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Implementation of Analytical Hierarchy Process (AHP) for Determining Priority of Software Assessment in West Java Provincial Government Based on ISO/IEC 25010 (Case Study: Sapawarga Application)

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Abstract

The quality of the software is defined ISO as the totality of the features and characteristics of the product or services that depend on the ability to satisfy user needs. Sapawarga is software used to meet the needs of citizens in channeling aspirations, proposals, and obtaining information in one application. There are some negative comments about the app on Google's app store. This indicates there are quality issues in sapawarga software. The results of a follow-up survey showed users of the application experienced a 45.20% decrease, due to the server not responding, difficulty finding information, etc. This research was conducted to evaluate the quality of the software based on ISO 25010 consisting of eight characteristics including functional suitability, reliability, usability, performance efficiency, maintainability, portability, security, and compatibility. The AHP pairing comparison method is used to select the three most important ISO characteristics. These three most important characteristics are then used to assess the application of sapawarga and propose recommendations for improvement. Based on expert judgment using AHP pair comparison method, the three characteristics that most affect the application of sapawarga are functional suitability, usability, and performance efficiency with interest rates of 24.9%, 23.2%, 16.5%. Recommendations are proposed to improve the quality of these three characteristics.

Keywords: sapawarga, software quality, application, ISO

Abstrak

Kualitas perangkat lunak didefinisikan ISO sebagai totalitas dari fitur dan karakteristik dari produk atau layanan yang bergantung dari kemampuan untuk memuaskan kebutuhan pengguna. Sapawarga adalah perangkat lunak yang digunakan untuk memenuhi kebutuhan warga dalam menyalurkan aspirasi, usulan, dan memperoleh informasi dalam satu aplikasi. Ada beberapa komentar negatif terhadap aplikasi pada *app store Google*. Hal ini menunjukkan ada masalah kualitas di perangkat lunak sapawarga. Hasil survei lanjutan menunjukkan pengguna dari aplikasi mengalami penurunan45,20%, akibat server tidak merespon, sulitnya mencari informasi, dan lain-lain. Penelitian ini dilakukan untuk mengevaluasi kualitas perangkat lunak berdasarkan ISO 25010 yang terdiri dari delapan karakteristik diantaranya *functional suitability*, *reliability*, *usability*, *performance efficiency*, *maintainability*, *portability*, *security*, dan *compatibility*. Metode perbandingan berpasangan AHP digunakan untuk memilih tiga karakteristik ISO paling penting. Tiga karakteristik paling penting ini selanjutnya digunakan untuk menilai aplikasi sapawarga dan mengusulkan rekomendasi perbaikan. Berdasarkan *informed judgment* pakar menggunakan metode perbandingan berpasangan AHP, tiga karakteristik yang paling mempengaruhi

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aplikasi sapawarga adalah *functional suitability*, *usability*, dan *performance efficiency* dengan tingkat kepentingan 24.9%, 23.2%, 16.5%. Rekomendasi diusulkan untuk memperbaiki kualitas pada ketiga karakteristik tersebut.

Kata Kunci: sapawarga, kualitas perangkat lunak, aplikasi, ISO

I. Introduction

TODAY the progress of Information and Communication Technology (ICT) is so fast and very global that it has led to the presence of technology that has an impact on all aspects of life, not only the development of science and technology but also the field of government. In the government sector, there are concepts of e-government, e-procurement, and e-voting [1]. According to Dennis K. Agboh, E-Government (Electronic government) is defined as the use of information and communication technology to enable citizens to communicate with government agencies through electronic media such as fax, smart cards, self-service kiosks, email, the Internet, and Electronic Data Interchange [2].

Many local governments have initiated e-government innovation in Indonesia [3] by providing a public service program in the form of a mobile application-based digital platform, namely the sapawarga application. Sapawarga is an application belonging to the West Java Provincial Government to help citizens channel their aspirations, obtain important information, and access public services in one application. With the sapawarga application, residents have a digital experience that can facilitate communication access with the government, although in the first stage it can only be used through public service officials such as RW management [4].

Based on the results of obtaining comment data on the play store, the sapawarga application is very useful, especially for public service implementers because it can file complaints from citizens directly to the West Java Provincial Government, and attract citizens to be able to use it. However, besides that, the results of the survey stated that users of the sapawarga application had decreased by 45.20%, this occurred due to several reasons including the server not responding, difficulty finding information, etc. Meanwhile, according to the technical implementation unit of public services, the software is said to be successful or successful if the users or visitors of the application are 85% [5] which considers several aspects, as follows [5] [6]:

1. Meeting the needs of the user, means that if the software cannot meet the needs of the software user, it is said to have no or less quality.
2. Compliance with specifications means that if the software development method does not follow standard methodologies, it is almost certain that good quality will be difficult or not achieved.

The International Standards Organization (ISO) defines quality as "the totality of features and characteristics of a product or service that bear on its ability to satisfy specified or implied needs" which means the totality of the features and characteristics of a product or service that depends on the ability to satisfy. user requirements [7]. Where the level of user satisfaction is to ensure that the purpose of building sapawarga is appropriate and prioritizes the fulfillment of residents' expectations [1].

The ISO 25010 model is an extension of the ISO 9126 standard which is the most important standard in the field of quality assurance. The ISO 25010 model has eight characteristics consisting of functional suitability, reliability, usability, performance efficiency, maintainability, portability, security, and compatibility. Each characteristic is then divided into 31 sub-characteristics. Besides, ISO 25010 has more complete specifications than other software guarantor models such as McCall, Boehm, and so on. So that each character in the ISO model can be defined and applied in any software and from these considerations, this study uses the ISO 25010 model as an evaluation model [8].

Based on the input from the IT Development Coordinator, it is necessary to prioritize the improvement of the sapawarga application from the three most important aspects. So, from the eight characteristics of ISO 25010

three most important characteristics were selected. So that the pairwise comparison method found in AHP is used. Thus this research aims to determine what quality characteristics most influence the quality of sapawarga applications and what recommendations can be proposed for application improvement. Also, the recommendations given in the form of prototypes and characteristics of ISO 25010 used in this study include functional suitability, performance efficiency, maintainability, portability, usability, and compatibility.

II. LITERATURE REVIEW

A. Related Research

Research related and relevant with the background problem of quality measurement and evaluation software using ISO 25010 and AHP. Table I is a summary of previous research related to this research.

TABLE I
RELATED RESEARCH

No.	Researcher Name and Year	Titles	Problems	Solutions	The Result
1.	Galang, Firman, & Siti, 2014	Pengukuran Kualitas untuk Aplikasi Permainan pada Perangkat Bergerak berdasarkan ISO 9126	There are many perspectives and parameters to measure the quality of a game application on a mobile device.	Create quality Standards from the game applications on mobile devices using ISO 9126 for mapping the problems and AHP method are conducted to get weight values on each aspect.	Results from The discussion is known that the developers can pay more attention and consider that factors that have valued the larger significance are aspects of functionality, usability, and portability.
2.	Siti, Yanuar, & Kusuma, 2015	Implementasi Metode AHP *(Analytical Hierarchy Process)* untuk Pengambilan Keputusan Pemilihan Tingkat Kematangan Sistem *e-Learning* Berdasarkan Proses Emm *(e-Learning Maturity Model)*	eMM has many criteria which will to the measurement of maturity and assessments based on consideration of development priorities to produce a more focused and efficient development of recommendations.	Combining AHP method with eMM, where weightlessness of AHP's priorities will affect the process of eMM evaluation in determining the level of interest.	The result of unmet eMM is the subarea order which needs to be improved, that is: L2 (Students are provided interacting mechanisms with lecturers and other students); O7 (Students equipped with information about e-learning pedagogy before starting college); L8 (*The assessment was designed to further build student competence*); O6 (Students equipped with information about e-learning technology before starting college); L5 (Students receive feedback over the

					results of their work in any lecture).
3.	Feby, Tony, & Izzano, 2018	Analisis Faktor yang Mempengaruhi Manfaat yang Dirasakan Pengguna e-Sapawarga Pemerintah Kota Surabaya Menggunakan ISSM	The registration process for becoming a member of the e-Sapawarga application is slow because the data entered during registration must be matched first with data of the population owned by the Department of Population and Civil Registry of the City of Surabaya, the process resulted in a long time spent days.	An e-government evaluation assesses the effectiveness of the e-Sapawarga system using the Information Systems Success Model (ISSM).	Factors affecting the benefits of the e-Sapawarga system and the recommendations that can be given to Dinkominfo are System Quality, User Satisfaction, Use, and Perceived Net Benefit.

B. Software Quality

Software is said to be quality when many users use it, instead, the software will fail when the user has some faults in the software [5]. As quoted from the E-Article entitled "Software Quality Guarantors" a software is said to be qualified when meeting the three fundamentals [7]:

1. Meeting user's needs means that if the software cannot meet the user's needs, then the person concerned is said to have no or lack of quality.
2. Meeting the standards of software development means that if the software development method does not follow standard methodologies, it is almost certain that good and difficult or not achieved.
3. Meets many implicit criteria - which means that if one of these implicit criteria cannot be met, the software involved cannot be said to have a good quality.

C. ISO 25010 Model

Fig. 1. Quality Model by ISO 25010

ISO 25010 is the standard used by the international world to evaluate or measures the quality of software [6]. Overall ISO 25010 has eight characteristics for measure software quality as in Fig. 1. The definition of ISO 25010 characteristics is as follows [8]:

1. Functional suitability is a system or product that provides functions to meet user needs, both expressed and implied when used under certain conditions.
2. Performance efficiency is the level at which the application product provides good performance with the number of resources used.
3. Compatibility is the ability of an application component or more to exchange information.

4. Usability is where a system or application product is easy to understand, use, and attractive to use.
5. Reliability is the level at which the application product can maintain a certain level of performance when used under certain conditions.
6. Security is a product-level application that provides services to protect access, use, modification, tampering, or harmful disclosure.
7. Maintainability is the product level of the application providing services to protect access, use, modification, destruction, or hazardous disclosure.
8. Portability is the degree to which application products can be moved from one room to another.

D. Analytical Hierarchy Process (AHP)

Analytical Hierarchy Process (AHP) is a method used for decision making of a problem based on pairwise comparisons or functional hierarchies between characteristics based on input from expert or human perceptions [6]. This study, using the AHP method as a comparison between characteristics in software based on ISO 25010. The results of the comparison between characteristics produce the order of importance weight values of all characteristics. The weighting of interests is carried out in several stages, including [6]:

1. Assessment of importance between characteristics is based on the Saaty scale to know the importance weight of each characteristic.
2. Calculating the importance of the characteristics using a matrix to produce the Eigen weight value.
3. Calculating the value of consistency from the comparison of interests between characteristics to produce an acceptable comparison value.

III. RESEARCH METHOD

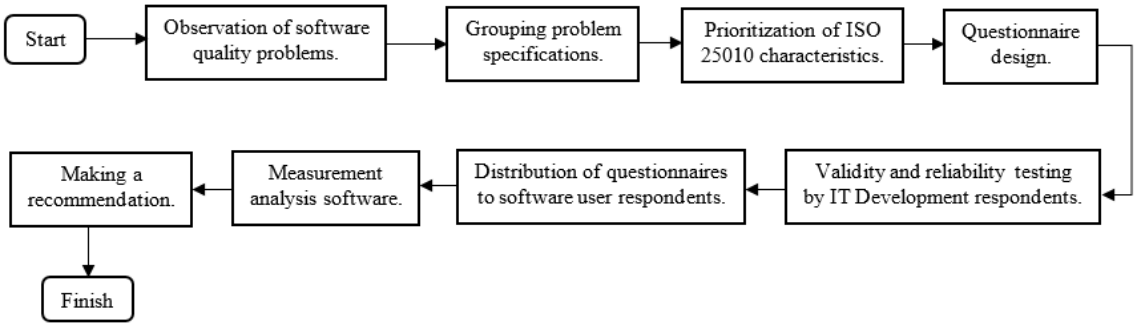

Fig. 2. The Flow of Quality Measurement for Sapawarga Application Software

This study utilizes several processes in determining the quality of software based on ISO 25010. The overall process flow can be seen in Fig. 2.

A. Observation of Software Quality Problems

At the observation stage, a search for problems faced in software development is carried out. The problem is obtained from user comments based on the experience of using the sapawarga application play store. These problems will be used as references and supporting data in the research. Next, the specifications are grouped.

B. Grouping Problem Specifications

At the stage of grouping the specifications, sorting the problems and mapping them into ISO 25010 is carried out. The results of grouping specifications will be used as candidate aspects of the characteristics that affect the level of software quality. After knowing the aspects that affect the quality of the software, then determining the

priority characteristics of ISO 25010 using AHP which aims to make it easier for developers to evaluate software to produce more directed and efficient development recommendations.

C. Prioritization of ISO 25010 Characteristics

At the stage of determining the priority characteristics of ISO 25010, this study utilizes several processes in the AHP method, namely the first pairwise-comparison, the second priority synthesis, and the third calculating the Consistency Ratio (CR). First, the pairwise-comparisons were weighted for each characteristic and sub-characteristics of ISO 25010 using the Saaty scale in Table II. Weighting was carried out by the IT Development Coordinator. For the two priority syntheses, we divide the x weight by the number of x weight columns to achieve normalized results. Then the average is calculated based on the rows to get the eigenvalues (W). Third, calculating the Consistency Ratio (CR) to find out whether the eigenvalues obtained are acceptable, dividing the Consistency Index (CI) value with the Index Ratio (IR) value where the CI value is obtained from reducing the λ_{maks} value by the number of characteristics then dividing by the number of characteristics minus one. while the IR value is the current value of the time and can be seen in Table III. The eigenvalues received are those of the CR ≤ 10% = 0.1. If the CR value is> 10% = 0.1 then the assessment should be repeated [11]. If the CR value is under the provisions, then a questionnaire is designed. Saaty Scale of Importance

TABLE II
SAATY SCALE OF IMPORTANCE

Intensity of Interest	Statement
1	Both characteristics are equally important.
3	Characteristics (A) are slightly more important compared to (B).
5	Characteristics (A) are more important than (B).
7	Characteristics (A) are more important than (B).
9	Characteristics (A) are essential compared to (B).
2, 4, 6, 8	Values between two values are close together.
*The opposite applies	

TABLE III
IR VALUE

Matrix Order	1	2	3	4	5	6	7	8	9
IR	0,00	0,00	0,52	0,89	1,11	1,25	1,35	1,40	1,45

D. Questionnaire Design

In designing the questionnaire, questions were made consisting of previously formed specifications. These questions can be seen in Table IV, which will later be used to measure the quality of the software owned by the West Java Provincial Government and filled in by respondents from users of the software. However, before the questionnaire is distributed and filled out by respondents, it must be tested for its validity and reliability.

TABLE IV
LIST OF QUESTIONS FOR EVALUATION OF SAPAWARGA APPLICATION BASED ON PRIORITY CHARACTERISTICS OF ISO 25010

No.	Code	Questions	Variable	Indicator
1.	F1	Does the information or data available on the application suit the needs?	*Functional Appropriateness*	*Functional Suitability*
2.	F2	So far, can the buttons or menus on the application system be used?	*Functional Correctness*	

3.	F3	Are the functions or information in the application as needed?	*Functional Completeness*	
4.	P1	Does the system respond quickly when displaying information?	*Time Behaviour*	*Performance Efficiency*
5.	P2	Is the system down and inaccessible during peak hours (08.00 - 11.30 WIB)?	*Capacity*	
6.	P3	Are the information resources contained in the application as expected?	*Resource Utilization*	
7.	U1	Do you recognize the sapawarga application as a medium for conveying suggestions and/or a medium for obtaining effective and efficient information?	*Appropriateness Recognizability*	*Usability*
8.	U2	Is the use of the sapawarga application system easy to learn?	*Learnability*	
9.	U3	Is the sapawarga application system easy for you to run?	*Operability*	
10.	U4	Is the sapawarga application display easy to understand and satisfying for you?	*User Interface Aesthetics*	
11.	U5	Can the system be used by many users at the same time?	*Accessibility*	
12.	U6	Does the system give a message when an error occurs while using it? *Usability*	*User Error Protection*	

E. Validity and Reliability Testing by IT Development Respondents

Validity and reliability testing aims to ensure that the questionnaire that is compiled can be used to measure the problem properly and produce valid data. The validity test was carried out using the Pearson Product Moment method [10]. Equation (1) shows the metric of the Pearson Product Moment method where r_{xy} is the product-moment correlation coefficient, $\sum x$ is the total item score, $\sum y$ is the total item score, and n is the number of respondents.

$$r_{xy} = \frac{n \ (\sum xy) - (\sum x) \ (\sum y)}{\sqrt{(n \ \sum x^2 - (\sum x)^2) \ (n \ \sum y^2 - (\sum y)^2)}} \quad \text{..... (1)}$$

The reliability test was carried out using the Cronbach Alpha test. Equation (2) is used to calculate reliability with Cronbach's Alpha [10] where r is the reliability value, k is the number of question items, $\sum S_b^2$ is the total variance score for each question item, and S^2 is the total variance. How to calculate the total variance can be seen in equation (3) where t is the number of answers and N is number of respondents.

$$r = \frac{k}{k-1} \left(1 - \frac{\sum S_b^2}{\sum S_t^2}\right) \quad \text{..... (2)}$$

$$\sum S_t^2 = \frac{\sum t^2 - \frac{(\sum t)^2}{N}}{N} \quad \text{..... (3)}$$

The assessment of the questionnaire was carried out by providing a rating scale for each answer to the question. Table V shows the rating scale for each answer using the Likert scale, namely strongly agree, agree, doubt, disagree, and strongly disagree. Furthermore, the results of the Likert scale are translated by interval analysis using equation (5) metrics in the Goal Question Metrics (GQM) method [9]. This stage was carried out by IT Developer respondents using cluster random sampling. Cluster random sampling generally increases the variability of the sample estimates compared to simple random sampling but also depends on how the clusters are differentiated [12]. If the questionnaire has been declared valid and reliable, then the questionnaire is distributed and used as a software quality measurement tool.

TABLE V
Likert scale

Score	***Category***
5	*Strongly Agree (SS)*
4	*Agree (S)*
3	*Doubtful (R)*
2	*Disagree (TS)*
1	*Strongly Disagree (STS)*

F. Distribution of Questionnaires to Software User Respondents

The distribution of questionnaires using the cluster random sampling method is the same as the validity and reliability test phase, but by following the instructions in the Slovin formula to determine the minimum number of samples. Equation (4) is the Slovin formula, where n is the sample size to be search, N is the population size, and e is the tolerance error, which is the percent leeway inaccuracy due to tolerable/desirable sampling errors, for example, 5%.. After distributing the questionnaire, the data obtained will be analyzed.

$$n = \frac{N}{1 + (N.e^2)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

G. Measurement Analysis Software

After distributing the questionnaire, the data obtained will be analyzed. The analysis carried out aims to determine the quality and causes of a problem in the software. A series of processes to take place as follows. First, calculate the metric value on each question using equation (5) where x is the metric value, S is Likert scale weight, $\sum A$ is the number of respondents' answers, and n is the number of respondents. Second, calculating the quality of the software using equation (6) where $Score$ is a quality value, W is an eigen weight, and x is the metric value. Finally, determining a category based on the acquisition of quality scores (S) refers to the external metric of software quality in Table VI.

$$x = \sum \frac{S \sum A}{n} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$$Score = x \,.\, W_{Sub\ characteristics} \,.\, W_{Characteristics} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

TABLE VI
Quality Category

Category	**Interval Value**

High	3,36 – 5
Medium	1,68 – 3,35
Low	0 – 1,167

H. Making a Recommendation

Recommend making for later application improvements. Proposed based on the low category of software quality assessment result and recommendations made to developers as a consideration in software development.

IV. RESULTS AND DISCUSSION

In the initial stage, a search for software quality problems on the Google app store has a comment of 2,432 but among all comments, there are negative comments about the quality of the sapawarga software as many as 492 comments so that Table VII. Furthermore, a problem mapping was carried out against the characteristics of ISO 25010 which can be seen in Table VIII.

Problems in general, points number 1, 2, and 8 in Table VII are mapped into performance efficiency characteristics because the resources used in the product when it is run/used meet the requirements. Then point number 3 is mapped into portability characteristics due to hardware (hardware) or software (software) in different operational environments. Points 5, 6, and 9 are mapped into usability characteristics because they include the ability of the software to be understood, learned, used, and attractive to users. Point number 10 is mapped into maintainability characteristics because the system can be assessed the impact of problems from system deficiencies. In detail, these specifications will be used as the basis for the formation of the questionnaire points. But before that, the prioritization of the characteristics is done first.

TABLE VII
MAPPING THE SPECIFICATIONS OF THE PROBLEMS THAT OCCUR BASED ON THE RESULTS OF OBSERVATIONS

No.	Problem	Amount	Specification
1.	Inaccurate data on which data repeats itself.	30	Resources used on the product when run/used meet the requirements.
2.	Often the server does not respond.	86	How far process response and processing time and yield rate from the system at which specific functions are executed.
3.	Applications can be downloaded but cannot be opened on certain smartphones.	64	Can adapt hardware or software in different operational environments.
4.	Proposed features have yet to be used.	47	The product or system does not cover all its users' goals and tasks.
5.	The built applications have not been consistent with the intended purpose for which people can both deliver suggestions and aspirations.	67	Users can recognize and understand the purpose of the Sapawarga application.
6.	Difficulty using the application, unable to upload images, and not can verify the validation of data.	30	Users can use applications to achieve specific goals and applications have capabilities that make applications easier to use.
7.	Slow application loading.	64	How far process response and time and yield rate from the system when specific functions are executed.
8.	Build lightweight and easy applications for clearing space and memory.	33	How far the application has a maximum limit or power accommodated based on system parameters that meet the requirements.

9.	Difficulty in finding data and/or information.	47	Applications have capabilities that make them easier to use.
10.	The application has not met the adaptation specifications to the impact of system changes.	24	Systems can be assessed the impact of problems from system deficiencies.

TABLE VIII

MAPPING SPECIFICATIONS WITH ISO 25010

No.	Specification	ISO 25010	
		Subcharacteristics	**Characteristics**
1.	Resources used on the product when it is run/used meet requirements.	*Resource Utilization*	*Performance Efficiency*
2.	How far response and processing time and yield rate from the system when specific functions are executed.	*Time Behaviour*	*Performance Efficiency*
3.	Can adapt hardware or software in different operational environments.	*Adaptability*	*Portability*
4.	Proposed features have yet to be used.	*Functional Completeness*	*Functional Suitability*
5.	Users can recognize and understand the purpose of the Sapawarga application.	*Appropriateness Recognizability*	*Usability*
6.	Users can use the application to achieve specific goals and the application have abilities that make the application easier to use.	*Learnability* dan *Operabilit*	*Usability*
7.	How far the application has a maximum limit or capacity based on system parameters that meet the requirements.	*Capacity*	*Performance Efficiency*
8.	Apps have abilities that make them easier to use.	*Operability*	*Usability*
9.	Systems can be assessed the impact of problems from system deficiencies.	*Analysability*	*Maintainability*

Characteristics prioritizing is done to help developers in evaluating software. These characteristics are Functional Suitability (FS), Compatibility (C), Usability (U), Performance Efficiency (PE), Maintainability (M), and Portability (P). The sequence of processes for determining the priority of characteristics using several flows in the AHP method is as follows. First, the weighting of six ISO 25010 characteristics was carried out in the form of pairwise-comparisons by the IT developer coordinator with the Saaty scale in Table II. To get a Pairwise Comparison Matrix, it was done by comparing each pairwise variance to produce a weighting which can be seen in Table IX. Second, after the pairwise matrix was obtained, synthesizing the priority by adding up each column, after which the Numbers in each cell were divided by the amount in the corresponding column. Thus resulting in a normalized matrix can be seen in the Table X. Third, measure the consistency of the assessment using CR and obtained a CR value of 9.2%, which means that the Eigen-weight value obtained is consistent. So that based on the results of the characteristic priority determination process, Table XI is the order of the highest priority to the lowest priority.

TABLE IX

PAIRWISE COMPARISON MATRIX

Characteristics	**FS**	**PE**	**C**	**U**	**M**	**P**
FS	1	3	2	1	3	1
PE	0,33	1	3	0,50	1	2
C	0,50	0,33	1	1	1	1
U	1	2	1	1	2	3

M	0,33	1	1	0,50	1	0,50
P	1	0,50	1	0,33	2	1

TABLE X

PRIORITY SYNTHESIS MATRIX

Characteristics	**FS**	**PE**	**C**	**U**	**M**	**P**	**Bobot Eigen (W)**
FS	0,240	0,383	0,222	0,231	0,300	0,118	0,249
PE	0,080	0,128	0,333	0,115	0,100	0,235	0,165
C	0,120	0,043	0,111	0,231	0,100	0,118	0,120
U	0,240	0,255	0,111	0,231	0,200	0,353	0,232
M	0,080	0,128	0,111	0,115	0,100	0,059	0,099
P	0,240	0,064	0,111	0,077	0,200	0,118	0,135
Total							1,000

TABLE XI

ISO 25010 CHARACTERISTICS PRIORITY

Rank	***Characteristics***	***Priority***
1	*Functional Suitability*	24,9%
2	*Usability*	23,2%
3	*Performance Efficiency*	16,5%
4	*Portability*	13,5%
5	*Compatibility*	12%
6	*Maintainability*	9,9%

Furthermore, after getting the Eigen weight value, characteristics prioritization is done. Which is characteristics are defined as specific properties. Functional suitability is the characteristic that most influences the quality of the sapawarga application, while to produce a more focused and efficient recommendation development where 3 aspects of project management are considered, namely scope, time, and cost so that this study refers to three priority characteristics, namely functional suitability, usability, and performance efficiency. The three characteristics used have sub-characteristics which can be seen in Table XII.

TABLE XII

ISO 25010 PRIORITY SUB CHARACTERISTICS

Characteristics	**Sub Characteristics**	**Explanation**
Functional Suitability	*Functional Completeness*	How far the set of functions covers all the goals and tasks of its users.
	Functional Correctness	How far the product can provide and justify the result matches a certain level as needed.
	Functional Appropriateness	How far the function of the system provides facilities in completing predetermined tasks and goals.
Usability	*Appropriateness Recognizability*	How far users can recognize and understand the applications used.
	Learnability	How far the application or product can be used by users to achieve effective, efficient learning, and freedom from certain risks and usage satisfaction.
	Operability	How far the application or product has the ability that will make it easier for users to use it.

	User Error Protection	How far the application or product can protect users if there is a failure.
	User Interface Aesthetics	How far the application or product interface can create a good interaction for the user.
	Accessibility	How far the application or product can be used by various groups of users with a range of characteristics to achieve goals in certain contexts.
Performance Efficiency	*Time Behaviour*	How far the response and processing time and the level of results of a system when the function is carried out in completing the requirements given.
	Resource Utilization	How many resources are used on the application or product when it is run as a fulfillment requirement.
	Capacity	How far out is the maximum limit or capacity of application or product based on system parameters that meet the requirements.

Based on the sub-characteristics of the three characteristics used, the weighting is carried out in Table XIII and making a questionnaire in Table IV. The functional suitability characteristic aspects of the question points used are about the level of user satisfaction with the features contained in the software in question. In the aspect of usability characteristics, the question points used are about the level of user understanding of the software in question. In the aspect of performance efficiency characteristics, the question points used are about application performance with the number of resources used.

After complete the questionnaire, validity and reliability were test with the IT Development population. In this test, data originating from respondents randomly, the number of which is 65 people ranging in age from 18 to 60 years with a male to the female sex ratio of 50:50. Several times the validity test was carried out until each question was declared valid. In this study, the validity test was carried out twice and the reliability test was carried out once with a value of 0.602 which was reliable. Then the questionnaire was distributed and filled in by 100 respondents who used the software.

The results of the weighting of the sub-characteristics can be seen in Table XIII and the results of distributing questionnaires can be seen in Table XIV. Furthermore, the calculation of software quality is carried out using equation (6) so that the results of the acquisition of software quality in Table XV and finally categorizing the value of software quality concerning Table VI to be able to determine the quality of the sapawarga application. The results of the software quality category can be seen in Table XVI.

TABLE XIII

Overall Results of Sub-Characteristic Eigen Weights

Characteristics	**Subcharacteristics**	**Eigen weight (WSub-characteristic)**
FunctionalSuitability	*Functional Appropriateness*	0,12
	Functional Correctness	0,272
	Functional Completeness	0,608
Performance Efficiency	*Time Behaviour*	0,416
	Capacity	0,458
	Resource Ultilization	0,126
Usability	*Appropriateness Recognizability*	0,06
	Learnability	0,076
	Operability	0,111
	User Interface Aesthetics	0,136
	Accessibility	0,392
	User Error Protection	0,225

TABLE XIV

QUESTIONNAIRE RESULTS

Characteristics	Sub Characteristics	Scores
Functional Suitability	*Functional Appropriateness*	2,85
	Functional Correctness	2,93
	Functional Completeness	2,36
Performance Efficiency	*Time Behaviour*	2,73
	Capacity	2,85
	Resource Ultilization	2.69
Usability	*Appropriateness Recognizability*	2,51
	Learnability	2,82
	Operability	2,92
	User Interface Aesthetics	2,86
	Accessibility	2,76
	User Error Protection	2,77

TABLE XV

QUALITY CHARACTERISTICS OF ISO 25010 SAPAWARGA APPLICATION

Characteristics	Eigen Weight ($W_{Karakteristik}$)	Sub Characteristics	Eigen Weight ($W_{Subkarakteristik}$)	Scores	Multiplication Result (Quality Score)
Functional Suitability	0,249	*Functional Appropriateness*	0,12	2,85	0,85
		Functional Correctness	0,272	2,93	1,98
		Functional Completeness	0,608	2,36	3,57
Performance Efficiency	0,165	*Time Behaviour*	0,416	2,73	1,87
		Capacity	0,458	2,85	2,15
		Resource Ultilization	0,126	2,69	0,55
Usability	0,232	*Appropriateness Recognizability*	0,06	2,51	0,34
		Learnability	0,076	2,82	0,49
		Operability	0,111	2,92	0,75
		User Interface Aesthetics	0,136	2,86	0,9
		Accessibility	0,392	2,76	2,51
		User Error Protection	0,225	2,77	1,44

TABLE XVI

SAPAWARGA APPLICATION QUALITY CATEGORY

No.	Sub-Karakteristik	Quality Score	Category
1.	*Functional Appropriateness*	0,85	*Low*
2.	*Functional Correctness*	1,98	*Medium*

3.	*Functional Completeness*	3,57	*High*
4.	*Time Behaviour*	1,87	*Medium*
5.	*Capacity*	2,15	*Medium*
6.	*Resource Ultilization*	0,55	*Low*
7.	*Appropriateness Recognizability*	0,34	*Low*
8.	*Learnability*	0,49	*Low*
9.	*Operability*	0,75	*Low*
10.	*User Interface Aesthetics*	0,9	*Low*
11.	*Accessibility*	2,51	*Medium*
12.	*User Error Protection*	1,44	*Low*

From table XV it can be concluded that the improvements that can be made by the developer based on the results of the software quality assessment are in a low category, namely the sub-characteristic aspects of functional appropriateness, resource utilization, appropriateness recognizability, learnability, operability, user interface aesthetics, and user error protection. Recommendations are given to developers can be seen in figures 3, 4, and 4. For the details of the following recommendations:

1. Appropriateness recognizability is part of usability characteristics where the user can recognize and understand the application used. The recommendations put forward in this study are to improve the appropriateness recognizability indicator, which is to hopefully add a feature in the form of a history of proposals where users can track the progress of the proposal when submitting a proposal. Besides, the addition of this feature is also a characteristic of the sapawarga application where residents can easily recognize the sapawarga application.

Fig. 3. Proposed Detail Prototype

2. Learnability is part of the usability characteristics where the user can use the application or product to achieve effective, efficient learning and freedom from risk and certain usage satisfaction. The recommendations put forward in this study are to improve the learnability indicators, namely to maximize the arrangement of the features contained in the application so that users will find it easier to learn and remember the functions of these features.

Fig. 4. Prototype Learnability

3. Functional appropriateness is part of the functional suitability characteristics where the function of the system provides facilities in completing predetermined tasks and objectives. The recommendations put forward in this study are to improve functional appropriateness indicators, namely that it is expected that the features and information available on the system are by the objectives of making the application and according to the needs of the work.

Fig. 5. Question and Answer Feature Prototype

V. Conclusion

In this research, the priority characteristics of ISO 25010 with the AHP method resulted in a priority sequence of characteristics, namely Functional Suitability 24.9%, Usability 23.2%, Performance Efficiency 16.5%, Portability 13.5%, Compatibility 12%, and Maintainability 9.9 %. From six characteristics of the sapawarga application ISO 25010, functional suitability is the characteristic that has the greatest influence on the quality of the sapawarga application software because it has the highest level of importance compared to other characteristics with a priority level of 24.9%.

Measuring the quality of the sapawarga application using AHP priority based on ISO 25010 sub-characteristics can be seen as follows:

a.	*Functional Appropriateness*	0,85	*Low*
b.	*Functional Correctness*	1,98	*Medium*
c.	*Functional Completeness*	3,57	*High*
d.	*Time Behaviour*	1,87	*Medium*
e.	*Capacity*	2,15	*Medium*
f.	*Resource Ultilization*	0,55	*Low*
g.	*Appropriateness Recognizability*	0,34	*Low*
h.	*Learnability*	0,49	*Low*
i.	*Operability*	0,75	*Low*
j.	*User Interface Aesthetics*	0,9	*Low*
k.	*Accessibility*	2,51	*Medium*
l.	*User Error Protection*	1,44	*Low*

In evaluating the quality of sapawarga software, sub-characteristics of AHP's three priorities are used, a recommendation is built, namely:

a. Functional appropriateness (how far the function of the system provides deep facilities complete the tasks and goals that have been determined).
b. Appropriateness recognizability (how far the user can recognize and understand the application used).
c. Learnability (how far the application or product can be used by the user in order to achieve effective, efficient learning, and freedom from risk and certain usage satisfaction).

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