

Quality Testing of Order Management Information System Based on McCall's Quality Factors

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Abstract—Satoedjari Merch is one of the companies that utilize convection system in managing information as a support order. After implementing a management information system, the necessary attention is to the quality of the system so that it can scale very well and as needed. Order Management System in Satoedjari Merch is still in the early stages of use, it requires quality testing system to maximize its benefit. One of good software quality is if it meets those aspects of McCall's Quality Factor. This study uses Product Operation aspect, because this aspect tests the quality related with system activity when the system is used. In the aspect of product operations, there are five factors that is correctness, reliability, efficiency, integrity and usability. According to the test results, it is known that the Order Management Information Systems of Satoedjari Merch for operator system excellent quality are the truth factor, reliability, convenience and efficient. Factors that have low values are on the relationship system and data security.

Keywords-Correctness; Efficiency; Integrity; McCall's Quality Factors; Product Operations; Reliability; Usability.

I. INTRODUCTION

Nowadays information technology is a very important part of a company, institution and agency. Information technology occupies a position that can support the achievement of the vision, mission and goals of a company. The company applies an information system that can meet the need to improve operational work requirements. The importance of information technology, so that in small and medium-sized companies also apply in the work system.

Satoedjari Merch Order Management Information System is a system used to help manage orders in Satoedjari Merch. This system is accessed by the owner of the convection as the admin of the system and the convection employee who is the operator. The features contained in this system include product management, financial reports, payments, client data and order management.

The application of a management information system requires attention related to the quality of the system so that it can be measured properly and as needed. Based on the results of the interview, the Satoedjari Merch Management Information System has not been implemented for long time. So that by testing the quality of the system, deficiencies in the system can be corrected immediately. Basically, testing is a step in the software engineering process that can be considered as damaging rather than building [1].

One standard of software quality is good when meeting aspects of McCall's Quality Factor. Basically McCall focuses on factors or criteria that affect software quality into three aspects, namely those related to the operational properties of the software (Product Operation), the ability of the software to undergo changes (Product Revision) and the adaptability or adjustment of software to the new environment (Product Transition) [2].

This study will examine the Satoedjari Merch Order Management Information System with McCall quality theory because this method has a complete software quality factor. McCall has precision and good testing details so that it can be used to test and guarantee the quality of the system. In McCall there are three aspects, namely product operation, product transition and product revision. But in this study took the aspect of product operation. The product operation aspect has five factors, namely correctness, reliability, efficiency, integrity and usability with different testing points of view so that the five factors are complementary in system quality assurance.

II. PURPOSE

Based on the introduction above, the purpose of this study is to measure the quality of the Satoedjari Merch Order Management System based on McCall's quality theory.

III. METHODOLOGY

A. Research Object

The object of this research is the Satoedjari Merch Order Management Information System. This information system is managed by the owner of the company itself. Management

information systems are used to simplify the management of orders at Satoedjari Merch convection companies.

B. Data Collection Method

1) Literature Study

Methods of collecting data are by looking for and reading references such as books related to software or system quality testing, previous studies which have similar aims to our aims. The use of the internet is also used as a medium to add information in gathering references.

2) Interviews

Data collection with interviews is an attempt to gather information by asking a number of questions verbally to collect data that cannot be obtained through observation and questionnaires. With this technique researchers can gain understanding with information from others [3].

3) Manual Testing

This step is to test the system manually with standard procedures and accuracy. This process is carried out by directly opening the system. This is a manual test using the test design that has been prepared.

4) System Data

System data is taken from some programs needed for testing white boxes using source code modules. This test is conducted with the white box to test the parameters of conciseness, modularity and simplicity.

5) Questionnaire Methods

The questionnaire method is a list that contains a series of questions or statements about a problem or field that will be studied. To obtain data, the questionnaire was then distributed to respondents, especially in survey research. Respondents in this study were users of the Satoedjari Merch Order Management Information System.

C. McCall Quality Factor

Calculation Method is based on McCall's quality theory. Each factor and sub factor have their respective formulas in their calculations, namely:

1) Correctness Factor

There are three metrics in the correctness factor, among others: completeness, consistency and traceability. The calculation formula is contained in Formula 1.

$$\text{Correctness} = \frac{\text{Completeness} + \text{Consistency} + \text{Traceability}}{3} \quad (1)$$

2) Reliability Factors

The reliability perspective at this point emphasizes the possibility of failure-free software operations over a certain period of time in a particular environment [4]. Reliability factor has five metrics, namely accuracy, error tolerance, consistency, modularity and simplicity. Calculation of reliability uses Equation 2.

$$\text{Reliability} = \frac{\text{Accuracy} + \text{Consistency} + \text{Error Tolerance} + \text{Modularity} + \text{Simplicity}}{5} \quad (2)$$

3) Efficiency Factors



The efficiency factor has three metrics, namely conciseness, execution efficiency, and operability. The formula for calculating the efficiency factor uses Equation 3.

$$Efficiency = \frac{Conciseness + Execution\ Efficiency + Operability}{3} \quad (3)$$

4) Integrity Factors

Integrity factor has three metrics namely auditability, instrumentation and security. So to determine the value of integrity uses Equation 4.

$$Integrity = \frac{Auditability + Instrumentasi + Security}{3} \quad (4)$$

5) Usability Factors

The usability factor has only two metrics, namely training and operability. Training metrics are measured by calculating the time needed to use the system in seconds, whereas operability metrics with questionnaires.

6) Rating Scale

The rating scale in assessing the results of the system quality factor testing uses rating scale, which is the raw data obtained in the form of numbers. They are then interpreted in a qualitative sense with the score interpretation criteria as follows [5]:

- Number 0% - 20% = Very Bad
- Number 21% - 40% = Not Good
- Number 41% - 60% = Enough
- Number 61% - 80% = Good
- Number 81% - 100% = Very Good

D. Experiment

Sudman and Bradburn [6] argue that experiments are research that attempts to manipulate one or more causal variables, then measure the effects of manipulation on one or more dependent variables. Experiments can be done in two ways, namely field and laboratory. Field experiments are carried out in real conditions while laboratory experiments are carried out in unnatural conditions. In this study laboratory experiments were carried out because it was carried out on users who were not real in order to do experiments to general respondents.

E. Data Analysis

The data obtained will then be processed and analyzed based on the criteria of each factor in McCall's theory. Processing and analyzing carried out the whole of the metrics with calculations that will produce conclusions from the quality of the management information system.

IV. RESULT AND DISCUSSION

A. Correctnes

The testing of the correctness factor aims to measure the level of truth of the system as measured by certain parameters. McCal's theory explains that in this factor there are three test metrics, namely completeness, consistency and traceability.

1) Completeness

The results of testing the completeness of operators are presented in Table I and for admin in Table II.

TABLE I. OPERATOR COMPLETENESS TEST RESULTS

No	Activity	Input	Extended Output	Remark	Note
1	Login	Klik Sign in	Login berhasil	✓	
	Entri User ID	Operator			
	Entri Password	Operator			
2	Menu Registrasi Klien	Klik	Tampil	✓	
	Tambah Klien	Klik	Form	✓	
	...				
C5	Total	46	46	45	

In completeness testing for operators the remark means that the features on the system are functioning properly. The results that are remarked or appropriate from the input and output are 45 features out of 46 features. So the percentage of operator completeness based on formula 3.6 is $(45 \div 46) \times 100\% = 97.8\%$. In the scale of assessment, the operator completeness is included in the excellent category.

TABLE II. ADMIN COMPLETENESS TEST RESULTS

No	Activity	Input	Extended Output	Remark	Note
1	Login	Klik Sign in	Login berhasil	✓	
	Entri User ID	Admin			
	Entri Password	Admin			
2	Menu Registrasi Klien	Klik	Tampil submenu	✓	
	...				
C5	Total	93	93	93	

In testing completeness for the admin sign remark means that the feature on the system is functioning properly. From testing on the top can be calculated features that are tested as many as 93. The results are remark or according to the input and output as much 93 features. So that the value of the admin completeness percentage based on formula 3.6 is $(93 \div 93) \times 100\% = 100\%$. Then the percentage completeness of the admin is included in the excellent category.

2) Consistency

The results of consistency operator testing are presented in Table III and consistency testing for admin Table IV.

TABLE III. OPERATOR CONSISTENCY TEST RESULTS

No	Activity	Dokumen	Produk	Remark	Note
1	Login	✓	✓	✓	
	User ID	✓	✓	✓	
	Password	✓	✓	✓	
2	Registrasi Klien	✓	✓	✓	
	Ubah	✓	✓	✓	
	Hapus	✓	✓	✓	
	Simpan	✓	✓	✓	
	...				
C5	Jumlah	49	49	49	

In testing the consistency of total metrics the features tested were 49 features and all remark. Then the percentage of



consistency operator metrics is $(49 \div 49) * 100\% = 100\%$. So it is included in the excellent category.

TABLE IV. ADMIN CONSISTENCY TEST RESULTS

No	Activity	Document	Product	Remark	Note
1	Login	✓	✓	✓	
	Username	✓	✓	✓	
	Password	✓	✓	✓	
2	Manajemen Produk	✓	✓	✓	
	Hapus	✓	✓	✓	
	...				
	Total	79	79	79	

In the admin consistency testing the total features tested were 79 features and all remark. Then the percentage of admin consistency metrics calculated based on formula is $(79 \div 79) * 100\% = 100\%$. So the admin consistency value is included in the very good category.

3) Traceability

The results of traceability operator testing are presented in Table V and traceability testing for admin in Table VI.

TABLE V. OPERATOR TRACEABILITY TEST RESULTS

No	Activity	Document	Product	Remark	Note
1	Login	✓	✓	✓	
	Entri User ID	✓	✓	✓	
	Entri Password	✓	✓	✓	
2	Menu Registrasi Klien	✓	✓	✓	
	Tambah Klien	✓	✓	✓	
	...				
C5	Total	50	49	49	

From testing on the features can be counted as many as 50. Results that remark or match the system with the document as many as 49 features. So that the value of traceability operator percentage is $(49 \div 50) * 100\% = 98\%$. Then the traceability admin value is included in the excellent category.

TABLE VI. ADMIN TRACEABILITY TEST RESULTS

No	Activity	Document	Product	Remark	Note
1	Login	✓	✓	✓	
	Entri User ID	✓	✓	✓	
	Entri Password	✓	✓	✓	
2	Manajemen Produk	✓	✓	✓	
	Produk	✓	✓	✓	
	Ubah	✓	✓	✓	
	Hapus	✓	✓	✓	
	Tambah Produk	✓	✓	✓	
	...				
C5	Total	50	49	49	

Based on the tests, results were obtained for each metric that exists in the factor of correctness to the system for the operator, namely completeness 97.8%, consistency 100% and traceability 98%, then based on the equation (1) the level of percentage correctness for operators is: $(97.8\% + 100\% + 98\%) \div 3 = 98.6\%$. With this percentage the operator's correctness is included in the excellent category.

While the value of correctness for system admin with the value of completeness is 100%, consistency 100% and

traceability 88%. Then the correctness value for admin based on equation (1) is: $(100\% + 100\% + 88\%) \div 3 = 96\%$. The admin correctness percentage shows that the level of the system included in the category is very good.

B. Reliability

1) Accuracy

The results of accuracy testing for operators are presented in Table VII and accuracy admin in Table VIII.

TABLE VII. OPERATOR ACCURACY TEST RESULTS

No	Activity	Input	Output	Remark	Note
1	Entri Nama	Farid	Farid	✓	
2	Entri Email	farid@gmail.com	farid@gmail.com	✓	
3	Entri Alamat	Padan rt.08 rw.03 Jagalan, Karangnongko	Padan rt.08 rw.03 Jagalan, Karangnongko	✓	
4	Entri Kodepos	57488	57488	✓	
5	Entri CP	085725625852	085725625852	✓	
6	Entri Keterangan	Teman kampung	Teman kampung	✓	
7	Entri Jumlah	3	3	✓	
8	Entri Nama	Operator	Operator	✓	
9	Entri Email	opp@gmail.com	opp@gmail.com	✓	
10	Entri Username	Oper	oper	✓	
11	Entri Password	****	****	✓	
	Total	11	11	11	

Testing the operator's metric accuracy obtained data from a total of 11 features, a remark feature of 11. So that the percentage value of the accuracy of the operator is 100% and included in the excellent category.

TABLE VIII. ADMIN ACCURACY TEST RESULTS

No	Activity	Input	Output	Remark	Note
1	Entri Nama Produk	Gaul	Gaul	✓	
2	Entri Deskripsi Produk	Jaket anak muda	Jaket anak muda	✓	
3	Entri Harga Produk	Rp. 150.000	Rp. 150.000	✓	
4	Entri Nama Kategori	TOPI	TOPI	✓	
5	Entri Nama Spesifikasi Order	Nama	Nama	✓	
	...				
	Total	22	22	22	

In testing the accuracy admin metrics showed data from a total of 22 features, features that remark 22. It can be calculated as a percentage of accuracy admin is 100% and included in the excellent category.

2) Error Tolerance

The test results are presented in Table IX for the system on the operator and Table X on the admin system.

TABLE IX. OPERATOR ERROR TOLERANCE TEST RESULTS

No	Activity	Validation Remark	Note
1	User ID	✓	



2	Password	✓	
3	Nama	X	There is no validation for empty name
4	Email	✓	
	...		
	Total	14	

Operator error metric tolerance testing showed features that remark as many as 14 from 17 features. It can be calculated the percentage of operator tolerance error is $(14 \div 17) * 100\% = 82.35\%$ and is included in the excellent category.

TABLE X. ADMIN ERROR TOLERANCE TEST RESULTS

No	Activity	Validation	Remark	Note
1	User ID	✓		
2	Password	✓		
3	Nama kategori	✓		
4	Nama produk	✓		
5	Harga produk	✓		
6	Nama spesifikasi order	✓		
7	Harga	✓		
8	Nama pengeluaran	✓		
9	Harga	✓		
			
	Total	23		

Testing the error tolerance metrics on system admin shows data from a total of 25 features, features that remark as many as 23. It can be calculated percentage of error tolerance value is $(23 \div 25) * 100\% = 92\%$. So the admin tolerance error is included in the excellent category.

3) Modularity

The testing of this metric is presented in Table XI for the operator system and Table XII for the admin system.

TABLE XI. OPERATOR MODULARITY TEST RESULTS

No	Activity	In	Out	Total of Rows	Remark	Note
1	Beranda	0	1	43	Dependent	
2	Cetak_nota	5	1	225	Independent	
3	Index	13	32	256	Dependent	
4	Login	1	4	68	Dependent	
5	Login_proses	4	1	31	Independent	
6	Logout	1	1	7	Independent	
	...					
	Total	20			14	

From testing modularity operators with 20 files it is obtained as many as independent 17 files. So that it can be calculated the percentage is $(17 \div 20) * 100\% = 85\%$ and includes a very good category.

TABLE XII. ADMIN MODULARITY TEST RESULTS

No	Activity	In	Out	Total of Rows	Remark	Note
1	Pengeluaran_tambah	2	0	71	Independent	
2	Pengeluaran_ubah	3	0	92	Independent	
3	Produk	3	0	73	Independent	
4	Produk_proses	6	3	144	Independent	
5	Produk_tambah	2	0	59	Independent	
	...					
	Total	20			14	

In the test with 35 files it is obtained independent remarks as many as 32 files. So that for admin modularity metrics can be calculated the percentage is $(32 \div 35) * 100\% = 91.43\%$ and includes in the excellent category.

4) Simplicity

The test results can be seen in Table XIII for the operator system and Table XIV for the admin.

TABLE XIII. OPERATOR SIMPLICITY TEST RESULTS

No	Activity	Var-In	Var-Out	Remark	Note
1	Beranda	0	1	Not simple	
2	Cetak_nota	5	1	Simple	
3	Index	13	32	Not Simple	
4	Login	1	4	Not Simple	
5	Login_proses	4	1	Simple	
	...				
	Total	20		17	

In testing the simplicity operator metrics there are 20 total files tested and the results are 17 simple files. So the percentage of independence obtained is $(17 \div 20) * 100\% = 85\%$. This percentage is included in the criteria very well.

TABLE XIV. ADMIN SIMPLICITY TEST RESULTS

No	Activity	Var-In	Var-Out	Remark	Note
1	Pengeluaran_tambah	2	0	Simple	
2	Pengeluaran_ubah	3	0	Simple	
3	Produk	3	0	Simple	
4	Produk_proses	6	3	Simple	
5	Produk_tambah	2	0	Simple	
	...				
	Total	20		17	

From testing the simplicity metric there are 35 total files tested and the results are 32 simple files. Then the independence presentation for the admin system obtained is $(32 \div 35) * 100\% = 91.43\%$. So, the percentage of simplicity admin is included in the excellent category.

5) Consistency

The results of consistency testing on the operator system are presented in Table III. The percentage of operator consistency metrics is 100%. While consistency testing in the admin system is presented in Table IV and the percentage of admin consistency metrics is 100%.

Based on the test, the percentage of operator reliability factors based on calculations using the equation (2), the results are: $(100\% + 83.35\% + 85\% + 85\% + 100\%) \div 5 = 90.67\%$. The score shows that the level of system reliability in the operator system is included in the excellent category.

While the reliability value for the admin system based on equation (2) is: $(100\% + 92\% + 91.43\% + 91.43\% + 100\%) \div 5 = 94.97\%$. This value indicates that the level of system admin reliability is included in the excellent category.

C. Efficiency

1) Conciseness

Concise testing results for the operator system are presented in Table XV and Table XVI for admin systems.

TABLE XV. OPERATOR ADMIN CONCISENESS TEST RESULTS



No	Activity	Number of Declared Class	LOC	Remark	Note
1	Beranda	0	43	0	
2	Cetak_nota	5	225	0,0222	
3	Index	13	256	0,0508	
4	Login	1	68	0,0147	
5	Login_proses	4	31	0,1290	
6		1	7	0,1429	
7		2	195	0,0103	
8		5	119	0,0420	
	...				
	Total LOC		2327		
	Total Remark			0,8654	

Based on the test results presented in Table XV, the percentage of operator system conciseness with a total of 20 classes can be calculated = $(20 - 0,8654) / 20 \times 100\% = 95.67\%$. So the percentage of program density for the operator system is included in the excellent category.

TABLE XVI. ADMIN CONCISENESS TEST RESULTS

No	Activity	Number of Declared Class	LOC	Remark	Note
1	Pengeluaran_tambah	2	71	0,0282	
2	Pengeluatan_ubah	3	92	0,0326	
3	Produk	3	73	0,0411	
	...				
	Total Remark		1,4882		

Based on the results of test metrics in Table XVI, the percentage conciseness for admin systems with the calculation is: $(35 - 1,4882) / 35 \times 100\% = 95.74\%$. This value indicates that the density or conciseness of the admin system program is included in the excellent category.

2) Execution Efficiency

In this test it is used a comparison of two browsers namely Mozilla Firefox and Google Chrome. The test results for the operator system are presented in Table XVII and Table XVIII for admin systems.

TABLE XVII. OPERATOR EXECUTION EFFICIENCY TEST RESULTS

No	Activity	Time (menit)	RAM (MB)	Usage of memory(MB)	Remark
1	Google chrome				99,40%
	Login	1	2048	17,97	
	Registrasi klien	2	2048	17,95	
	Tambah kluen	2	2048	6,01	
	Order	1	2048	6,40	
	Tambah order	2	2048	9,34	
	Pembayaran	2	2048	8,92	
	Cetak invoice	2	2048	19,40	
	Edit profil	2	2048	11,64	
	Logout	1	2048	11,62	
	Average of total			12,14	
2	Mozila Firefox				95,55%
	Login	1	2048	80,63	
	Registrasi klien	2	2048	81,80	
	Tambah kluen	2	2048	104,07	
	Order	1	2048	75,11	
	Tambah order	2	2048	113,07	
	Pembayaran	2	2048	88,06	
	Cetak invoice	2	2048	81,07	
	Edit profil	2	2048	127,07	
	Logout	1	2048	64,07	

Average of total	90,55
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From the tests, results which are presented in Table XVII in the remark column, the value Google Chrome is 99.40% while Mozilla Firefox is 95.55%. The smaller the RAM usage, the greater the efficiency. So the comparison of the use of two of the most efficient browsers is Google Chrome.

TABLE XVIII. ADMIN EXECUTION EFFICIENCY TEST RESULTS

No	Activity	Time (menit)	RAM (MB)	Usage of memory(MB)	Remark
1	Google chrome				99,34%
	Login	1	2048	7,41	
	Tambah produk	2	2048	12,34	
	Tambah kategori	2	2048	11,14	
	Tambah spesifikasi order	2	2048	10,85	
	Tambah pengeluaran	2	2048	11,29	
	Cetak laporan pengeluaran	2	2048	15,69	
	Cetak laporan pendapatan	2	2048	17,02	
	Cetak laporan profit	2	2048	15,22	
	Lihat grafik	1	2048	15,66	
	Tambah admin	2	2048	16,12	
	Tambah operator	2	2048	15,65	
	Average of total			13,49	
2	Mozila Firefox				95,05%
	Login	1	2048	5,78	
	Tambah produk	2	2048	72,60	
	Tambah kategori	2	2048	49,04	
	Tambah spesifikasi order	2	2048	93,22	
	Tambah pengeluaran	2	2048	81,16	
	Cetak laporan pengeluaran	2	2048	65,27	
	Cetak laporan pendapatan	2	2048	93,67	
	Cetak laporan profit	2	2048	104,91	
	Lihat grafik	1	2048	83,81	
	Tambah admin	2	2048	97,00	
	Tambah operator	2	2048	141,17	
	Rata-rata total			80,69	

From the test results presented in Table XVIII in the remark column, the value obtained for Google Chrome is 99.34% while Mozilla Firefox is 95.05%. So the most efficient browser used to run the system is Google Chrome.

3) Operability

After testing the validity and reliability, a valid questionnaire statement can be seen in Table XIX.

TABLE XIX. QUESTIONNAIRE

No	Pernyataan	SS	S	N	TS	STS
1	Informasi pelanggan cepat dan mudah diperoleh					
2	Sistem memiliki petunjuk penggunaan yang baik					
3	Sistem mempermudah dalam mengelola orderan					
4	Saya mengetahui kegunaan dan fungsi sistem					
5	Menu dalam sistem mudah ditemukan					
6	Fitur sistem mudah dipahami					
7	Tata letak sistem dapat dilihat dengan jelas					
8	Sistem secara keseluruhan mudah digunakan					

This research uses 30 respondents because this research is included in experimental research. The selected respondents



were all students. The results of the questionnaire test data recapitulation of respondents are presented in Table XX.

TABLE XX. NUMBER OF QUESTIONNAIRE WEIGHT RECAPITULATION RESULTS

	SS	S	N	TS	STS	Total of Weight
p1	25	64	15	2	3	109
p2	55	64	9	0	0	128
p3	55	60	6	2	2	125
p4	35	64	15	2	2	118
p5	65	36	9	0	0	110
p6	40	72	6	0	0	118
p7	30	68	21	0	0	119
p8	20	68	9	4	2	103
Score total						930

Based on the testing of operability factors the results can be calculated by the percentage score factor is:

$$Operability = \frac{930}{(8 \times 30 \times 5)} \times 100\% = 77.5\%$$

These results can be concluded that the management information system has a user convenience level of 77.5%. After knowing the percentage of the metrics that exist in Efficiency factor, then the percentage of the operator system efficiency can be calculated using Equation 3 as follows:

$$Efficiency = \frac{95.67\% + 99.40\% + 77.5\%}{3} = 90.86\%$$

The results of factor efficiency calculations for the admin system can also be calculated using same equation and the results are:

$$Efficiency = \frac{95.74\% + 99.34\% + 77.5\%}{3} = 90.86$$

Based on the efficiency percentage of 90.85%, the efficiency levels of both are included in the excellent category.

D. Integrity

1) Auditability

The test results are presented in Table XXI for operators and Table XXII for admin systems.

TABLE XXI. OPERATOR AUDITABILITY TEST RESULTS

No	Activity	System	Document System	Remark	Note
1	Login	√	√	√	
	Entri User ID	√	√	√	
	Entri Password	√	√	√	
2	Menu Registrasi Klien	√	√	√	
	Tambah Klien	√	√	√	
	...				
Total		50	49	49	

Testing of auditability metrics above shows data from a total of 50 features, remarked features as many as 49. So that the percentage value of auditability operators can be calculated $(50 \div 49) * 100\% = 98\%$.

TABLE XXII. ADMIN AUDITABILITY TEST RESULTS

No	Activity	System	Document System	Remark	Note
1	Login	√	√	√	
	User ID	√	√	√	
	Password	√	√	√	
2	Manajemen Produk	√	√	√	



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...				
Total	92	81	81	

In testing the system admin to metric auditability above shows data results obtained from a total of 92 features, features that remark as many as 81. It can be calculated percentage value of auditability admin is: $(81 \div 92) * 100\% = 88\%$. So that the level of ease of checking the system by users is included in the excellent category.

2) Instrumentation

This metric examines the instruments that exist in the system that identify when an error occurs.

TABLE XXIII. OPERATOR INSTRUMENTATION TEST RESULTS

No	Scenario	Valid Response	Error Response	Remark
1	Entri User ID yang salah	User ID = Operator	Maaf User Name dan Password yang Anda Masukkan Salah	√
2	Entri Password yang salah	Entri password yang benar	Maaf User Name dan Password yang Anda Masukkan Salah	√
3	Nama=null	Nama tidak boleh kosong	Please fill out this field.	√
4	Nama=angka	Nama=huruf	-	x
	...			
Total		21	15	15

The results of the remark from the test were 16 instruments. So the value of the percentage of operator system instrumentation is $(15 \div 21) \times 100\% = 71.43\%$. This value shows the limits of the instrument system in a good category.

TABLE XXIV. ADMIN CONSISTENCY TEST RESULTS

No	Scenario	Valid Response	Error Response	Remark
1	Entri User ID yang salah	User ID = Operator	Maaf user name dan password yang anda masukkan salah	√
2	Entri Password yang salah	Entri password yang benar	Maaf user name dan password yang Anda masukkan salah	√
3	Nama kategori=null	Nama kategori tidak boleh kosong	Please fill out this field	√
4	Nama produk=null	Nama produk tidak boleh kosong	Please fill out this field	x
	...			
Total of remark				22

In the instrumentation admin test the instrument tested were 24. The results that were remarked were 22 instruments. So the percentage of admin instrumentation is $(22 \div 24) * 100\% = 91.67\%$. The value of the existing system admin instruments is included in the excellent category.

3) Security

This metric examines the security that exists in the system to maintain data security in it.

TABLE XXV. OPERATOR SECURITY TEST RESULTS

No.	Activity	Product	Doc. System	Remark	Note
1.	Login	√	√	√	
2.	Session Logout	√	x	x	
3.	Level User	√	x	x	
4.	Enkripsi Password	√	x	x	
5.	Enkripsi URL	x	x	x	
Total				1	

A remark means there is a security that fills the feature. The results that are remarked or appropriate from testing are one feature. So the percentage of instrumentation is $(1 \div 5) \times 100\% = 20\%$.

TABLE XXVI. ADMIN SECURITY TEST RESULTS

No.	Activity	Product	Doc. System	Remark	Note
1.	Login	√	√	√	
2.	Session Logout	√	x	x	
3.	Level User	√	x	x	
4.	Enkripsi Password	√	x	x	
5.	Enkripsi URL	x	x	x	
Total				1	

In the admin section, the result that are remark are one feature. So the value of the admin instrumentation percentage is $(1 \div 5) \times 100\% = 20\%$. Admin system security is included in the very bad category.

From the results of factor integrity testing on the operator system, the results obtained for the three metrics are: 98% auditability metrics, 71.43% instrumentation, 20% security. So the percentage factor integrity for the operator system calculated is $(98\% + 71.43\% + 20\%) \div 3 = 63.14\%$. In the scale of the assessment of system relations and system security including good categories.

While for the system integrity factor, the admin gets 88% auditability metrics, instrumentation 91.67% and security 20%. So the percentage factor of admin system integrity is: $(88\% + 91.67\% + 20\%) \div 3 = 66.57\%$. System relationship factors and system security are in a good category.

E. Usability

1) Operability

Testing these metrics is also a sub-factor of efficiency. The test results for operability metrics are 77.5%. For a detailed explanation, see section 4.3.3.

2) Training

In this study training test metrics were conducted on 30 new user respondents. Testing is done by calculating the time needed by the respondent to run every activity in the system. The results of testing training metrics for the operating system are presented in Table XXVII.

TABLE XXVII. OPERATOR TRAINING METRIC TEST RESULTS

Respondent	T1	T2	T3	T4
1	60	40	50	20
2	21	26	12	6
3	30	45	15	25
4	30	45	15	25
5	60	53	9	50
6	42	49	31	6
7	47	74	22	10

8	51	105	12	3
9	52	84	18	30
10	50	51	20	6
11	38	48	25	3
12	26	17	8	20
13	43	62	19	7
14	45	52	4	8
15	50	45	35	20
16	60	90	60	90
17	25	45	15	10
18	40	55	19	5
19	40	89	18	25
20	60	40	50	20
21	21	26	12	6
22	30	45	15	25
23	30	45	15	25
24	60	53	9	50
25	42	49	31	6
26	47	74	22	10
27	51	105	12	3
28	52	84	18	30
29	50	51	20	6
30	38	48	25	3
Average	43,03333	56,5	21,2	18,43333
Average of total	34,79167			

Based on the results of the operator training test presented in Table XXVII, it can be seen the level of understanding of users in using the system is 34.79 seconds.

TABLE XXVIII. ADMIN TRAINING METRIC TEST RESULTS

Respondent	T1	T2	T3	T4	T5	T6	T7
1	45	10	14	13	12	8	22
2	55	12	23	18	14	20	32
3	20	5	5	5	5	5	20
4	60	60	60	60	60	60	60
5	59	60	40	50	45	60	70
6	45	12	19	16	30	25	31
7	28	10	8	7	13	15	53
8	24	16	14	8	8	8	12
9	28	7	9	21	12	19	17
10	42	10	18	16	12	11	38
11	41	19	9	11	14	8	33
12	52	11	22	35	7	8	27
13	35	8	23	22	16	21	46
14	30	18	32	22	20	9	41
15	29	22	19	16	12	13	46
16	29	11	14	0	20	25	27
17	30	10	15	20	20	25	27
18	19	8	15	17	21	25	31
19	60	30	40	30	30	30	30
20	45	10	14	13	12	8	22
21	55	12	23	18	14	20	32
22	20	5	5	5	5	5	20
23	60	60	60	60	60	60	60
24	59	60	40	50	45	60	70
25	45	12	19	16	30	25	31
26	28	10	8	7	13	15	53
27	24	16	14	8	8	8	12
28	28	7	9	21	12	19	17
29	42	10	18	16	12	11	38
30	41	19	9	11	14	8	33
Average	39,26	18,66	20,6	20,4	19,86	21,13	35,03
Average of total	24,995						



Based on the results of the admin system training test presented in Table XXVIII, it can be seen that the level of user understanding in using the system is 24.99 seconds.

Figure 1 and Table XXIX show test results for both the admin and the operator. These results show five tests for both users.

F. Test Result

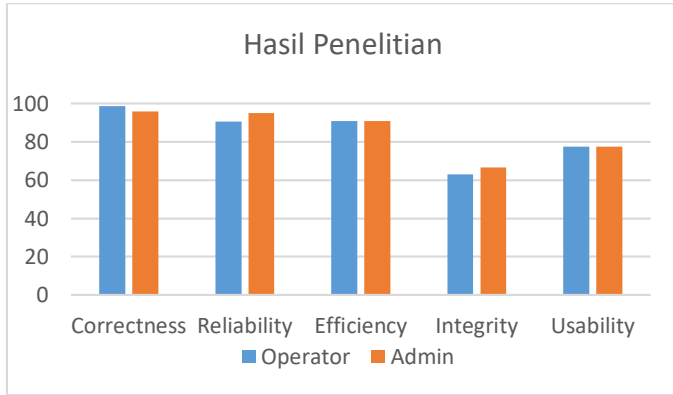


Figure 1. McCall's Quality Factors Test Results

TABLE XXIX. RESEARCH RESULT

No	Factor	Metric	Result for Operator	Result for Admin
1	Correctness		98,6 %	96%
		Completeness	97,8%	100%
		Consistency	100%	100%
		Traceability	98%	88%
2	Reliability		90,67%	94,97%
		Accuracy	100%	100%
		Error Tolerance	82,35%	92%
		Simplicity	85%	91,34%
		Modularity	85%	91,34%
3	Efficiency		100%	100%
		Consistency	100%	100%
			90,85%	90,86%

		Conciseness	95,67%	95,74%
		Execution Efficiency	99,40%	99,34%
		Operability	77,5%	77,5%
4	Integrity		63,14%	66,57%
		Auditability	98%	88%
		Instrumentasi	71,43%	91,67%
		Security	20%	20%
5	Usability		77,5%	77,5%
		Oprability	77,5%	77,5%
		Training	34,79 detik	24,99 detik

V. CONCLUSION

Based on research, it can be concluded that the test results are of the system operator for the correctness is 98.6%, reliability is 90.67%, efficiency is 90.85%, integrity is 63.14% and usability consisting of operability and training metrics are 77.5% and 34.79 seconds respectively. While for the system admin percentage the value of correctness is 96%, reliability is 94.97%, efficiency is 90.86% integrity 66.57% and usability consisting of operability and training metrics are 77.5% and 24.99 seconds respectively. From the results, it can be concluded for the level of truth, accuracy, efficiency and ease of use by the user, are included in very good categories. The lowest percentage is in the integrity factor, which are 66.14% and 66.57%, so it needs to be improved for the monitoring capabilities of data access systems.

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