ANALYSIS OF THE QUALITY OF WEB-BASED ONLINE EXAMS AT THE R.I. PROSECUTOR'S OFFICE EDUCATION AND TRAINING AGENCY USING THE ISO 25010 STANDARD

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ABSTRACT

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The Education and Training Agency for the Attorney General's Office of the Republic of Indonesia is one of the institutions that requires flexible and distributed learning. In the exam assessment process, the Education and Training Agency of the Attorney General's Office of the Republic of Indonesia collects data on questions given to participants in the form of files. The file is then used by participants to answer questions, then the answer file is sent to the organizers for inspection and assessment. With the implementation of such an exam, various problems arise which result in frequent delays in receiving the exam results report because the organizers experience time and energy constraints in manually correcting participants' answers one by one. Other problems that occur arise from the condition of the answer file which is often lost or deleted due to the error of the participants. Based on the above problems, the Education and Training Agency of the Indonesian Attorney General's Office feels the need to apply information technology. The creation of this web-based online exam system has been implemented since the beginning of 2022 until April 2022. The online exam system has been used in May and has started to be used.

To find out whether the quality of the web-based online exam system has met the initial goal to be achieved, namely to facilitate the organizers in carrying out the exam process, assessing training participants' answers and making reports on the results of the assessment, a system evaluation is needed. This study aims to analyze the online exam system used in the Education and Training Agency of the Indonesian Attorney General's Office which is currently being used with the ISO 25010 method of product quality dimensions. The objectives to be achieved with this thesis research are to analyze the

Keywords: ISO 25010, product quality model, online exam system.
quality of the online exam system at the Indonesian Attorney's Education and Training Agency using the ISO 25010 standard, and to provide input and suggestions for improving the online exam system at the R.I Attorney's Education and Training Agency. Based on the results of research and discussions that have been carried out using the ISO 25010 standard method, the quality of the online examination system of the Indonesian Attorney's Education and Training Agency is quite feasible and meets the criteria.

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INTRODUCTION

The R.I Prosecutor's Training Agency is one of the institutions that requires flexible and distributed learning. In the examination assessment process, badiklat of the R.I Prosecutor's Office created an online examination system with the aim of making it easier for organizers to make questions and check participants' answers so that they can be automatically carried out by the system, so as to speed up the preparation of participant score reports.

In mid-2022, this exam system has been completed and began to be used for online exam activities. In order to find out the quality and results of the web-based online examination system that has been developed, a method is needed to assess whether the system has met the initial goals to be achieved, namely making it easier for training providers to carry out the exam process, assessing the answers of training participants and making reports on assessment results.

The ISO 25010 - System and Software Quality Requirement and Evaluation method is a standard method in measuring the quality of software that is online. ISO 25010 is a method that will be used to analyze the online examination system used at the R.I. Prosecutor's Training Agency R.I. Testing characteristics consist of product quality model dimensions consisting of 8 characteristics ISO/IEC, (2011).

Past Research

In the first study entitled "Quality Analysis of E-Exam Applications Using ISO 25010 Standard." From the analysis carried out, the E-Exam application has not met the reliability character, so the conclusion was drawn, that the E-Exam in Bekasi schools has not met the ISO 25010 standard Tyas et al., (2021).

The second study was titled "Evaluation of UNG Websites Using ISO/IEC 25010." From the analysis carried out, the UNG website has not met the characteristics of
Performance Efficiency, which means that the UNG Website cannot maintain and attention users Tangkudung et al., (2019).

The third research with the title "Evaluation Analysis of Augmented Reality Application for Balinese Cultural Information Based on ISO / IEC 25010 Standards." So based on the results of all the research that has been carried out, it can be concluded that the quality of the Augmented Reality Museum Bali application has met the ISO 25010 standard Andika & Yanti, (2018).

The fourth study entitled "Development of an Islamic Higher Education Institution Tracer Study Information System and It's Performance Analysis using ISO/IEC 25010." The results of this study show that all characteristics of ISO 25010 have been met. With the successful development of the tracer study information system, it will make it easier for UIN Syarif Hidayatullah to monitor and collect information about UIN Syarif Hidayatullah alumni Anggraini et al., (2019).

The fifth research is "Quality Measurement of Transportation Service Application Go-Jek Using ISO 25010 Quality Model." The results showed that the GO-JEK application has good quality in the dimensions of product quality and quality of the dimensions of use, or user perspective Izzatillah, (2019).

The sixth study was titled "Building a Web-Based Student Daily Examination System with Reference to ISO 25010 Quality Standards." From the analysis carried out, the results obtained that all test cases have results that are in accordance with the expected or valid value Larasati et al., (2018).

**METHOD**

The object of research is the scientific goal of obtaining data with a certain purpose and usefulness about an objective, valid, and reliable thing about a thing Sugiyono, (2020).

The object of this study is a web-based online examination system owned by the Education and Training Agency of the Prosecutor's Office of the Republic of Indonesia.

The type of research "Quality analysis of online examination systems using iso 25010 standards" is quantitative research. Research methods are basically a scientific way to obtain data with a specific purpose and usefulness. Based on this, there are four keywords that need to be considered, namely the scientific way, data, purpose and usefulness Sugiyono, 2020).

**Reliability**

Reliability Characteristics Testing Uses the WAPT 10.1 tool to analyze the online exam system. Using a stress testing scenario with a total of 20 virtual users within 10 minutes. Data analysis of reliability test results is carried out by calculating the total
success rate and failure rate from the WAPT test results, then reliability calculations are carried out using the Nelson model: Tian et al., (2004).

\[ R = \frac{n-f}{n} = 1 - \frac{f}{n} = 1 - r \]  (Formula 2)

Information:

- \( R \) = Reliability
- \( f \) = Total failure
- \( n \) = Total test case (work load unit)
- \( r \) = Error rate

From the results of these calculations, it is then matched with the Telcordia GR 282 standard on "Software Reliability and Quality Acceptance Criteria" to determine the level of reliability of the system. According to Telcordia standards, software reliability success is 95% or 0.95. Asthana & Angela, (2009) The image display of the WAPT 10.1 software can be seen in figure 1.

![WAPT Software Display](https://www.loadtestingtool.com/)

**Figure 1. WAPT software display**

Source: WAPT 10.1 Application, [https://www.loadtestingtool.com/](https://www.loadtestingtool.com/)

**Usability**

Testing the characteristics of Usability was carried out using a questionnaire given to participants of the Prosecutor's Administration Technical Training (TAK) Class II Wave 4 of 2022 with a total of 285 participants. To find out the exact number of samples in a study, it was calculated using the Slovin formula with a margin of error of 9%.

\[ n = \frac{N}{1 + Ne^2} \]  (Formula 3)
The interpretation of the results of the usability test using the formula:

\[
P = \frac{\text{skor total}}{\text{total respondents}} \times 100\%
\]

After the respondents' results are obtained, calculations can be made for the usability characteristic test.

Information:

\[
\begin{align*}
SS &= \text{The number of respondents answering Strongly Agree is scored 5} \\
S  &= \text{The number of respondents Agreed was scored 4} \\
N  &= \text{The number of respondents answering Enough Agree was given a score of 3} \\
TS &= \text{The number of Disapproving respondents was given a score of 2} \\
STS &= \text{The number of strongly disapproving respondents was scored at 1}
\end{align*}
\]

The score retrieved is calculated as:

\[
\text{The score Retrieved} = (\text{JSS} \times 5) + (\text{JS} \times 4) + (\text{JCS} \times 3) + (\text{JTS} \times 2) + (\text{JSTS} \times 1)
\]

After the score is obtained, then a percentage calculation is carried out to obtain the interpretation of the results of the usability test using the formula:

\[
P = \frac{\text{skor total}}{\text{total respondents}} \times 100\%\quad \text{(Formula 1.2)}
\]
Information:
Total score = Total score of respondents' answer results
i = Number of questions
r = Number of Respondents

The calculation results are then converted into score interpretation with a slight modification of the ranking terms used. The division of modified eligibility categories can be seen in table 2. Riduwan, (2010).

Table 2. Score Interpretation Criteria

<table>
<thead>
<tr>
<th>No</th>
<th>Persentase</th>
<th>Interpretasi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0% - 20%</td>
<td>Sangat Tidak Layak</td>
</tr>
<tr>
<td>2</td>
<td>21% - 40%</td>
<td>Tidak Layak</td>
</tr>
<tr>
<td>3</td>
<td>41% - 60%</td>
<td>Cukup Layak</td>
</tr>
<tr>
<td>4</td>
<td>61% - 80%</td>
<td>Layak</td>
</tr>
<tr>
<td>5</td>
<td>81% - 100%</td>
<td>Sangat Layak</td>
</tr>
</tbody>
</table>

Source: Riduwan, (2010)

**Performance Efficiency**

Performance Efficiency character testing is intended to test the level of performance efficiency of an application. Performance Efficiency testing is carried out using GTMetrix software. GTMetrix report results must meet the load in less than 10 seconds. The view of GTMetrix can be seen in figure 2.

![Figure 2. GTMetrix report view](https://gtmetrix.com/)

If the criteria tested have obtained the value, it will be compared with the time response Stated By. Hoxmeier & Dicesare, (2000) Customer satisfaction according to Hoxmeier & DiCesare can be seen in table 3.
Table 3. Customer Satisfaction Table

<table>
<thead>
<tr>
<th>Response Time (Seconds)</th>
<th>Predicate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3</td>
<td>Very Satisfied</td>
</tr>
<tr>
<td>3-9</td>
<td>Satisfied</td>
</tr>
<tr>
<td>9-12</td>
<td>Quite Satisfied</td>
</tr>
<tr>
<td>&gt;12</td>
<td>Not Satisfied</td>
</tr>
</tbody>
</table>


Security

Security characteristics testing is performed to test for system vulnerabilities. Does the online examination system in the Badiklat of the R.I. Prosecutor's Office have any security loopholes. This test was performed using the Sucuri SiteCheck web. The test is carried out by entering the link of the online exam system into the Sucuri SiteCheck web then the application is run. The view of the web sucuri SiteCheck can be seen in figure 3.

![Sucuri SiteCheck](https://sitecheck.sucuri.net/)

Figure 3. Webview Sucuri SiteCheck
Source: [https://sitecheck.sucuri.net/](https://sitecheck.sucuri.net/)

Maintainability

Maintainability characteristics testing is carried out using measures tested by direct researchers operationally against the Badiklat online examination system of the R.I. Prosecutor's Office In accordance with the testing instruments mentioned by Land, this test includes 3 aspects, namely instrumentation, consistency and simplicity.

The analysis for maintainability characteristic testing according to the test instrument Land, (2002) is contained in table 4.
Table 4. Portability Characterization Testing

<table>
<thead>
<tr>
<th>Aspek</th>
<th>Penilaian</th>
<th>Hasil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrumentation</td>
<td>Terdapat notifikasi peringatan ketika terjadi kesalahan saat isi form data dan notifikasi berhasil ketika input datanya sesuai</td>
<td></td>
</tr>
<tr>
<td>Consistency</td>
<td>Penggunaan satu model rancangan pada seluruh rancangan sistem</td>
<td></td>
</tr>
<tr>
<td>Simplicity</td>
<td>Kemudahan dalam pengelolaan, perbaikan dan pengembangan sistem</td>
<td></td>
</tr>
</tbody>
</table>


**Portability**

*Portability* characteristics testing uses *cross browsing compatibility testing* on *desktop* and *mobile* to test the quality of software running well on different browsers. To maximize data collection and efficiency using limited resources and the time required, this test uses the lambdatest tool. Figure 4 is a view of the lambdatest web.

![Lambdatest Webview](https://www.lambdatest.com/)

**Compatibility**

Testing the characteristics of compatibility is carried out using the *PowerMapper tool* by running the system in the *browser*, where the system in this *browser* can perform
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its respective functions properly without experiencing interference. The view of the *PowerMapper web* can be seen in figure 5.

![PowerMapper webviews](https://www.powermapper.com/)

**Figure 5. PowerMapper webviews**
Source: [https://www.powermapper.com/](https://www.powermapper.com/)

RESULT AND DISCUSSION

*Functional Suitability*

The results of this test are evidenced by the presentation of data in the form of a table. The total tested functions run correctly and there are no constrained functions or errors. Such as the recapitulation of the test results shown in table 5.

<table>
<thead>
<tr>
<th>Penguji</th>
<th>Functional Completeness</th>
<th>Functional Correctness</th>
<th>Functional Appropriateness</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ya</td>
<td>Tidak</td>
<td>Ya</td>
<td>Tidak</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>


The results of this test can be calculated with the *Matrix Formula Feature Completeness*.

\[
X = \frac{\frac{1}{4} \times 3}{\frac{1}{2} \times 3} = \frac{24 \times 3}{24 \times 3} = 1
\]

(Formula)
Based on these calculations, the result $X = 1$ is obtained. This means that the quality of the R.I. Prosecutor's Office's online examination system is declared good, acceptable and meets the functional suitability aspect because the value of $X$ is equal to 1.

**Reliability**

On testing the reliability characteristics the results are as follows: success session 16635, session failed 0, successful page 16635, page failed 0, successful hit 16635, failed hit 0. The results of testing using WAPT 10.1 can be seen in figure 6.

![Figure 6. Reliability Test Results using WAPT 10.1](https://www.loadtestingtool.com/)

The recap of the test results using WAPT 10.1 is as follows:

**Table 6. Total test case**

<table>
<thead>
<tr>
<th>Test case</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful sessions</td>
<td>16.635</td>
</tr>
<tr>
<td>Successful pages</td>
<td>16.635</td>
</tr>
<tr>
<td>Successful hits</td>
<td>16.635</td>
</tr>
<tr>
<td>Total</td>
<td>49.905</td>
</tr>
</tbody>
</table>

Source: Wapt 10.1 recap results

**Table 7. Total failure (Failure)**

<table>
<thead>
<tr>
<th>Test case</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session failed</td>
<td>0</td>
</tr>
<tr>
<td>Page failed</td>
<td>0</td>
</tr>
<tr>
<td>Hit failed</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Wapt 10.1 recap results

Then Calculated use formula:

$$R = 1 - \frac{f}{n} = 1 - \frac{0}{49.905} = 1 - 0 = 1$$

(Formula 7)

1550  
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The result, if expressed in the form of a percentage, is 100%. According to Telcordia standards, the reliability success of the software is 95% or 0.95. Thus, Asthana & Angela, (2009), the R.I. Prosecutor's Office's Badiklat online examination system has met the characteristics of Reliability.

Usability

Testing usability characteristics through questionnaires, the results of respondents' answers are obtained, then calculations can be made for the Usability characteristics test. A recap of the results of the 86 respondents on the questionnaire on the online exam can be seen in table 8.

Table 8. Recap of Usability Characteristic Test Results

<table>
<thead>
<tr>
<th>Jawaban</th>
<th>Pertanyaan</th>
<th>Jumlah</th>
</tr>
</thead>
<tbody>
<tr>
<td>JS</td>
<td>165 160 125 180 125 195 130 126 1200</td>
<td></td>
</tr>
<tr>
<td>JS</td>
<td>144 136 148 124 156 112 132 144 1096</td>
<td></td>
</tr>
<tr>
<td>JCS</td>
<td>42 42 51 30 57 42 30 36 330</td>
<td></td>
</tr>
<tr>
<td>JTS</td>
<td>2 8 8 10 2 4 20 18 72</td>
<td></td>
</tr>
<tr>
<td>JSTS</td>
<td>2 3 4 2 3 7 5 28</td>
<td></td>
</tr>
<tr>
<td>Skor Total</td>
<td>2726</td>
<td></td>
</tr>
</tbody>
</table>

Source: Likert, (1932)

The data obtained from the respondents' answers were then calculated. Calculates the percentage of the score by the following formula:

\[ P = \frac{\text{Skor total}}{86 \times 5} \times 100\% \]

then \[ P = \frac{2726}{86 \times 5} \times 100\% \]

so that \[ P = 79.24\% \]

The percentage result of testing the characteristics of usability is 79.24%, when referring to the criteria of interpretation of the score Riduwan, (2010). percentage of 61% - 80% declared Viable. So the R.I. Prosecutor's Office's Badiklat online examination system was declared feasible and met the Usability test.

Performance Efficiency

The results of testing the characteristics of Performance Efficiency can be seen from figure 7.
From the results above, it can be concluded that although the overall test got a grade D with a performance score of 63%, the result of the loading time got 3.9 seconds. The results are then compared with a table on user satisfaction with the time response proposed by Hoxmeier & DiCesare, (2000) good if the load time is at least less than 10 seconds. From these results, it can be concluded that the badiklat online examination system of the R.I Prosecutor's Office has met the characteristics of Performance Efficiency with a satisfied predicate.

**Security**

The display of the test results of the Security characteristics can be seen in figure 8.

Based on the results of security testing using the Sucuri Sitehack web, the Badiklat online examination system of the R.I Prosecutor's Office has an intermediate or moderate security risk, no malware was found and was not declared on the blacklist, so it can be concluded that this online exam system is in accordance with security characteristics so that it is safe to use.
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**Maintainability**

Testing the characteristics of maintainability based on operational tests of instrumentation aspects that the system has notifications, consistency aspects of the results the system has similarity in model design, and the simplicity aspect of the results the system has a structured source code so that the badiklat online examination system of the R.I. Prosecutor's Office has met the aspects of maintainability.

**Portability**

Testing portability characteristics using Lambdatest's web tool. This test is carried out in a wide variety of desktop and mobile browsers. The following results of testing portability characteristics can be seen in table 9.

<table>
<thead>
<tr>
<th>No</th>
<th>Sistem Operasi</th>
<th>Type</th>
<th>Browser</th>
<th>Hasil Pengujian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Windows 10</td>
<td>Desktop</td>
<td>Google Chrome</td>
<td>Berjalan dengan baik</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mozilla Firefox</td>
<td>Berjalan dengan baik</td>
</tr>
<tr>
<td>2</td>
<td>MacOS</td>
<td>Desktop</td>
<td>Safari</td>
<td>Berjalan dengan baik</td>
</tr>
<tr>
<td>3</td>
<td>Android</td>
<td>Mobile</td>
<td>Google Chrome</td>
<td>Berjalan dengan baik</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mozilla Firefox</td>
<td>Berjalan dengan baik</td>
</tr>
</tbody>
</table>

Based on the results of testing portability characteristics using Lambdatest, results were obtained that the Badiklat Kejaksaan R.I. online examination system performed well in each browser and had met the portability criteria.

**Compatibility**

The results of compatibility testing using PowerMapper software can be seen in figure 9.
Testing *compatibility* characteristics using the *PowerMapper* application on the Badiklat Kejaksaan R.I online exam system with several browsers on both *desktop* and *mobile devices*. Compatibility test results do have several major and minor issues on Internet Explorer, Firefox, Safari, and IOS browsers. This problem occurs because the CSS code used by the online exam system does not support it in that browser. However, the results in the *critical issue* section show that there are no problems in all browsers, so it can be concluded that the online exam system meets the compatibility criteria.

**Recommendations**

Considering that the implementation of the Badiklat online exam of the R.I Prosecutor's Office was attended by participants of the Prosecutor's Administrative Technical Training (TAK) which numbered around 285 people, the *loading* of the exam page reached 3.9 seconds on the standard performance *efficiency* characteristics could still experience a longer loading when accessed by training participants simultaneously. Then it needs an evaluation for improvement and an increase in the *load speed* of the exam page, namely:

1. Optimization of the code of the question data retrieval program carried out by the participants.
2. Setting up servers, databases and internet networks more precisely and efficiently at the Badiklat R.I Prosecutor's Office so that the implementation of the exam runs more smoothly.

Perform problematic CSS updates both from the CSS version used and from the CSS code to make it more compatible with all types of browsers. And do CSS optimization by bundled the code to a more minimalist size so that when loading CSS is lighter and faster.
CONCLUSION

Based on the results of research and discussions that have been carried out using the ISO 25010 standard method, the quality of the Badiklat online examination system of the R.I Prosecutor’s Office is quite decent and meets the criteria. With the characteristics of functional suitability meets the standard because the value of X is equal to 1. The reliability characteristics have not failed, so it can be said to be very good. The usability characteristic gets a score of 79.24% then it is declared a worthy predicate. Although the performance efficiency characteristics get grade D, but with a response time of 3.9 seconds, it still gets the title of Satisfied. Security characteristics have medium or moderate security risks. The characteristics of maintainability meet the three elements of instrumentation, consistency and simplicity so that it is easy to re-develop. The portability characteristics of the results can be run in any browser with a good appearance. The compatibility characteristics are compatible with some desktop and mobile devices, only on IOS and Internet Explorer devices that have the problem of unsupported CSS code. The problem is because some browsers do not support the CSS code used by the Badiklat Kejaksaan R.I online exam system. However, the results in the critical issue section show that there are no problems in all browsers, so it can be concluded that the online exam system meets the compatibility criteria.

Based on the results of research and discussions that have been carried out using the ISO 25010 standard method, the quality of the online examination system of the R.I Prosecutor's Office is quite feasible and meets the criteria.

REFERENCE


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