results	Category
Corrections	74%	Good
Usability	60%	Pretty good
Integrity	77%	Good
Reabillity	83%	Very good
Efficiency	46%	Not good

The table above shows below, the results of the McCall method calculation of the correctness quality factor get a good category with a percentage result of 74%, from the usability factor get a good value with a result of 60% with a fairly good category, the integrity factor get a good value with a result of 77% with a good category, from the reliability factor get a good value with a result of 83% with a very good category, from the efficiency factor get a bad value with a result of 46% with a bad category.

CONCLUSIONS

Based on the results of research and discussion that have been carried out on the eKinerja application of the Bener Meriah Regency Communication and Informatics Service. This study resulted in the correctness quality factor getting a category (good) with a percentage result of 74%, from the usability factor getting a category (quite good) with a quality score of 60%, the integrity factor getting a category (Good) with a quality score of 77%, from the reliability factor getting a category (very Good) with a quality score of 83%, from the efficiency factor getting a category (not Good) with a quality score of 46%. And the total value of the overall Quality Level is 68% which is at the level of 61% -80% which is included in the Good category range.

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