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Analysis of File Document Application Quality Using ISO 25010:2011 Method (Case Study: PT. Averin Informatika Teknologi)

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Abstract— *Information systems provide an important role for the smooth running of activities in a company. These activities include the ability to process, store and access the required information quickly and accurately. PT. Averin Informatics Technology, which in its daily activities uses a document file application system as a tool for doing work. The document file system needs to be tested on the quality of the application. This is intended to ensure that the software or software produced is in accordance with predetermined needs. The test was carried out using the ISO 25010: 2011 method with 7 characteristics, namely functional suitability, performance efficiency, compatibility, usability, reliability, maintainability and portability. Testing the document file application using testing with black box testing, stress testing and questionnaires. The test was successfully carried out, the results of testing the quality of the document file application got a value of 4.852 out of 5 because the document file application was able to carry out all available functions, had reliability and was easy to use.*

Keywords— *ISO 25010:2011, Software Quality, Document File Application.*

I. INTRODUCTION

Currently the need for information is getting higher and continues to grow rapidly. So that various fields of companies ranging from small, medium and high companies have made changes. Changes made are like a computerized system in a company, so that they are able to compete and improve the quality of work. In today's world of work, technology is the main point that is important in carrying out all work activities using existing resources, namely computers and internet networks. Activities in a company or an information system institution provide a very important role for the smooth running of the company's activities. These activities include the ability to process, store and access the required information quickly and accurately.

PT. Averin Informatika Teknologi, which in everyday life uses information systems as a tool in doing work. The document file application system is a system based on information system technology implemented in the company. The system is used as an effort to simplify the process of entering and leaving a document.

The document file system needs to be tested for the quality of its application. This is so that the software produced is in accordance with predetermined needs. In addition, testing is carried out to ensure there are no bugs or errors so that application users are satisfied when using it. The software testing standards vary widely among which are ISO 25010: 2011.

The ISO 25010: 2011 method has become an international testing standard for determining software quality. The ISO 25010: 2011 method was previously known as the ISO 9126 standard (Mistrik, et al., 2016). The model determines 8 characteristics, namely functional suitability, reliability, performance efficiency, usability, maintainability, security, compatibility and portability which are further divided into a series of sub characteristics. Therefore, in this study, the document file application system testing uses the ISO 25010 standard with several characteristics, namely functional suitability, performance efficiency, compatibility, usability, reliability, maintenance, and portability.

II. RESEARCH METHODS

The methodology to be used in research to analyze the quality of document file applications is as follows:

A. Problem Analysis

The problem faced by many application developers is how to make sure the software they create is really high quality according to the flow that has been planned in advance and there are no defects in the program. For users to use quality applications and free from program defects in a functional manner so as to assist users in carrying out activities.

The document file application must really be usable according to its function when it is operated by the user. Therefore, the function of use by users is very concerned so that when documenting the file it can run properly. To ensure that the document file application is really of good quality, software testing must be carried out. So far, the document file application has never tested the quality using ISO 25010. Therefore, the application is tested for the quality of the application, so that there can be no or no program defects.

B. Characteristics and Sub-Characteristics ISO/IEC 25010:2011

1. Functional Suitability

These characteristics represent application products or systems that provide functionality to meet the needs when using the product in certain circumstances (iso25000, 2020). This characteristic has the following sub-characteristics:

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a. Functional completeness
b. Functional correctness
c. Functional appropriateness

2. *Performance Efficiency*

This characteristic represents performance relative to the number of resources used under defined conditions (iso25000, 2020). This characteristic has the following sub-characteristics:

a. Time Behaviour
b. Resource Utilization
c. Capacity

3. *Compatibility*

A component's ability to exchange information with other products, systems, or components. Apart from that, it can also perform the required functions by sharing the same hardware or software environment (ISO25000, 2020). This characteristic has the following sub-characteristics :

a. Co-existence
b. Interoperability

4. *Usability*

The extent to which the system can be used by users to achieve certain goals with effectiveness, efficiency and usage satisfaction (iso25000, 2020). This characteristic has the following sub-characteristics :

a. Appropriateness recognizability
b. Learnability
c. Operability
d. User error protection
e. User interface aesthetics
f. Accessibility.

5. *Reliability*

The degree to which an application product can maintain while performing a function at any given time (iso25000, 2020). This characteristic has the following sub-characteristics :

a. Maturity
b. Availability
c. Fault tolerance
d. Recoverability

6. *Maintainability*

These characteristics indicate the level of effectiveness and efficiency of the product or system that can be modified. Modifications made can include repair, development or adaptation of software to adapt to the new environment (iso25000, 2020). This characteristic has the following sub-characteristics :

a. Modularity
b. Reusability
c. Analyzability
d. Modifiability
e. Testability

7. *Portability*

The level of effectiveness and efficiency at which a system or software can be transferred from different hardware, software, or operational environments (iso25000, 2020). This characteristic has the following sub-characteristics :

a. Adaptability
b. Installability
c. Replaceability

C. Analytical Hierarchy Process(AHP)

Analytical Hierarchy Process (AHP) is a method to support decision making. In 1980 Thomas L., Saaty developed AHP. AHP is a decision making tool that describes a complex problem in a hierarchical structure. The hierarchy has many levels, namely objectives, criteria, and alternatives. Hierarchy is defined as a representation of a very complex problem in a multilevel structure. The first level is an objective. Then followed by the level of factors, criteria, sub criteria to the last level of the alternative. Through this hierarchy, a complex problem can be broken down into a group. Then arranged into a hierarchical form, so that the problem will appear more structured and systematic (Agus, N., Agus, M., Gede, D., 2018).

D. Blackbox Testing

Black box testing is often called functional or specification based testing. This testing involves observing the output based on certain inputs. This test only checks the output value based on the respective input value. No attempt was made to study or check the application program code. This test is based on an external specification. Just check the functionality of the software, observe the basic aspects of the software, to check whether it is according to user requirements.

There are several strategies that can be used to perform black box testing, including boundary value analysis, equivalence class partitioning, decision table testing, cause effect graph (Made I, 2019).

E. Stress Testing

Stress testing is used to test system stability and reliability. This test can determine system robustness and error handling under very heavy load conditions. Stress testing is done to make sure a system won't crash under a crisis situation.

Stress testing is known as endurance testing. The most prominent use of stress testing is to determine the limits of defective software or hardware. In addition, it is also to check whether the system shows effective fault management in extreme conditions (Ferry, 2019).

III. RESULT AND DISCUSSION

A. Determination of the Characteristics and Sub Characteristics of the ISO 25010 Model

Previously, the research method was determined using the ISO 25010 method. The ISO 25010 method has 8 characteristics and 32 sub characteristics, whereas in this study it will only use 7 characteristics and 26 sub characteristics. The characteristics and sub characteristics used can be seen in figure 1.

The results of determining the characteristics and sub characteristics of this study for testing the document file system application software are using 7 characteristics and 26 sub characteristics. The reason for not using all the sub-characteristics of the ISO 25010 software testing model is because there are several sub-characteristics that are not

owned by the document file system application that will be tested. In addition, there is previous research conducted by (Fadli, Siti and Chastine, 2019) which states that the use of the ISO 25010 model must be adjusted to the functional characteristics of the software to be tested.

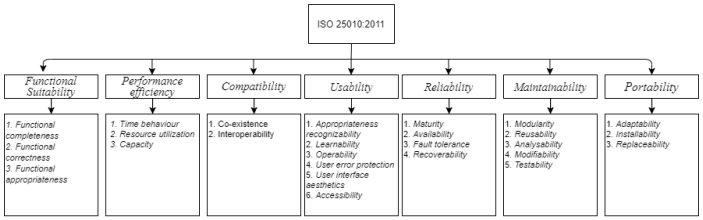

Fig. 1. Method ISO 25010:2011.

The next step is to determine the initial weight values for the characteristics and sub-characteristics of the ISO 25010 model software testing using the AHP (Analytical Hierarchy Process) method. This weight determination uses a web-based AHP tool with the url https://bpmsg.com/ahp/ahp-calc.php. There are 7 characteristics of the ISO 25010 model used by the author, namely functional suitability, performance efficiency, compatibility, usability, reliability, maintainability, portability.

B. Results of Determining the Weight of the ISO 25010: 2011 Model Using the Hierarchical Analytical Process Method (AHP)

The results of determining the priority weights of the 7 characteristics of ISO 25010: 2011 obtained the resulting weights for criteria based on comparisons between characteristics. The results of determining the characteristic weights are as follows:

Cat		Priority	Rank	(+)	(-)
1	functional suitability	33.4%	1	11.6%	11.6%
2	performance efficiency	28.8%	2	12.2%	12.2%
3	compatibility	11.3%	4	5.9%	5.9%
4	usability	12.0%	3	5.7%	5.7%
5	reliability	8.3%	5	2.9%	2.9%
6	maintainability	3.6%	6	0.6%	0.6%
7	portability	2.5%	7	0.8%	0.8%

Fig. 2. Results of Weight Determination 7 Characteristics of ISO 25010: 2011

There are results of determining the priority weights of the 7 characteristics of ISO 25010: 2011. The results of these seven characteristics are functional suitability characteristics in position number 1 with a weight of 33.4%, performance efficiency characteristics in position number 2 with a weight of 28.8%, usability characteristics in position number 3 with a weight of 12.0%, compatibility characteristics in position number 4. With a weight of 11.3%, the reliability characteristics are in position 5 with a weight of 8.3%, the maintainability characteristics are in the 6th position with a weight of 3.6% and the portability characteristics are in the last position with a weight of 2.5%.

C. The Results of Determining the Weight of the Functional Suitability Sub Characteristics Using the AHP Method

The results of determining the priority weights of the functional suitability sub characteristics ISO 25010: 2011 obtained the resulting weights for the criteria based on the comparison between the sub characteristics. The results of determining the weight of the sub characteristics are functional appropriateness sub-characteristic at number 1 with a weight of 68.2%, the functional appropriateness sub-characteristic at number 2 with a weight of 21.6% and the Functional appropriateness sub-characteristic at number 3 with a weight of 10.3%.

D. The Results of Determining the Weight of the Performance Efficiency Sub Characteristics Using the AHP Method

The results of determining the priority weight of the sub-characteristics performance efficiency ISO 25010: 2011 obtained the weight generated for the criteria based on the comparison between the sub characteristics. The results of determining the weight of the sub characteristics are time behavior sub-characteristics at number 1 with a weight of 61.5%, resource utilization sub-characteristics at number 2 with a weight of 29.2% and sub-characteristics capacity at number 3 with a weight of 9.3%.

E. The Results of Determining the Weight of the Usability Sub Characteristics Using the AHP Method

Based on the results of determining the priority weights of the sub-characteristics of the usability of ISO 25010: 2011, the resulting weights for the criteria are obtained based on the comparison between the sub characteristics. The results of determining the weight of the sub characteristics are sub-characteristics are appropriateness recognizability at number 1 with a weight of 43.4%, learnability at number 2 with a weight of 22.6%, operability at number 3 with a weight of 15.7%, user error protection at number 4 with weights 11.1%, aesthetics user interface is in the 5th position with a weight of 4.1% and accessibility is in the 6th position with a weight of 3.1%.

F. The Results of Determining the Weight of the Compatibility Sub Characteristics Using the AHP Method

The results of determining the priority weight of the sub-characteristics of the reliability characteristics of ISO 25010: 2011 obtained the resulting weights for the criteria based on the comparison between the sub characteristics. The results of determining the weight of the sub characteristics are sub characteristics are the co-existence sub-characteristics in the number 1 position with a weight of 75.0% and the interoperability sub-characteristics in the number 2 position with a weight of 25.0%.

G. The Results of Determining the Weight of the Reliability Sub Characteristics Using the AHP Method

The results of determining the priority weight of the sub-characteristics of the reliability characteristics of ISO 25010: 2011 obtained the resulting weights for the criteria based on the comparison between the sub characteristics. The results of the four sub-characteristics are the maturity sub-characteristics

at number 1 with a weight of 54.0%, the availability sub-characteristics at number 2 with a weight of 28.3%, the sub-characteristics of fault tolerance at number 3 with a weight of 12.9% and the recoverability sub-characteristics. positioned number 4 with a weight of 4.7%.

H. *The Results of Determining the Weight of the Maintainability Sub Characteristics Using the AHP Method*

The results of determining the priority weight of the sub-characteristics of the maintainability characteristics of ISO 25010: 2011 obtained the resulting weights for the criteria based on the comparison between sub characteristics. The results of the five sub-characteristics are the modularity sub-characteristics at number 1 with a weight of 40.5%, the Reusability sub-characteristics in the number 2 position with a weight of 30.1%, the analysability sub-characteristics in the number 3 position with a weight of 16.1%, number 4 with a weight of 9.7% and sub testability characteristics in position number 5 with a weight of 3.6%.

I. *The Results of Determining the Weight of the Portability Sub Characteristics Using the AHP Method*

The results of determining the priority weight of the sub-characteristics of the ISO 25010: 2011 portability characteristics obtained the resulting weights for the criteria based on the comparison between the sub characteristics. The results of determining the priority weight of the 3 sub portability characteristics. The results of the three sub-characteristics are adaptability sub-characteristics at number 1 with a weight of 68.1%, installability sub-characteristics at number 2 with a weight of 25.0% and the replaceability sub-characteristics at number 3 with a weight of 6.9%.

J. *Testing Functional Suitability Characteristics*

1. *Functional Completeness*

Testing the document file application on sub-functional completeness characteristics using the black box testing method. The results of the testing conducted show that all the features in the document file application can function properly. Therefore, the functional completeness sub-characteristics got a score of 5 and got the very good category.

2. *Functional Correctness*

Testing the correctness sub-characteristics used the black box testing method. The test results show that all the main functions of the application are functioning properly. Therefore, the sub-characteristics of functional accuracy got a score of 5 and got the very good category.

3. *Functional Appropriateness*

Testing the appropriateness sub characteristics using the black box testing method. The results of the tests conducted show that all features can function properly. Therefore, the functional suitability sub-characteristics got a score of 5 and got a very good category.

4. *Total Value of Functional Suitability Characteristics*

Based on the assessment of the functional suitability sub-characteristics, namely functional completeness, functional correctness, functional appropriateness, the assessment of the three sub-characteristics uses a predetermined standard value.

TABLE I. Total Value of Functional Suitability Characteristics

No.	Sub Characteristic	Weight	Score	Total
1.	*functional completeness*	68,2%	5	0,682*5= 3,41
2.	*functional correctness*	21,6%	5	0,216*5= 1,08
3.	*functional appropriateness*	10,3%	5	0,103*5= 0,515
Total				5

K. *Testing Performance Efficiency Characteristics*

1. *Time Behaviour*

Testing the sub-characteristics of time behavior using the black box method. The test results show that the application process speed can function properly. Therefore, the time behavior sub-characteristics get a score of 5 and get very good category.

2. *Resource Utilization*

Testing the sub-characteristics of resource utilization using the black box testing method. Testing is done to test the memory and RAM used by the application. The results of the sub-characteristics of the resource utilization score 4 and get a good category.

3. *Capacity*

Testing document file applications on sub capacity characteristics using the black box testing method. Based on the tests that have been done, the sub-characteristic of resource utilization gets a value of 4 and gets a good category.

4. *Total Value of Performance Efficiency Characteristics*

Based on an assessment of the sub-characteristics of performance efficiency, namely time behavior, resource utilization and capacity, it can be seen in the table below.

TABLE II. Total Value of Performance Efficiency Characteristics

No.	Sub Characteristic	Weight	Score	Total
1.	*Time behaviour*	61,5%	5	0,615*5= 3,075
2.	*Resource utilization*	29,2%	4	0,292*4= 1,168
3.	*Capacity*	9,3%	4	0,093*4= 0,372
Total				4.615

L. *Testing Usability Characteristics*

Test the usability characteristics using a questionnaire. Based on an assessment of the sub characteristics of usability, namely the suitability of recognition, learning ability, operation, user error protection, user interface aesthetics and accessibility, can be seen in the table below.

TABLE III. Total Value of Usability Characteristics

No.	Sub Characteristic	Weight	Score	Total
1.	*Appropriateness recognizability*	43,4%	5	0,434*5=2,17
2.	*Learnability*	22,6%	5	0,226*5=1,13
3.	*Operability*	15,7%	5	0,157*5=0,785
4.	*User error protection*	11,1%	4	0,111*4=0,444
5.	*User interface aesthetics*	4,1%	5	0,041*5=0,205
6.	*Accessibility*	3.1%	5	0,031*5=0,155
Total				4,889

M. *Testing Compatibility Characteristics*

1. *Co-existence*

Testing the co-existence sub characteristics using black box testing method. The results of this test, the document file application can run together with other applications in a single resource. Therefore, the co-existence sub-characteristics got a score of 5 and got a very good category.

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2. Interoperability

Testing the document file application on the sub-characteristics of interoperability using the black box testing method. The results of the test are that the document file application is connected to other applications. Therefore, the interoperability sub-characteristics scored 5 in the very good category.

3. *Total Value of Compatibility Characteristics*

Based on the assessment of the sub-characteristics of compatibility, namely Co-existence and interoperability, the assessment of the two sub-characteristics uses a predetermined standard value. The results of the assessment from sub compatibility can be seen below.

TABLE IV. Total Value of Compatibility Characteristics

No.	Sub Characteristic	Weight	Score	Total
1.	*Co-existence*	75,0%	5	0,75 *5= 3,75
2.	*Interoperability*	25,0%	5	0,25 *5= 1,25
Total				5

N. Testing Reliability Characteristics

1. Maturity

Testing the sub-characteristics of maturity using the stress testing method. The test results show that the application is successful in carrying out the main function, namely the upload and download document functions. Therefore, based on the sub-characteristics of maturity, it gets a score of 5 and gets a very good category.

2. Availability

Testing the document file application on sub availability characteristics using the stress testing method. The results of the tests that have been carried out by the application have a high success rate from several attempts to upload documents. Therefore, the availability sub characteristics get a value of 5 and get a very good category.

3. Fault Tolerance

The sub-characteristic fault tolerance test uses the stress testing method to test the application error tolerance level. The results of the tests that have been done show that the document file application has a high level of fault tolerance. Therefore, the sub-characteristic of fault tolerance obtained a value of 5 and got the very good category.

4. Recoverability

Testing the document file application on the recoverability sub characteristics using the black box testing method. The results of the tests that have been done are able to rebuild and maintain application performance. Therefore the recoverability sub-characteristics get a score of 5 and get very good category.

5. *Total Value of Reliability Characteristics*

Based on the assessment of the sub-characteristics of reliability, namely maturity, availability, fault tolerance and recoverability, the assessment of the four sub-characteristics uses a predetermined standard value. The results of the assessment of sub reliability can be seen in the table below.

TABLE V. Total Value of Reliability Characteristics

No.	Sub Characteristic	Weight	Score	Total
1.	*Maturity*	54,0%	5	0,54*5=2,7
2.	*Availability*	28,3%	5	0,283*5=1,415
3.	*Fault Tolerance*	12,9%	5	0,129*5=0,645
4.	*Recoverability*	4,7%	5	0,047*5=0,235
Total				4,995

O. Testing Maintainability Characteristics

1. Modularity

Testing the sub-characteristics of modularity using the method of observation or observation. The result of the observation is that the application can divide modules according to access rights. The author gives a score of 5 and gets a very good category.

2. Reusability

Testing the sub-characteristics of reusability using observation or observation methods. document file applications can be used for the development of similar applications, or securities management, and online meeting applications. The author gives a score of 5 for the reusability sub-characteristics with the very good category.

3. Analysability

Testing the document file application on the analysis sub characteristics using the black box testing method. The results of the testing conducted show that only one case can analyze the incorrect input. The analyzability sub-characteristic got a score of 2 and got a bad category.

4. Modifiability

Testing the document file application on the modifiability sub characteristics using the observation or observation method. Based on the observations, the writer gave a value of 5 for the modifiability sub-characteristics and got the very good category. Because the application can be modified as needed.

5. Testability

Testing the sub-testability characteristics using the method of observation or observation. Based on observations and tests that have been done, the document file application can be tested easily. Therefore, the authors give a score of 5 and get a very good category, because the document file application can be tested easily.

6. *Total Value of Maintainability Characteristics*

Based on the assessment of the five sub characteristics above using a predetermined standard value. The results of the assessment of sub reliability can be seen in the table below.

TABLE VI. Total Value of Maintainability Characteristics

No.	Sub Characteristic	Weight	Score	Total
1.	*Modularity*	40,5%	5	0,405*5=2,025
2.	*Reusability*	30,1%	5	0,301*5=1,505
3.	*Analysability*	16,1%	2	0,161*2=0,322
4.	*Modifiability*	9,7%	5	0,097*5=0,485
5.	*Testability*	3,6%	5	0,036*5=0,18
Total				4,517

P. Testing Portability Characteristics

1. Adaptability

Testing the document file application on sub adaptability characteristics using the blackbox testing method. The results of the tests that have been done show that the document file

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application can adapt to different environments. Therefore the adaptability sub-characteristics get a score of 5 and get the very good category.

2. *Instability*

Testing the document file application on the instability sub-characteristics using the blackbox testing method. The results of the tests that have been carried out show that the document file application can be installed in different environments and all functions can run well. Therefore, the instability sub-characteristic got a score of 5 and got the very good category.

3. *Replaceability*

Testing the document file application on the replaceability sub characteristics using the observation method. The results of the observations that have been made are that the document file application can be replaced with several similar applications. Therefore, the sub characteristics get a score of 5 and get a very good category.

4. *Total Value of Portability Characteristics*

Based on the assessment of the sub-characteristics of portability, namely adaptability, installability and replaceability, the assessment of the three sub-characteristics uses a predetermined standard value. The results of the assessment of the portability sub-characteristics can be seen in the table below.

TABLE VII. Total Value of Portability Characteristics

No.	Sub Characteristic	Weight	Score	Total
1.	*Adaptability*	68,1%	5	0,681*5=3,405
2.	*Installability*	25,0%	5	0,25*5=1,25
3.	*Replaceability*	6,9%	5	0,069*5=0,345
Total				5

Q. Total Assessment Results of Characteristics and Sub Characteristics Testing

After assessing the characteristics and sub-characteristics of the ISO 25010: 2011 model in the document file application, the next step is to calculate the total characteristics and sub-characteristics of ISO 25010: 2011 as shown in the table below.

TABLE VIII. Total Assessment Results of Characteristics and Sub Characteristics Testing

No.	Characteristic	Weight	Score	Total
1.	Functional Suitability	33,4%	5	0,334*5 = 1,67
2.	Performance Efficiency	28,8%	4,615	0,288*4,615 = 1,329
3.	Usability	11,3%	4,889	0,113*4,889 = 0,552
4.	Compalibility	12,0%	5	0,12*5 = 0,6
5.	Reliability	8,3%	4,995	0,083*4,995 = 0,414
6.	Maintainability	3,6%	4,517	0,036*4,517 = 0,162
7.	Portability	2,5%	5	0,025*5 = 0,125
Total				4,852

R. Document File Application Recommendations

Based on the results of research that has been carried out for testing the document file application that has been tested using black box testing, stress testing and questionnaires. The lowest test results on the maintainability characteristics on the anaysability sub-characteristics which get a value of 2 out of 5 and get a bad category. The results that have been done are that the application is running well but in the application there is no warning if the user uploads wrongly with extensions other than pdf, excel and word documents. Therefore, the author recommends that if there is an application development in the future, it should be given the function of not releasing files other than documents so that the application becomes even better.

IV. Conclusion and Suggestions

A. Conclusion

The document file application test has been successfully carried out using the ISO 25010 method. The steps taken to test the quality of the document file application using ISO 25010 are determining the weight of the characteristics and sub-characteristics using the Analytical Hierarchy Process (AHP) method. The next stage is making indicators for assessing the sub-characteristics of the ISO 25010 model, assessing the characteristics of functional suitability, performance efficiency, compatibility, usability, reliability, maintainability and portability.

Testing the quality of the document file application using the ISO 25010: 2011 method which tests with 7 characteristics and 26 sub characteristics is done by the black box testing method, the stress testing method and the questionnaire method. The value generated from the tests that have been carried out is 4.852 of the total value of 5 from the document file application. The results of testing the quality of the document file application get a value of 4.852 out of 5 because the document file application is able to carry out all available functions, has reliability and is easy to use.

B. Suggestions

Testing the quality of the document file application using the ISO 25010 method which the author does is still open to development. The development of document file application testing using the ISO 25010 method can be done by adding testing of security characteristics. In addition, it is also necessary to carry out various types of testing, such as tools for testing reliability. The use of tools aims to make the results even more accurate.

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